

Getting Started with

Mastering
PHYSICS

The logo for Mastering PHYSICS features the word "Mastering" in a light green, sans-serif font above the word "PHYSICS" in a bold, orange, sans-serif font. Two curved arrows, one above and one below the text, form a circular path around the word "PHYSICS".

Using MasteringPhysics: Instructor Edition

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1 Registering, Logging In, and Logging Out

To set up your MasteringPhysics instructor account:

1. [Get an instructor access code](#)¹ from your Addison-Wesley representative.
2. Go to www.masteringphysics.com and click on the icon of the book you are using.
3. First-time users must click on Register and fill in the requested information about yourself and your college or university.

1.1 Getting an instructor account

To get your free MasteringPhysics instructor account, you need an instructor access code.

Instructor access codes are available from your Addison-Wesley representative.

1. Go to www.aw-bc.com and fill in the requested information about yourself and your college or university.
2. You will be given the email address and contact information of your Addison-Wesley representative. Contact your representative.

For security reasons, you may be asked to provide confirmation that you are an instructor.

Note: Instructor access codes remain the property of Addison-Wesley, may not be resold, and may be canceled at any time.

1.2 Getting a student account

Your Addison-Wesley representative can also provide you with a complimentary student account.

This is useful for registering in your own class to see how students see it.

1.3 Registering

Once you have your instructor account, you should register.

The screenshot shows two side-by-side panels. The left panel is titled "First Time User?" and contains the text "Register here with your Access Code to establish your Login Name and Password." Below this is a "Register" button. Further down, it says "Want to buy access online? Click below to use your credit card." with a "Buy Now" button. The right panel is titled "Established User?" and contains the text "If you have already registered an account, log in here." Below this are input fields for "Login Name" and "Password", followed by a "Log In" button. At the bottom of the right panel are three links: "Forgot your Login/Password?", "View your account summary", and "Select a different product". At the very bottom of the interface, there are links for "Product Support" and "Purchase Subscription".

To register, click on the Register button on the login screen. You will fill in a form and choose a login name and a password.

Note: Make sure your email address is entered correctly, in case you ever need to request your password.

If you also register as a student, you will go through a similar process

Note: Choose a second, different login name and password for yourself when you register as a student.

1.4 Logging in

To log in to MasteringPhysics, enter your login name and password at the login screen.

The screenshot shows a login interface with two main sections: "First Time User?" and "Established User?".

- First Time User?**: Includes the text "Register here with your Access Code to establish your Login Name and Password." with a "Register" button. Below it, it says "Want to buy access online? Click below to use your credit card." with a "Buy Now" button.
- Established User?**: Includes the text "If you have already registered an account, log in here." with input fields for "Login Name" and "Password", and a "Log In" button. Below the "Log In" button are three links: "Forgot your Login/Password?", "View your account summary", and "Select a different product".

At the bottom of the interface, there are two links: "Product Support" and "Purchase Subscription".

If you forget your password, click on **Forgot your Login/Password?**

1.5 Logging out

To end your session in MasteringPhysics:

1. Click **Log Out** at the top right of the page.

We strongly recommend logging out explicitly, especially in a laboratory or library environment. Avoid merely closing the browser window because this may not end your session and other users may have access to it.

1.6 Changing your personal information

To change your password or other personal information, click on **View your account summary** on the login screen.

You can also change your personal information on the Welcome page, or from here if you are viewing this Help as HTML.

1. Click on [Change your password and other personal information here.](#)

(This link takes you to the Pearson Educational user profile page, <https://register.pearsoncmg.com/userprofile/>)

2 Getting Started with MasteringPhysics

To work in MasteringPhysics, do the following in approximately this order:

Create a class

- [Create a class](#) ^[6]
- [Edit class information](#) ^[6]
- [Customize class welcome](#) ^[8]

Add and manage teaching assistants

- [Add a TA](#) ^[10]
- [Set TA privileges](#) ^[10]
- [Remove a TA](#) ^[11]

Set up an assignment

- [Use a pre-built assignment.](#) ^[12]
- [Create your own assignment](#) ^[13].
- [Copy an assignment from one of your classes to another](#) ^[12].
- [Require students to solve problems in order](#) ^[23].
- [Remove problems from an assignment.](#) ^[25]
- [Re-order problems on an assignment](#) ^[21].
- [Delete an assignment](#) ^[16].

Add and manage problems

- [Search for problems by type, difficulty, estimated time etc](#) ^[17].

- [Work through problems as a student.](#)^[18]
- [View problems with all hints, subparts, and answers exposed.](#)^[18]
- [Print solutions to problems](#)^[19].
- [Assign numeric problems with randomized variables](#)^[24]. (When variables are randomized, each student works a problem with slightly different values.)

Enroll and group students

- [Allow students to enroll in your class.](#)^[26]
- [Organize students into groups.](#)^[27]

Administer the class

- [Use the same assignment for more than one class](#)^[12].
- [Remove a student who has dropped your course](#)^[28].
- [Suspend a student who is abusing the program](#)^[28]
- [Close down a class at the end of the semester](#)^[29]

Grading Features

- How grading works
 - [Types of problems available in <PRODUCTNAME>](#)^[16]
 - [How <PRODUCTNAME> grades students](#)^[36]
 - [What <PRODUCTNAME> does not count as a wrong answer.](#)^[37]
 - [Answer tolerance](#)^[37]
 - [How you can use grading to motivate students](#)^[101]
- [Set the number of allowed answer attempts](#)^[13].
- [Modify how an assignment is graded](#)^[13].
- [Give partial credit for late assignments](#)^[13].
- [Adjust a student's score](#)^[47].
- [Give a student an extension](#)^[48].
- [Print your gradebook](#)^[49].
- [Download your gradebook as a CSV file](#)^[49] (which can be read by Excel and other spreadsheet programs)

Use best practices from other professors

- [Set student expectations for the course](#)^[99]
- [Explain the product](#)^[99]
- [Assign 'Introduction to <PRODUCTNAME>'](#)^[100]
- [Use grading strategies to motivate students](#)^[101]
- [Prevent and catch cheating](#)^[102]

2.1 Welcome Screen

When you log in to the course, you will see the Welcome screen.

From the main window, under "Tools you can use," you can access often-used parts of the Help system, check system FAQs, check system requirements for the program, check the status of the servers MasteringPhysics uses, and other useful tasks.

The left-hand tabs take you to common actions within MasteringPhysics:

Tab	Action
Assignment list	Displays a list of assignments for your class. From here you can add and edit assignments.
Current assignment	Returns you to the last assignment you selected, if you've moved to other pages.
Current problem	Returns you to the last problem you selected, if you've moved to other pages.
Previous problem	Takes you to the previous problem on the current assignment.
Next problem	Takes you to the next problem on the current assignment.
Class list	Displays the list of your current and expired classes. From here you can view and edit class properties, enrollment, groups, and instructors given access to your course; you can go to the Gradebook; and you can delete classes.
Gradebook	Displays the Gradebook for the current class. From here you can view and edit student grades.
Problem Library	Takes you to the Problem Library, containing all problems in MasteringPhysics.

The top tabs are reference and the Log Out tab:

Tab	Action
Home	Takes you to the Welcome screen.
Constants	Displays a list of physical constants.
Help	Opens this Help file.
Credits	Shows developers' credits for MasteringPhysics.
Log Out	Logs you out of MasteringPhysics. Especially if you are on a network, we strongly recommend logging out explicitly at the end of a session.

2.2 Set Up Classes

To set up a new class, you [create a class](#)⁶⁷, then [edit the class information](#)⁶⁷.

2.2.1 Creating a class

To create a new class:

1. From the Welcome screen, click on **Class List**, in the left-hand set of tabs.

Class List for Sarah Smith					
New Course ID: <input type="text" value="MPSMITH0002"/>		<input type="button" value="Create"/>			
Course ID	Class Title	Expiration (End Date)	Enrollment	View	Action
MPSMITH0032	Class MPSMITH0032	05/17/05 12:00 am	Closed	Properties Enrollment Groups Assistants Gradebook	<input type="button" value="Delete"/>

2. Fill in **New Course ID** with the ID of your course. Your students will need this ID when they register.
3. Click **Create**.

Your new class appears in the list of your classes.

Note: A course ID can be used only once. If you want to use a similar ID from year to year, append the year to it: PHYS115F2005, PHYS115F2006, etc. Course IDs cannot currently contain anything but alphanumeric characters (no underbars).

2.2.2 Editing class information

Once you have created a class, you can edit its properties.

1. Click on **Properties** from the Class List.

http://www.masteringhelp.com/mp/mp_support_form.php

Class List for Sarah Smith					
New Course ID: <input type="text" value="MPSMITH0002"/> <input type="button" value="Create"/>					
Course ID	Class Title	Expiration (End Date)	Enrollment	View	Action
<u>MPSMITH0032</u>	Class MPSMITH0032	05/17/05 12:00 am	Closed	Properties Enrollment Groups Assistants Gradebook	<input type="button" value="Delete"/>

The Edit Class Properties screen appears. Edit the fields:

Class Display Mode: <input type="button" value="Edit Class Properties"/>	
Class Properties for MPSMITH0032	
Title:	<input type="text" value="Class MPSMITH0032"/>
Class Expiration (End Date):	<input type="text" value="05/17/05 12:00 am"/> <input type="button" value="Calendar"/>
Timezone:	<input type="text" value="US-Eastern"/>
Allow Students to Enroll:	<input type="text" value="No"/>
Default Wrong Answer Penalty (% per part):	<input type="text" value="3"/> % (0-100)
Default Hint Bonus Or Penalty (% per part):	Unopened hint bonus is <input type="text" value="2"/> % (0-100)
Contact E-mail:	<input type="text" value="ssmith@effedtech.com"/> <input type="button" value="Email"/>
Introduction: (16KB max, HTML ok)	<div style="border: 1px solid gray; height: 100px;"></div>
	<input type="button" value="Preview"/>
<input type="button" value="Save"/>	

Property	Effect
Title	Names your class. By default this is the course ID of the class.
Class Expiration (End Date)	Sets the last day of the class. After this date, the class is over. No student can submit work. All students are disenrolled from the class, allowing them to enroll in other MasteringPhysics classes. Set the class expiration date late enough to ensure that students have time to submit their final assignments.
Time Zone	Selects the timezone in which your class is being given. MasteringPhysics uses this to tell when students submit their answers. If your timezone has not been added to our list, pick a convenient timezone and adjust the hour when assignments are due. Contact us to have your timezone added to our list.
Allow students to enroll	Change this to "Yes" when you want to allow students to enroll. You will probably not want to do this while you are developing the course. Remember to do it before your class starts!

Default wrong answer penalty (% per part)	<p>Sets the default penalty for wrong answers, per part. (See Recommended Grading Strategies^[10†].) You can override this for individual assignments.</p> <p>If this value is changed, the new value will apply to new assignments but not to assignments already created.</p> <p>Note: Multiple-choice questions^[35†] are graded differently; a penalty is always charged, to prevent students guessing their way through questions.</p>
Default hint bonus or penalty (% per part)	<p>Sets the default bonus for unused hints, per part. (See Recommended Grading Strategies^[10†].) You can override this for individual assignments.</p> <p>You can instead choose to charge a penalty for using hints.</p> <p>If this value is changed, the new value will apply to new assignments but not to assignments already created.</p> <p>Notes:</p> <ul style="list-style-type: none"> • Multiple-choice questions^[35†] are graded differently; a penalty is always charged, to prevent students guessing their way through questions. • The hint bonus or penalty applies only to hints (text that helps students to answer a problem part). Subparts of a problem part are graded like any other wrong answers. (See "Grading of tutorial problems"^[32†].)
Contact Email	<p>Sets whether you receive emailed student comments^[105†].</p> <ul style="list-style-type: none"> • If you wish to get student comments, insert your email address. • If you wish another person, such as a TA, to get student comments, insert that person's email address. <p>If you leave this field blank, the MasteringPhysics authoring staff will get student comments about the questions at the end of the semester, to aid in periodic review of questions. No one will see student comments until then.</p> <p>You may want to create a special email address outside of your regular account, such as on Yahoo or Hotmail. This has the advantage of collecting the data in one location.</p>
Welcome Message	<p>Adds your own messages here in plain text or HTML. You can preview these messages by clicking Preview.</p> <p>See Customizing the Class Welcome Page^[8†]</p>

2.2.2.1 Customizing the Welcome Message

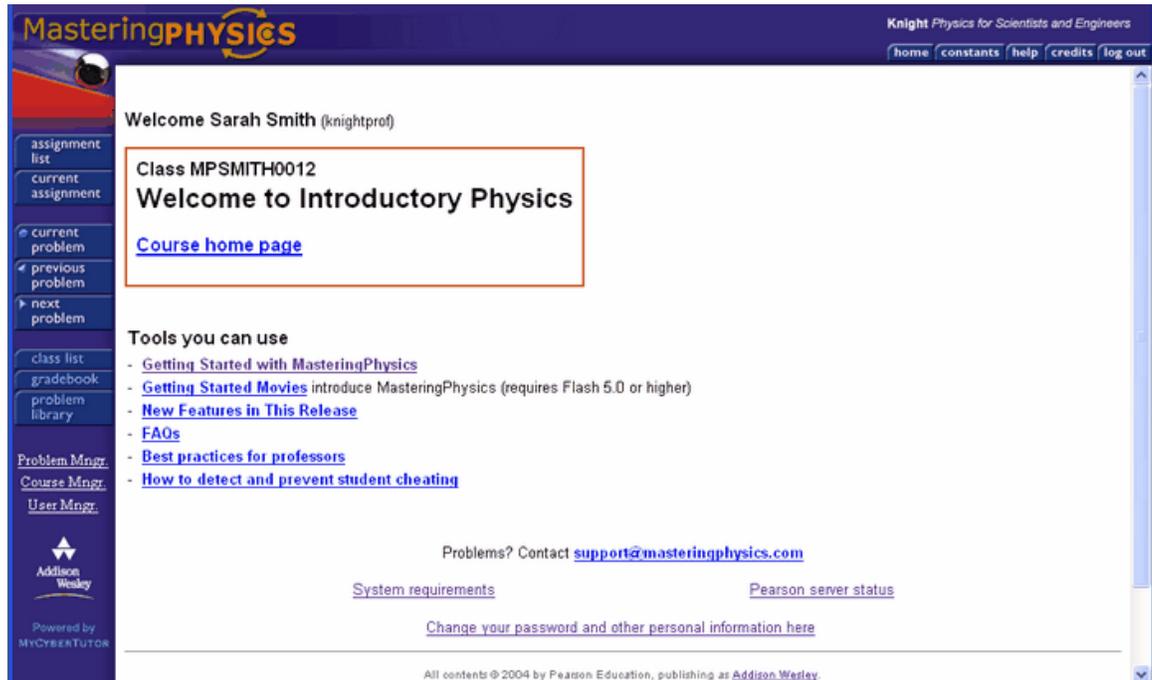
You can customize your welcome message using either plain text or standard HTML tagging.

Your welcome message will appear on your students' home page.

This welcome message should be short (2-3 lines at most). However, professors frequently use it to link to a [class home page](#)^[100], which can contain extensive information about the class.

- [Sample welcome message code](#)^[97]

2.2.2.1.1 Sample welcome message code



Replace **bold text** with your values:

```
<body>
<font size="+2" face="Arial, Helvetica, sans-serif">
<strong>Welcome to Introductory Physics</strong></p>
<p><strong><font face="Arial, Helvetica, sans-serif">
<a href="http://www.myschool.edu/~users/me/thiscourse/index.htm">Course
home page</a>
</font></strong></p>
</body>
```

2.2.3 Deleting a class

To delete a class, click on **Delete** opposite the class name in the Class List.

2.2.4 Give Colleagues and Assistants Access

From the Assistants screen, you can [add](#)^[10] teaching assistants to your course, give them any level of [privileges](#)^[10] you allow, and [remove](#)^[11] them from the course.

"Teaching assistants" may be colleagues at any level. To share a course with another professor, for example, simply make him or her an assistant in your course. This makes it easy to create [reference classes](#)^[31] or classes you and your colleagues can work on together.

The distinction between the original course professor and "assistants" with full privileges is merely for recordkeeping. It is not visible to students.

2.2.4.1 Adding TAs and colleagues to a course

Before a person can be added to a course as a TA, that person must have access to MasteringPhysics as an instructor.

You can request instructor codes for your TAs by contacting your Addison-Wesley representative.

- To find the contact information for your representative, go to <http://www.aw-bc.com>. In the upper left corner of the screen, supply your zip code. You will be asked for the name of your college or university and your department. You will then get contact information for your Addison-Wesley representative.

To add a TA or colleague to a course:

Class List for Sarah Smith					
New Course ID: <input type="text" value="MPSMITH0002"/>		<input type="button" value="Create"/>			
Course ID	Class Title	Expiration (End Date)	Enrollment	View	Action
MPSMITH0032	Class MPSMITH0032	05/17/05 12:00 am	Closed	Properties Enrollment Groups Assistants Gradebook	<input type="button" value="Delete"/>

1. Make sure the person has registered and logged in at least once. Get their login name.
2. Click on Assistants from the Class List, or select View Assistants from the Class Display Mode Selector.
3. Add the person's login name, and click on Submit. The person's name, login name, and email address appear on the Class Assistants list.

Class Display Mode: <input type="text" value="View Assistants"/>								
Class Assistants for MPSMITH0032								
Add Assistant (Login ID): <input type="text"/>		<input type="button" value="Submit"/>						
Class Update Privileges								
Assistant	Properties	Enrollment	Groups	Assistants	Assignments	Gradebook	Essays	Remove
Sarah Smith (swrsprof) swrs@world.std.com	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="button" value="Save"/>								

2.2.4.2 Giving privileges to TAs and colleagues

To give privileges to a TA or colleague, click on the boxes corresponding to the privileges you want to give that person, then click on **Save**.

An "assistant" with full privileges can do everything that the original course instructor can.

Class Display Mode: View Assistants

Class Assistants for MPSMITH0032

Add Assistant (Login ID):

Assistant	Class Update Privileges							Remove
	Properties	Enrollment	Groups	Assistants	Assignments	Gradebook	Essays	
Sarah Smith (swrsprof) swrs@world.std.com	<input type="checkbox"/>							

Privilege**Allows TA/colleague to...**

Properties

Update class properties

Enrollment

Change enrollment status of students

Groups

Add and delete groups into which students are placed

(Adding, deleting, or changing groups does not affect the enrollment status of students in those groups.)

Assistants

Add TAs, give privileges to assistants, or delete assistants

An assistant who has "Assistants" privileges can add and manage assistants, just as if he or she were the original professor.

Assignments

Create and modify class assignments

Gradebook

View and modify gradebook

Essays

Grade essays

2.2.4.3 Removing TAs and colleagues from a course

To remove a TA or colleague from a course, click on **Remove** opposite the TA's name, then click on **Save**.

Removing a TA from a course does not otherwise limit his or her access to MasteringPhysics.

2.3 Set Up Assignments and Problems

Clicking on a class title will take you to the Assignment List view, where you add and edit class assignments. Here, you can create new assignments, copy one of our pre-built assignments, or copy an assignment from another class for which you have teaching privileges.

When you click Create New Assignment, the Assignment List opens. From here you can:

- [Use a pre-built assignment](#)^[12].
- [Create your own assignment](#)^[13].
- [Copy an assignment from one of your classes to another](#)^[12].
- [Require students to solve problems in order.](#)^[23]
- [Remove problems from an assignment](#)^[25].

- [Re-order problems within an assignment](#)^[21].
- [Delete an assignment](#)^[16].

2.3.1 Creating assignments

When you create new assignments, you can copy whole assignments, copy and then edit an assignment, or create new, empty assignments to which you add problems.

An important pre-built assignment is "Introduction to MasteringPhysics." This practice assignment shows students the basics of working with MasteringPhysics. Students who do this assignment first are happier with the course at an earlier date. This pre-built assignment is automatically added to all new classes.

- [Use a pre-built assignment](#)^[12]
- [Create your own assignment](#)^[13]
- [Copy an assignment from one of your classes to another](#)^[12]
- [Delete an assignment](#)^[16]

2.3.1.1 Using pre-built assignments

You may want to copy an assignment that has already been created (by MasteringPhysics, or by yourself in another class).

You must have instructor access to the class from which you want to copy assignments.

Class Display Mode: View Assignment List			
Assignment List for MPSMITH0033			
New Assignment Title: Assignment 1		Create	Pre-Built Assignments: SHARED
			Go
Assignment Title	Date Due	View	Action
No assignments			

To add a pre-built assignment to your class:

1. Make sure you are in the class into which you want to copy assignments.
2. Click on **Assignment List**, or select **View Assignment List** from the Class Display Mode Selector.
3. Click the down arrow next to Pre-Built Assignments. You'll see the course IDs of your other classes, and a category called SHARED.
4. Select SHARED if it is not selected and click on **Go**.
5. To preview an assignment before you copy it, click on the assignment's title. Use your browser's Back button to return.
6. Click on **Copy** to copy an assignment. You can copy only one assignment at a time.
7. [Edit the assignment properties](#)^[13]. You will always need to edit the due dates and display dates of the assignment, since these values do not copy from class to class.

Note: If an assignment being copied contains problems already being used elsewhere in the course, those problems will not be copied with the new assignment. You can force adding a duplicate problem by making a local copy with the Authoring Tool and using that copy.

2.3.1.2 Creating an assignment

To add a new assignment to your class:

The screenshot shows the 'Assignment List for MPSMITH0033' interface. At the top, there is a 'Class Display Mode' dropdown menu set to 'View Assignment List'. Below this, there is a 'New Assignment Title' field containing 'Assignment 1', a 'Create' button, a 'Pre-Built Assignments' dropdown menu set to 'SHARED', and a 'Go' button. The main area is a table with columns for 'Assignment Title', 'Date Due', 'View', and 'Action'. The table currently displays 'No assignments'.

1. Make sure you are in the class into which you want to copy assignments.
2. Click on **Assignments** from the Class List, or select **View Assignment List** from the Class Display Mode Selector.
3. Edit the assignment title, or use the supplied title.
4. Click on **Create**. You are taken to the assignment properties for that assignment.
5. [Edit the assignment properties](#)¹³.
6. [Add problems to the assignment.](#)¹⁹

2.3.1.3 Setting assignment title, dates, and grading

To set assignment properties:

1. Click on **Properties** for the assignment, or select **Edit Assignment Properties** from the Assignment Display Mode Selector.
2. Edit values for the assignment properties.
3. Click on **Save**.

If you are copying assignments, note that due dates and display dates do not copy; they must be re-entered.

Note: Click on the calendar icon next to a date to make date entry easy.

Assignment Display Mode: Edit Assignment Properties

Title: Assignment 2

Date Due: 12/02/04 12:00 pm

Display in List: from 11/25/04 12:00 pm until 12/02/04 12:00 pm

Decrease to 0 % over the course of 0 hours past due date

Attempts Allowed (per part): 6 (0 = unlimited, 30 max.)

Request Solution Allowed: Yes

Wrong Answer Penalty (% per part): 3 % (0-100)
Note: This setting does not apply to multiple-choice questions

Hint Bonus Or Penalty (% per part): Unopened hint bonus is 2 % (0-100)

Staff Notes:
(16KB max)

Save

Add Text	Type	Title	Difficulty	Time	Points	Extra Credit	Serial	Randomization
No problems								

Note: Before you set grading choices, it's useful to read [Recommended grading strategies](#)¹⁰¹ for advice on using grading to motivate your students.

Property	Effect
Title	Names the assignment. This title will appear in the assignment list.
Date Due	Sets the date and hour when the assignment is due. Avoid making assignments due at 12AM or 12PM. 12AM is midnight (since 12:01 AM is one minute after midnight), but students are often confused. It is better to use 11PM or 1AM.
Display in List	Sets how long you wish the assignment to remain visible to students. We recommend keeping assignments visible until the end of the semester. The display date of an assignment must be the same date as, or later than, the due date. If you set the due date later than the display date, you will see the following message at the top of the screen: Assignment properties updated. ERROR: due date not in display range, reset to display range end. Reset your display date, then reset the due date.

- * Partial Credit** Sets whether you wish to allow partial credit for late assignments. If you wish to allow partial credit, fill out the percentage by which a student's score will be scaled over a given number of hours after the deadline.
- Note** how this works: If you set the partial credit on an assignment to "Decrease to 50% over the course of 12 hours past due date", then:
- A problem submitted at any point before the deadline receives full credit.
 - A problem submitted between 0 and 12 hours after the deadline receives an amount of credit that decreases linearly from 100% to 50% depending on exactly when the problem was submitted:
 - 1 hour after deadline = $50\% + 50\% * (12-1)/12 = 95.8\%$
 - 2 hours after deadline = $50\% + 50\% * (12-2)/12 = 91.7\%$
 - 3 hours after deadline = $50\% + 50\% * (12-3)/12 = 87.5\%$
 - 6 hours after deadline = $50\% + 50\% * (12-6)/12 = 75\%$
 - A problem submitted 12 or more hours after the deadline receives 50% credit (i.e. 50% of the student's original score on the problem).
- A problem submitted *much* later than 12 hours after the deadline still receives 50% of possible credit. That is, if it is due in November but submitted in December it still receives 50% of possible credit.
- Thus, students looking for extra points at the end of the semester have an incentive to go back and finish unfinished problems.
- * Answer Attempts Allowed (per part)** Sets how many wrong answers students are allowed before the system stops accepting answers. MasteringPhysics recommends at least 5; most students get the right answer by 8 attempts if they get it at all.
- If you leave this field blank or give it a value of 0, unlimited attempts are allowed.
- Note:** Duplicate answers and student formatting errors in answers do not count as separate attempts; see "[What counts as a right answer?](#)"³⁷
- Request Solution Allowed** Sets whether students can see solutions to a problem part.
- If No, students cannot see the solution to a problem part even after they have given up or exhausted their answer attempts.
 - If Yes, they can see the solution.
- MasteringPhysics recommends allowing students to see a solution for at least Skill-BUILDER (SB) and Self-Tutoring Problems (STP).
- You can set Request Solution Allowed to No until after the due date of the assignment, then edit it to Yes.
- Note:** Students cannot request a solution for a problem part until they have exhausted all of the hints associated with that part.
- * Wrong Answer Penalty (% per part)** Sets percentage by which wrong answers are penalized; if blank or 0, no penalty. This wrong answer penalty applies to all answers, whether in main parts or subparts.
- Note:** Formatting errors are not counted as wrong answers and do not penalize a student. Duplicate answers do not further penalize a student.

* [Hint](#)^[102] **Bonus or Penalty (% per part)** Sets percentage taken off student score for opening hints or added to score for not using hints. The point value applies to the entire assignment, and the percent added or subtracted is per hint. If blank or 0, no bonus or penalty.

Setting the penalty to 0, but setting a wrong answer penalty, means that taking hints will not be penalized, but giving wrong answers in subparts will be.

Staff notes Displays a field where you can write notes for yourself and your TAs. These notes are internal and are not seen by students.

2.3.1.4 Deleting a class assignment

To delete an assignment from a class, go to the Assignment List and click on **Delete** at the right of the row containing the assignment.

Note: You cannot delete an assignment until you have saved it. If you are not able to delete an assignment, save it, then click on **Delete**.

- Deleting an assignment does not delete the problems in the assignment. They are still part of the Problem Library or your own personal library of created and edited problems.
- If students have already done the assignment, deleting the assignment does not delete the work they have done. If problems from the assignment are used later in the course, the students' work will reappear.

2.3.2 Find and Work Problems

The Problem Library contains a large number of tested tutorial problems that you can use. They are organized not only by textbook part and chapter, but also by [type](#)^[16], level of difficulty, and estimated time to complete.

You'll find you want to copy entire assignments and choose problems from them. However, it's always useful to use the Problem Library features as well:

- [Search for problems by type, difficulty, estimated time etc](#)^[17].
- [Work through problems as a student](#)^[18].
- [View problems with all hints, subparts, and answers exposed](#)^[18]

2.3.2.1 How to tell problem types

There are two basic types of problems in MasteringPhysics.

- End-of-Chapter problems simply ask one or more questions and expect a response.
- Skill Builders and Self-Tutoring Problems give multiple ways through the problem.
 - Students who understand the problem immediately can simply answer it.
 - Other students (most of the class) can take a tutorial.

Tutorial problems may include:

- Optional textual [hints](#)^[102] designed to help stuck students

- [Subparts](#)^[102], simpler sub-problems that lead students toward a procedural understanding of the problem.
- Specific **feedback** for wrong answers submitted

Problem Type Skill Builders



Purpose

SBs improve conceptual understanding or develop a key skill. They are detailed worked examples that provide multiple forms of help including:

- Specific **feedback** to wrong answers submitted
- Optional hints designed to help stuck students
- Subparts that allow students to practice problem-solving and lead them toward a solution.

The hints, subparts, and feedback have been developed from detailed studies of how real students have gone about solving these problems and their most common difficulties at each step.

Self-Tutoring Problems



STPs help students bridge the gap from following worked examples to tackling end-of-chapter problems.

STPs are "standard" multi-part, multi-step homework problems that provide individualized feedback and help similar to that in Skill Builders.

End-of-Chapter Problems



EOCs provide additional problems adapted from specific textbooks. These problems are available only to classes using those textbooks.

Some of these problems can be assigned in two ways:

- With algorithmically generated variables and corresponding numerical answers
- Algebraically, with symbolic math answers.

Several graphics in the Problem Library provide information about specific problems:



Tutorial problem with specific hints, rejoinders, and follow-up text



Problem that can use fixed or randomized numbers



Problem that can use symbolic math answers as well as numbers.



Problem that uses an applet.

[Properties of Ocean Waves](#)
Paired with: [Problem 15.1](#)

[Paired problems](#)^[18] (STP problems paired with EOC problems), in textbooks that use paired problems.

2.3.2.2 Searching for problems of a specific type

To search for problems of a specific type:

1. On the Assignment List, click on **Add Problems** for the assignment, or select **Add Problems** from the Assignment Display Mode Selector.
2. Select a part and chapter from which you would like to search for problems.
3. Select the [types of problems](#)^[16] you would like to search for (Skill Builders, Self-Tutoring

- Problems, and/or End-of-Chapter problems) by clicking on the boxes next to those types.
- Click on Submit. A list of problems appears.

Assignment Display Mode: Add Problems

Add Problems to Assignment 2

Part: Chapter: Problem Type(s): SB STP EOC

New Problem Name:

Summary 75 problems found for Part 1 / Chapter 1 (SB+STP+EOC)

Assign	Type	Title	Difficulty	Time	View
<input type="checkbox"/>	SB	Dimensions of Physical Quantities	1	3m	Solution
Dimensions introduced, finding dimension of physical quantities					
<input type="checkbox"/>	SB	Geometric vs Componentwise Vector Addition	2	18m	Solution
Show that adding vectors with components or with geometry gives the same results. Must follow "Vector Addition: Geometry and Components." Long problem - recommend for practice					
<input type="checkbox"/>	SB	Made to Order (of Magnitude)	?	?	Solution
Several unrelated order-of-magnitude calculations.					

By default the problems appear sorted by type (SB, then STP, then EOC).

- In some products, Self-Tutoring Problem "pairs" have been created for selected End-of-Chapter problems by enhancing the End-of-Chapter problems with hints and feedback. To search for paired problems, try searching in any chapter for STP and EOC problems. Paired problems are identical except for their title and problem type.

You can also sort problems by title, difficulty, and estimated time to complete.

- Click on the title of the column on which you'd like to sort.
- A small box appears beside the title of the sort column. The default sort is ascending.
- To sort in descending order, click on the box next to the title. The sort is redone in descending order.

2.3.2.3 Viewing and working through problems as a student

To work a problem as if you were a student:

- Open the problem by clicking on its title. You will see it as a student would see it.
- You can now work the problem.

Click on **Restart Work** at the top right corner of the problem to reset it to its original form.

2.3.2.4 Viewing the solution to problems

There are two ways to view the solution to a problem. One is to click on **Solution** under the View column. The other is to:

- Open the problem by clicking on its title.
- Select **Solution View** from the pull-down menu in the Action column.

You will see the problem's solution with all hints/subparts/answers displayed.

To return to the student view, select **Standard View** from the pull-down menu in the Action column.

To get back to **Add Problems**, use the **Back** button in your browser.

2.3.2.5 Printing out problem solutions

MasteringPhysics allows you to print out the solutions to individual assignments.

1. On the Assignment List, click on **Print View** for the assignment, or select **View Printable Solutions** from the Assignment Display Mode Selector.
2. To print the solutions, click on Print at the upper right-hand corner.

Note: Printable solutions are for professors' convenience only; students do not have this option.

Important: Printed solutions should never be distributed to students or posted on the Web.

Printed solutions are protected under copyright laws.

2.3.3 Adding and working with problems

MasteringPhysics makes it easy to assign and manage problems.

- [Add problems to an assignment](#)¹⁹
- [Rearrange the order of problems](#)²¹
- [Modify problem instructions](#)²²
- [Set whether or not a problem depends on the previous problem in the assignment](#)²³
- [Assign problems either numerically, symbolically, or with randomized variables.](#)²⁴
- [Assign credit for problems](#)²²
- [Remove problems from an assignment](#)²⁵

2.3.3.1 Adding problems to an assignment

To add problems to an assignment:

1. On the Assignment List, click on **Add Problems** for the assignment, or select **Add Problems** from the Assignment Display Mode Selector.
2. Select a part and chapter from which you would like to search for problems.
3. Select the [types of problems](#)¹⁶ you would like to search for (Skill Builder, Self-Tutoring Problem, and/or End-of-Chapter problems) by clicking on the boxes next to those types.

Assignment Display Mode: Add Problems <input type="button" value="v"/>			
Add Problems to Chapter 4			
Part:	Chapter:	Problem Type(s):	
3: Applications of Newtonian Mec... <input type="button" value="v"/>	15: Fluids and Elasticity <input type="button" value="v"/>	<input checked="" type="checkbox"/> SB <input checked="" type="checkbox"/> STP <input checked="" type="checkbox"/> EOC <input type="button" value="Submit"/>	

Note: EOC problems are available for adopters of specific texts. If you are using a text that does not have EOC problems, you will see only the SB and STP boxes.

4. Click on **Submit**.
MasteringPhysics displays all problems available in the Problem Library for that part and chapter.

Note: If you are using the Authoring Tool, you may also want to search for problems in My Problems, at the end of the Problem Library.

To help in your search for problems to add, you can re-order the order of problems. Click on the title of any of the categories to re-order problems by that category.

Type (Default) Orders problems by problem type: first SB, then STP, then EOC, and finally EOC randomizable.

Title Orders problems by title. All EOC problems are filed in numerical order as "Problem NN.NN."

Default order is ascending; click twice for descending order.

Difficulty Orders problems by estimated difficulty on a scale of 1 to 5.

Default order is easiest first; click twice for hardest first.

Time Orders problems by estimated time to finish.

Default order is shortest first; click twice for longest first.

You can look at a problem before you decide whether to add it to the assignment.

1. Click on the title of any problem to [preview](#)¹⁸⁾ it, [work through](#)¹⁸⁾ it, or view its [solution](#)¹⁸⁾.

Select the problems you want to add to your assignment by checking the Assign box next to the problems. Problems available for use are automatically saved to the assignment.

<input type="checkbox"/>	SB	Streamlines and Fluid Flow	1
Find flow velocity versus area for incompressible fluids, and then how streamlines relate to velocity.			
<input checked="" type="checkbox"/>	SB	Young's Modulus	2
Contains several questions, conceptual and quantitative, leading to better understanding of Young's modulus.			
<input checked="" type="checkbox"/>	STP	18-Karat Gold vs. 14-Karat Gold	3
Find the density of 18-karat gold and the percentage composition by volume of 14-karat gold.			

The Assign box indicates whether the problem can be used in this assignment, as the following key indicates:

KEY: = Problem not assigned · = Problem on current assignment · = Problem on other assignment

Unchecked box The problem has never been assigned before. These problems are available for new assignments

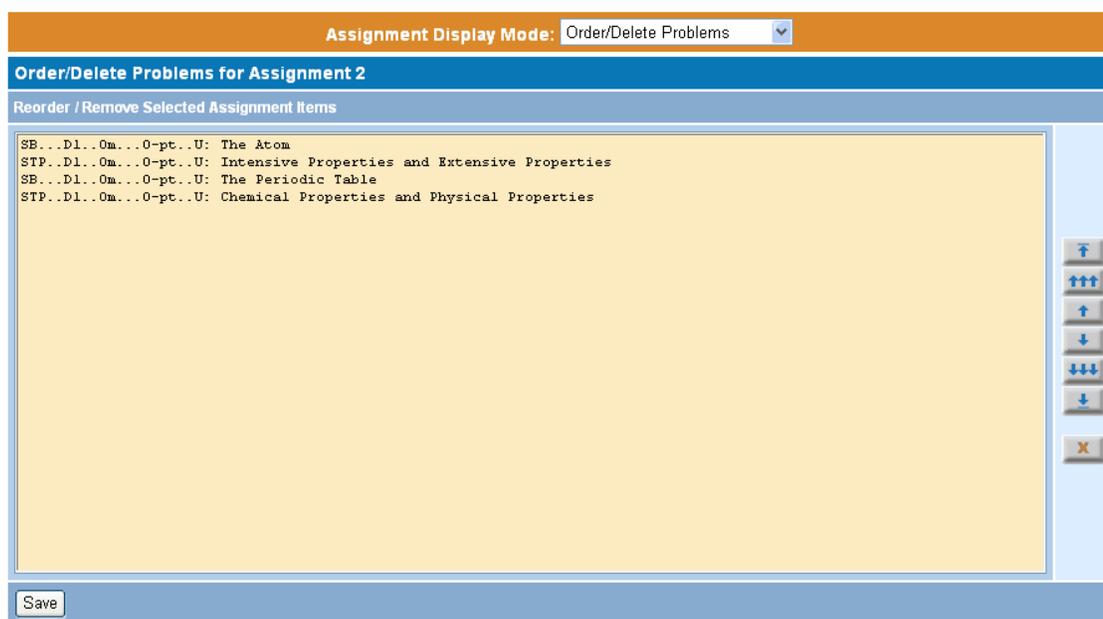
Checked box	The problem has been selected for the currently active assignment. These problems cannot be selected again.
Box with an X	The problem has been selected for another assignment in your class. You cannot assign the same problem twice.

To reorder problems or remove problems from an assignment, select **Order/Delete Problems**.

2.3.3.2 Rearranging the order of problems

To rearrange the order of problems:

1. On the Assignment List, click on **Properties** for the assignment, then select **Order/Delete Problems** from the Assignment Display Mode Selector.



2. Click on a problem to select it. The problem will highlight.
3. Click on one of the buttons to the right to move the problem up and down.
4. Click on the X button to delete a problem from the assignment. The problem will not be deleted from the Problem Library.
5. When you are finished, click on **Save**.

Button	Effect
	Moves problem to top of assignment.
	Moves problem up three places.
	Moves problem up one place.
	Moves problem down one place.
	Moves problem down three places.
	Moves problem to bottom of assignment.



Deletes problem from assignment. Does not delete from Problem Library.

2.3.3.3 Assigning credit to problems

MasteringPhysics assigns a default point value of 0 to each problem. To change that value:

1. On the Assignment List, click on **Properties** for the assignment, or select **Edit Assignment Properties** from the Assignment Display Mode Selector.
2. Scroll toward the bottom of the page to view individual problems.
3. Under the Points column, use the pull-down menu to change the desired number of points for a given problem.
4. Once you have completed your modifications, click on **Save** at the bottom of the page.

Summary 2 problems										
Add Text	Type	Title	Difficulty	Time	Points	Extra Credit	Serial	Randomization	Order	Action
	SB	The Atom	1	0m	1	<input type="checkbox"/>	<input type="checkbox"/>	--	1	Remove
Determine number of electrons/protons/neutrons from given atomic number, plus general questions about atom structure										
	STP	Intensive Properties and Extensive Properties	1	0m	0	<input type="checkbox"/>	<input type="checkbox"/>	--	2	Remove
Determine whether a given property is intensive or extensive										

Problems with a point value of 0 are counted as practice problems.

2.3.3.3.1 Assigning problems for extra credit

To assign problems for extra credit, check the Extra Credit box.

Problems assigned for extra credit are optional. They will not lower a student's grade, but may raise it.

Summary 2 problems										
Add Text	Type	Title	Difficulty	Time	Points	Extra Credit	Serial	Randomization	Order	Action
	SB	The Atom	1	0m	1	<input type="checkbox"/>	<input type="checkbox"/>	--	1	Remove
Determine number of electrons/protons/neutrons from given atomic number, plus general questions about atom structure										
	STP	Intensive Properties and Extensive Properties	1	0m	0	<input type="checkbox"/>	<input type="checkbox"/>	--	2	Remove
Determine whether a given property is intensive or extensive										

2.3.3.4 Customizing problem instructions

You may wish to create customized instructions for students.

1. If you are not already viewing your assignment, click on the **Assignment List** tab, then click the **Properties** link for the assignment you wish to modify. If you are viewing your assignment, select **Edit Assignment Properties** from the Assignment Display Mode Selector.
2. Click on the **Add Text** button to the left of the question name.



- On the screen that appears, you may enter your own comments about a particular assignment using plain text or standard HTML. For instance, you may want to include the URL for an online drill or example relating to the problem.

Summary 2 problems										
Add Text	Type	Title	Difficulty	Time	Points	Extra Credit	Serial	Randomization	Order	Action
		This is an example of Add Text.							1	Remove

- Once you have completed your modifications, click on **Save** at the bottom of the screen.
- To see your customized instructions, change the Assignment Display Mode to **View As Student**. Your comments appear above the problem's title, like this:

This is an example of Add Text.

[incomplete] [Converting Units: The Magic of 1](#) is for practice

To remove customized instructions, click on **Remove** next to the instructions.

2.3.3.5 Requiring problems to be worked in order

You may require students to finish one problem before the next appears (i.e., work them in serial order):

To require that problems be worked in order:

- On the Assignment List, click on **Properties** for the assignment, or select **Edit Assignment Properties** from the Assignment Display Mode Selector.
- Scroll toward the bottom of the page to view individual problems.
- Under the Serial column, click the box to indicate that the problem can be worked only after the preceding one has been completed.
- Once you have completed your modifications, click on **Save** at the bottom of the page.

Summary 4 problems										
Add Text	Type	Title	Difficulty	Time	Points	Extra Credit	Serial	Randomization	Order	Action
	SB	The Atom	1	0m	0	<input type="checkbox"/>	<input type="checkbox"/>	--	1	Remove
Determine number of electrons/protons/neutrons from given atomic number, plus general questions about atom structure										
	SB	The Periodic Table	1	0m	0	<input type="checkbox"/>	<input type="checkbox"/>	--	2	Remove
Identify elements, metals/nonmetal, or groups based on their description.										
	STP	Intensive Properties and Extensive Properties	1	0m	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	--	3	Remove
Determine whether a given property is intensive or extensive										
	STP	Chemical Properties and Physical Properties	1	0m	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	--	4	Remove
Determine whether given properties of a substance are chemical or physical										

When a student views an assignment, serialized problems appear on a light gray background. If a student tries to work that problem before finishing the previous problem, they are prompted to work on the previous problem first.

(This does not affect you; your instructor access allows you to click on problems in any order.)

Advanced Chemistry

Assignment 2

Assignment is due at 12pm on [date]

Credit for problems submitted late will be [percentage].
 The wrong answer penalty is 3% per problem.
 The unopened hint bonus is 2% per problem.
 You are allowed 6 attempts per answer.

Microsoft Internet Explorer

You must finish the previous problem before working this problem.

OK

[incomplete] [The Atom](#) is for practice

[incomplete] [The Periodic Table](#) is for practice

[incomplete] [Intensive Properties and Extensive Properties](#) is for practice

[incomplete] [Chemical Properties and Physical Properties](#) is for practice

Summary 0 of 4 problems complete (0% avg. score)
0 of 0 points

2.3.3.6 Assigning numeric problems with randomized values

The majority of End-of-Chapter problems, and some other problems, can be randomized so that numeric answers are different for each student. Randomization helps prevent student answer-sharing.

Problems that are not randomized require either answers in the form of a symbolic expression or numeric answers that are the same for every student.

Not all problems can be randomized, and some problems are always randomized.

A randomizable problem is indicated in the Problem Library by a set of dice next to its name..



You can choose whether randomizable problems are randomized:

1. On the Assignment List, click on **Properties** for the assignment, or select **Edit Assignment Properties** from the Assignment Display Mode Selector.
2. Scroll toward the bottom of the page to view individual problems.
3. Under the Randomization column, choose whether a randomizable problem will appear with fixed numbers (the same for every student), random numbers (different for every student), or symbol (a symbolic expression).
4. Once you have completed your modifications, click on **Save** at the bottom of the page.

STP Law of Definite Proportions 1 0m 0 Random Numbers 5 Remove

Determine the ratios of different types of atoms in molecules.

2.3.3.7 Removing problems from an assignment

To remove problems from an assignment:

1. On the Assignment List, click on **Properties** for the assignment, or select **Edit Assignment Properties** from the Assignment Display Mode Selector.
2. Scroll toward the bottom of the page to view individual problems.
3. Under the Action column, click **Remove** for any problem you would like to remove.
4. The remaining problems are rearranged in order.

Summary 5 problems											
Add Text	Type	Title	Difficulty	Time	Points	Extra Credit	Serial	Randomization	Order	Action	
	SB	The Atom	1	0m	0	<input type="checkbox"/>	<input type="checkbox"/>	--	1	<input type="button" value="Remove"/>	
Determine number of electrons/protons/neutrons from given atomic number, plus general questions about atom structure											
	SB	The Periodic Table	1	0m	0	<input type="checkbox"/>	<input type="checkbox"/>	--	2	<input type="button" value="Remove"/>	
Identify elements, metals/nonmetal, or groups based on their description.											
	STP	Intensive Properties and Extensive Properties	1	0m	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	--	3	<input type="button" value="Remove"/>	
Determine whether a given property is intensive or extensive											
	STP	Chemical Properties and Physical Properties	1	0m	0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	--	4	<input type="button" value="Remove"/>	
Determine whether given properties of a substance are chemical or physical											
	STP	Law of Definite Proportions	1	0m	0	<input type="checkbox"/>	<input type="checkbox"/>	Random Numbers	5	<input type="button" value="Remove"/>	
Determine the ratios of different types of atoms in molecules.											

Note: Removing problems from an assignment does not remove them from the Problem Library.

2.3.3.8 Updating problems

Because MasteringPhysics is Web-based, problems may be updated and improved during the semester as well as from semester to semester. When a new version of a problem is published during the semester, it is immediately added to the Problem Library.

If you see an issue with a problem in MasteringPhysics or want to suggest an improvement, first look in the Problem Library for the most current version of the problem. If the issue also affects the copy in the Problem Library, [contact us](#) and describe your issue or suggestion.

Please note:

If the problem is currently being used in an assignment, the assignment is not automatically updated. This is because updating a problem may involve changing the correct answer. Students who have already answered the problem might therefore find their previously correct answer marked wrong.

You may choose to update or not to update the problem.

To update the problem, [remove it](#)^[25] from the assignment, then [add it](#)^[19] back in. To avoid any possible mismarking, all students' work on that problem is discarded.

- If you [assigned this problem for credit](#)^[22], required this problem to be [worked in order](#)^[23], or [randomized](#)^[24] it, you will need to do those again.

If you do not want to update the problem, you may wish to [customize the problem instructions](#)^[22].

2.4 Enroll Students

Students who enroll in your course automatically appear in the MasteringPhysics Enrollment view.

Note: To enroll, students simply need to know your course ID and the student ID they should use (their college identification ID number, Social Security number, or other identification).

Make sure that your first communications with them include your course ID and instructions on what student ID they should use.

You can

- [Turn course enrollment on and off](#)^[26]
- [Suspend a student from a class](#)^[28] in case the student may have dropped out, or is cheating
- [Disenroll](#)^[28] individual students, such as students who have definitely dropped out or wish to move to another class

All students are automatically disenrolled at the end of the course.

You can choose to organize students into [groups](#)^[27], such as sections.

2.4.1 Allowing students to enroll in your course

When you are ready to enable students to access your course:

1. Go to [Edit Class Properties](#)^[6].
2. Change **Allow Students to Enroll** to Yes.
3. Click on **Save**.

For your students to log into MasteringPhysics, they will need the Course ID (not the title of the course), a student access code, and instructions on what student ID they should enter (their college ID number, Social Security Number, or other identification number).

Students who purchase new text books will find their code in the Student Access Kit that comes with the text. Students who purchase used texts may purchase an access code directly from the [<PRODUCTNAME> website](#).

Students who have difficulties enrolling can usually find help through our [Web-based list of FAQs](#). From the same page they can also contact Technical Support.

2.4.2 Organizing students into sections

It may be useful to organize students into smaller, more workable groups, for example by section.

In practice, the current way of identifying groups in MasteringPhysics works best for up to about 8 groups. For very large courses with many sections, it may be more workable to separate the class into multiple MasteringPhysics classes and copy assignments from a [reference class](#)^[31].

- Use groups if you expect that students will do a lot of moving from group to group.
- Use a reference class and multiple classes if your class is very large or you do not expect students to move much once the semester has started.

You can [create](#)^[27] and [delete](#)^[27] groups at will. Deleting groups does not [disenroll](#)^[28] students from the class.

2.4.2.1 Creating groups

To create a new group:

1. Click on **Groups** from the Class List, or select **View Groups** from the Class Display Mode Selector.

Class List for Sarah Smith					
New Course ID: <input type="text" value="MPSMITH0002"/>		<input type="button" value="Create"/>			
Course ID	Class Title	Expiration (End Date)	Enrollment	View	Action
MPSMITH0032	Class MPSMITH0032	05/17/05 12:00 am	Closed	Properties Enrollment Groups Assistants Gradebook	<input type="button" value="Delete"/>

2. Type in a name for the new group.
3. Select an icon. Icons are a combination of letter (such as A), color (such as Blue), and geometric shape (such as Circle).
3. Click on **Create**.

Class Display Mode: <input type="button" value="View Groups"/>			
Class Groups for MPSMITH0033			
New Group Name: <input type="text"/>		Icon: <input type="button" value="A"/> <input type="button" value="Blue"/> <input type="button" value="Circle"/>	<input type="button" value="Create"/>
Group Name	Icon	Members	Action
No groups			

The current way of identifying groups in MasteringPhysics works for up to about 8 groups. For very large classes with many sections, it may be more workable to separate the class into multiple classes and copy assignments from one class to the others.

2.4.2.2 Deleting groups

To delete a group:

1. Click on **Groups** from the Class List, or select **View Groups** from the Class Display Mode Selector.
2. Click on **Delete** opposite the name of the group.

Class Display Mode: <input type="button" value="View Groups"/>			
Class Groups for MPSMITH0033			
New Group Name: <input type="text"/>		Icon: <input type="button" value="A"/> <input type="button" value="Blue"/> <input type="button" value="Circle"/>	<input type="button" value="Create"/>
Group Name	Icon	Members	Action
Cubs	<input type="button" value="c"/>	0	<input type="button" value="Delete"/>
Red Sox	<input type="button" value="A"/>	1	<input type="button" value="Delete"/>
Total: 2 groups (1 members)			

The students are not removed from the class; only the group is deleted.

2.4.2.3 Assigning students to groups

To assign students to groups:

1. Go to **View Enrollment** in the Class Display Mode, or click on **Enrollment** in the class properties.
2. For each student, check the checkbox to the right of the icon for the student's group.

Name	Student ID	Login ID	E-mail	Groups	Status
Knight-Student, Sarah	xxx	ssknight	ssmith@effedtech.com		Enrolled
<input type="button" value="Save"/>					

3. Click on **Save**.

Note: If you forget which group is which, roll the mouse over an icon to see the group name.

2.4.3 Suspending students from a class

Students who may have dropped the course, or students who are suspected of illegal behavior (such as cheating), should be suspended from your course. Suspending is a temporary measure and can be reversed at any time. However, suspended students cannot submit work in the course, get credit, or see solutions.

Since they are not disenrolled from the course, they cannot enroll in another course.

To suspend a student:

1. On the Class List, click on **Enrollment** for the class, or select **View Enrollment** from the Class Display Mode Selector.
2. Change the student's status to **Suspended**.
3. Once you have completed your modifications, click on **Save** at the bottom of the page.

Name	Student ID	Login ID	E-mail	Groups	Status
Smith, Sarah	random	ssyf	ssmith@effedtech.com	(n/a)	Enrolled
<input type="button" value="Save"/>					

Suspending dubious accounts helps protect innocent students from accruing bad grades and is an extremely effective way to [prevent student cheating](#)^[102].

Suspended students can be re-enrolled without penalty. Simply change their status back to **Enrolled** and click on **Save**.

Students who have been suspended may need [extensions](#)^[48] on assignments that were due while they were suspended.

2.4.4 Disenrolling students

Disenrolled students have left the class and can enroll in another class.

To disenroll a student:

1. On the Class List, click on **Enrollment** for the class, or select **View Enrollment** from the Class Display Mode Selector.
2. Change the student's status to Disenrolled.
3. Once you have completed your modifications, click on **Save** at the bottom of the page.

Name	Student ID	Login ID	E-mail	Groups	Status
Smith, Sarah	random	ssyf	ssmith@effedtech.com	(n/a)	Enrolled

Save

Students may enroll in a new course only after being disenrolled from any previous courses.

Before you disenroll students who will join another MasteringPhysics class of the same course in the same semester, [export](#) their grades, since student grades do not transfer between classes.

2.4.5 Disenrolling all students at end of course

At the end date of each course, all students are automatically disenrolled from that course. This allows them to enroll in other courses.

You do not have to disenroll students explicitly; just [set the class expiration date](#) appropriately.

Since students who are disenrolled from a course cannot submit further work, all student work must be submitted before the end date of the course.

Note: The class expiration date should be several days after any student is likely to submit work.

For added security, [back up your students' grades to a CSV file](#) at the end of each course.

2.5 Contact Students by Email

Your gradebook and enrollment pages both contain links to students' contact information.

- From the Enrollment page you can view students' contact information.
- You can also click on a student's name on the Gradebook page to see a popup window with the student's contact information.

You can use the Download function of the gradebook to create a broadcast email list with all students' emails.

1. [Download the Gradebook to a CSV file](#) and open the file (e.g. in Microsoft Excel). You will see a column containing all students' email addresses.
2. Copy the data in that column and paste it into the "To:" or "CC:" field of your email program.

2.6 Checklist for Beginning and Ending Courses

At the end of each course you should:

1. [Export a copy of the grades from your Gradebook](#) for your records.

2. Make sure that the course expiration date has passed, if necessary by [editing the course expiration date](#).

As you begin a new course:

1. Make sure that the class expiration date of any prerequisite classes has passed by [checking the class properties](#). Make sure to check your own classes!
2. If you are continuing with the same TAs but have a new course ID, remember that you must [add your TAs to the new course](#) and [edit their privileges](#).
3. Remember to [set "Allow Students to Enroll" to Yes](#).

If your course is continuing from one semester to the next with no change in course ID, you need to do only the following:

1. [Export a copy of the grades from your Gradebook](#) for your records.
2. [Disenroll](#) any students who have dropped the course. (If you are not sure they have dropped, but they do not appear to be handing in assignments, you should [suspend](#) them temporarily.)
3. [Remove](#) any teaching assistants who are not continuing; [add](#) new teaching assistants and give them [privileges](#).

2.7 Reuse Courses

Once you or your colleagues have created your first MasteringPhysics courses, it is easy to reuse them.

Note: You should always create a new class, rather than trying to work with an old one. This ensures that the previous class's information is preserved.

2.7.1 Copying a class from a previous class

You can create a new class quickly from a previous class.

If you are creating a class from another professor's class, first have him or her [make you an "assistant"](#) in that class. You should have at least ["Assignment" privileges](#).

Once you are an assistant in a class, it will appear on your Class List and you can copy assignments from it as well as from classes you yourself have created.

If you are copying from one of your own classes, you won't need to do this step. Simply:

1. [Create a new class](#).
2. [Edit its properties](#). Remember to save your edits.
3. [Copy assignments from another class](#). Currently you must copy assignments one by one.
4. [Edit the assignment properties](#). (You will need to edit at least the due dates and display dates. Remember to save your edits.)
5. [Add new problems or delete old ones as necessary](#).

Note: If a problem has been republished since you used it in a previous class, the new version of the problem is used in your new class. This ensures that you have the most up-to-date version of the problem.

If you and your colleagues are frequently copying the same class, you can make it a [reference class](#).

2.7.2 Creating MasteringPhysics reference classes

Very large classes, or classes with multiple instructors, may want to set up their class as more than one MasteringPhysics class.

MasteringPhysics makes it easy to set up a "reference class," a class that can be copied and adapted by multiple instructors:

1. Set up the class with the assignments, problems, and edited/created problems that you would like it to have.
2. Give other instructors [access](#) to the class as "teaching assistants" [with appropriate privileges](#). Make sure to check the privilege of adding new instructors!

All instructors with access to the reference can then create classes from it:

1. [Create a new class](#).
2. [Edit the class information for the class](#).
3. Copy each [pre-built assignment](#) from the reference class.
4. [Edit the due date and Display in List date](#) for each assignment since these dates do not copy with the assignment.

Reference classes can be refined over multiple semesters. They can be used to create a standard course or succession of courses.

Note: Changes to the assignments in the reference class do not propagate to the classes that have been made from the reference class. This allows work on the reference classes without disturbing current courses.

2.7.3 Notes on reusing classes

If an assignment being copied contains problems already being used elsewhere in the course, those problems will not be copied with the new assignment. You can force adding a duplicate problem by making a local copy with the Authoring Tool and using that copy.

If an assignment being copied contains problems that have been updated and republished, the new version of the problem will be used in the new course even if the problem was not updated in the previous course. You can force using the old version of the problem by making a local copy with the Authoring Tool and recreating the old version of the question.

- In general, it's better to use the newer version; new versions often fix issues you may not immediately notice.
- It is always advisable to check your copied assignments for new question versions.

To keep courses from going stale, [search the Problem Library](#) for new problems.

- Also use problems you and your colleagues create with the Authoring Tool.

3 How Grading Works

MasteringPhysics provides many ways to see how well your students perform against other MasteringPhysics students, to look at individual students' answers and grades, and even to use the gradebook to prevent cheating.

Grading reflects the MasteringPhysics philosophy of helping students to do as well in physics as they possibly can. See how this works in "[The tutorial-based system of grading](#)."

The [grading algorithm](#) provides a sophisticated, automatic way of evaluating your students' work.

The [Assignment Summary](#) screen provides two kinds of information about your assignment:

- Data about each problem

- For each problem, statistical information about your students' performance versus the average of all students answering that problem

The [Gradebook](#)^[43] handles most grading automatically and provides you with the ability to view, edit and recalculate students' grades, as a class or in detail.

You can look at students' work down to the level of individual answers. All students' answers are timestamped, so you can tell not only how a student answered, but how quickly and exactly when.

3.1 The tutorial-based system of grading

There are two principal kinds of problems in MasteringPhysics:

- End-of-chapter problems, which simply ask a question and ask for a response.
- Tutorial problems, including Skill Builders and Self-Tutoring Problems.

Students have two paths through tutorial problems.

1. Students who understand the problem immediately can simply answer each problem part.
2. Other students (most of the class) can take a tutorial path through the problem.

Essentially, SB and STP problems allow students to choose between answering the question immediately and getting tutored on the answer. It is not an either-or decision; if the student tries to answer the question and doesn't get it right, he or she can open hints and subparts and be tutored on how to approach the problem.

The tutoring that SB and STP problems provide includes:

- Optional textual [hints](#)^[102] designed to help stuck students
- [Subparts](#)^[102], simpler sub-problems that lead students toward a procedural understanding of the problem.
- Specific **feedback** for wrong answers submitted

Grading reflects these differences in kind. Grading of EOC problems is simple and should be familiar.

However, [grading of tutorial problems](#)^[32] is designed to give students the maximum incentive to answer the problem correctly by providing the maximum credit for getting any part of the answer right.

3.2 Grading of tutorial problems: problem parts, hints, and subparts

The SB and STP tutorial problems, one of the most important innovations of MasteringPhysics, are designed to help students learn at their own pace. They are graded innovatively too, to encourage self-paced learning.

Students who need to learn something from an assignment **will get maximum credit by opening hints and doing subparts until they can answer the main part correctly.**

The tutoring consists of three kinds of interaction:

- Textual hints give information; they don't include subproblems.
- Subparts break down the problem into a smaller series of problems. Each subpart contains one or more problems to solve. Doing subparts helps students conceptualize and practice how to approach the main problem.
- After students complete a part or subpart, optional feedback may provide more information.

Grading reflects this tutorial approach. For the purposes of this discussion, let's say that each main part of a tutorial problem is worth 1 point:

1. Students can always immediately answer the main part; if they are correct, they immediately get full credit, 1.
2. When a problem part has subparts, the possible points a student can get are divided equally between all subparts and the main part. That is, the answer to any subpart counts for $1/n$; the answer to the final part also counts for $1/n$. There's no extra weight given to the answer to the main part.
3. Students must provide an answer to each main part of the problem. This is not optional.
4. Students can choose not to open a subpart, or open it but not answer it.
5. Any subpart that is not answered correctly will get a final grade that depends on whether the main part was answered correctly or not.
 - If the main part is correct, the subpart is graded as correct (less any points for wrong answers).
 - If the main part is not correct or the student exceeded the number of allowed answers without getting a correct answer, any unfinished subpart will be graded incorrect as well.

Hints don't count toward a student's grade unless the professor gives a bonus for not using them (or, rarely, a penalty for using them). Feedback is free.

For example, suppose a problem part has

- 1 textual hint
- 3 subparts, each with 1 question to answer
- 1 final answer

Here are some simple cases, where the professor is not charging for hints or wrong answers. (For other cases, see "[How professors can modify grading](#)"^[34].) Grading rewards knowledge and persistence:

Case 1:

Student answers all subparts correctly and also gets the final answer. Each subpart counts for $1/4$ of the possible grade. Student has answered 3 subparts and the final answer correctly, for a total of 4 out of 4. Student gets $4/4$, or full credit.

Case 2:

Student opens subpart 1, answers it, understands how to work the problem, doesn't bother with the other 2 subparts, goes right on and answers final question right. The student has correctly answered 1 subpart and the final answer, and gets credit for having answered the other 2 subparts correctly, for $4/4$, or full credit.

Case 3:

Student opens subpart 1, answers it correctly, goes directly on to final answer but gets that wrong (without exceeding the number of allowed answers). Student then goes back, opens other subparts, and works them before succeeding in answering the main part. Student eventually gets 4 out of 4 answers correct, for full credit.

Case 4:

Student answers all subparts correctly but never gets the final answer. Student gets 3 out of 4 answers correct, for $3/4$ credit. (This is a rare case; most students who answer all the subparts correctly will get the final answer as well.)

Case 5: Deferred credit

Student does not answer main part correctly, works 1 subpart correctly, but does not work the other subparts. When assignment is due, student is credited with only 1 out of 4 answers correct, for $1/4$

credit.

- However, if professor gives partial credit for late work, student can go back anytime until the end of the course and work the other subparts for additional credit, even if student has exceeded allowed answers on main part.

Case 6: The only case in which student is guaranteed to lose credit:

Student requests solution for a main part or a subpart.

- If student requests solution to a subpart, the student gets no credit for the subpart even if the main part is correct.
- If student gets subparts right but requests solution to the main part, s/he gets credit for those subparts but not for the main part.

It is not allowed to request the solution to the main part before opening all hints and subparts.

3.3 How professors can modify grading

Note: Before you set grading choices, it's useful to read [Recommended grading strategies](#)^[10] for advice on using grading to motivate your students.

Professors may choose to modify this grading scheme in several ways.

Wrong answers

Professors may charge for [wrong answers](#)^[37]. However, this can discourage students from useful experiments; if you assess a charge for wrong answers, it should be small.

Set this value as a default in the [Class Properties](#)^[6] or assignment by assignment in the [Assignment Properties](#)^[13].

Charge/credit for hints

Professors may optionally charge for opening hints or give extra credit for not opening them. Credit or charge is by hint or subpart; that is, if a professor charges 3% for opening a hint or subpart and the student needs to open 6 of them, then the student's possible grade is reduced by 18%. (Feedback is never charged for.)

There is a difference between hints and subparts. Hints are textual. Subparts are simpler tutorial problems.

Important note: If you do not charge for opening hints but do charge for wrong answers, students will be charged a wrong answer penalty for a wrong answer to a subpart.

This is not a penalty for using hints. It is simply a standard penalty for a wrong answer.

Students do not like being charged for hints and it may discourage them from using tutorials; it works better to give extra credit for not using them. Students who have accumulated extra credit from hints they haven't used are more willing to experiment and use hints when they need them.

Set this value as a default in the [Class Properties](#)^[6]. You can override it assignment by assignment in the [Assignment Properties](#)^[13].

Important note: Even if you do not charge for wrong answers in subparts, students will still be charged a [multiple-choice penalty](#)^[35] for wrong answers on a multiple-choice question. The [multiple-choice penalty](#)^[35] is not modifiable; otherwise, students would simply guess their way through.

This is not a penalty for using hints. It is simply a standard penalty for a wrong answer on a multiple-choice question.

Extra credit questions

You may make a question an extra-credit question. That is, it does not count against the student's grade, but may improve it.

Limit to number of allowed answers

Professors may set an upper limit to the number of allowed answers. If students exceed this limit, they receive no credit on the part or subpart. Again, this can discourage students from experimenting.

Set this value assignment by assignment in the [Assignment Properties](#)^[13].

Partial credit for late assignments

Professors may assess a charge for assignments turned in late.

Set this value assignment by assignment in the [Assignment Properties](#)^[13].

Point value of a problem

Professors can [set the point values of problems](#)^[22]. Problems that have no point value are listed as "for practice" in the assignment. If you expect your students to do these problems, it may be wise to make it clear to them that "practice" problems are not optional, or give these problems small point scores.

3.3.1 Wrong answers on subparts can affect grade

Students often believe that "no penalty for opening hints" or subparts is the same as "no penalty for answering subparts incorrectly."

If you do not charge for opening hints or subparts, but do charge for wrong answers, students are charged for a wrong answer to a subpart.

This is not a penalty for using hints. It is simply a standard penalty for a wrong answer.

Any other choices you make (for instance, about number of allowed answers) also apply to subparts.

Subparts are different from main parts in only two ways:

- Students do not have to open a subpart (and may receive a bonus for not opening it).
- If students open a subpart, they do not have to answer it.

3.3.2 Multiple-choice wrong answers always lose credit

Multiple choice questions are always specially graded.

- For each unique wrong multiple-choice answer a student submits, he or she loses $1/(n-1)$ points, when n is the number of options to choose from.

This "guessing penalty" is always applied even if professors do not otherwise charge for wrong answers. Otherwise students could simply guess their way through multiple-choice questions.

If you do not want multiple-choice questions to count against your students' grades, make them practice problems, for no points.

3.4 How the program calculates a grade

Note: Actual class statistics and actual grades are calculated only after the assignment is due. Until the assignment due date passes, partially completed assignments

- **May not be reflected in the student's grade**
- **Are not counted in the class average.**

MasteringPhysics uses the following rules in grading students:

- Every correct "main part" of a problem counts for 1 credit. For example, if a problem has 6 parts, MasteringPhysics treats it as if it is worth 6 credits.
- If the part has [subparts](#)^[32], the possible credit for the part is divided by the number of subparts plus 1 (for the main part). If a problem part has 3 subparts, students receive 1/4 credit for each subpart they answer, even if they are unable to obtain the answer to the main part.
- If the student requests the solution to a subpart or exceeds the number of possible answers to a subpart, they will lose credit for that subpart even if they are able to obtain the answer to the main part.
- If a student does not answer a subpart, the subpart is graded as correct if the main answer is correct and incorrect if the main answer is incorrect.
- If a question is [multiple-choice](#)^[35], wrong answers are always charged for.

When teachers set up assignments, they may choose to [modify](#)^[34] this grading scheme:

- Penalize wrong answers or limit the number of allowed answers
- Reward students for not using hints/subparts (or, rarely, penalize for their use)
- Set a late charge if an assignment is turned in past the time it is due

These values apply to the entire assignment. Limitations and penalties that apply to main answers (e.g. a wrong answer penalty) also apply to answers to subparts, even when the "hint penalty" is 0.

After the entire problem has been completed, the student's total points are divided by the maximum points for the problem equal to:

$$\text{Max_points} = \text{number of main parts}$$

This ratio is their score for the problem, and can be greater than 1 if the student got mostly correct answers without using any hints and the hint bonus is on.

In the student's view of the assignment, this score appears as a percentage next to any problem that the student has completed.

3.4.1 Grading of essays

The grading of essays is different from other types of answers, since essay grades are not computed until the essay has been graded.

In the problem's grade summary page, any main part for which the student submitted an essay answer does not display a computed grade, but instead displays the message "grade pending". Any main part that contains an essay solution is provisionally graded as if that sub-part did not exist, and the main part score is displayed with a provisional icon (a yellow question mark). The total problem score is calculated as if the parts containing essays do not exist in the problem.

If there are no non-essay main parts, then only the provisional icon is displayed; there is no score until the essays have been graded.

Once the essay has been graded, the grade summary page computes the problem score according to the standard rules, using the assigned essay grade. The provisional icon is no longer displayed.

3.5 How the program calculates a student's average

Although the individual assignment scores are given as percentages, the student's final score is a weighted average based on how many points each assignment is worth (computed by summing the number of points each problem on the assignment is worth).

- Only assignments that have become due are counted in the student's average.
- Only problems for credit are counted in the student's average.

3.6 What counts as a right answer?

Answers that are formatted incorrectly or that have unbalanced parentheses do not count as wrong answers.

If the format is not correct but can be unambiguously corrected, MasteringPhysics corrects it and does not count it as a wrong answer.

Numeric answers are graded correct if they are within 2% of the correct answer. If later parts of the problem depend on a particular value of the answer, later parts of the question prompt the student to use that value.

Note: If an answer is asked for in alphabetic or numeric order, and the student does not give it in that order, it is **not** counted as correct. That is, the answer acb is not equivalent to abc . This is because MasteringPhysics uses string matching on these answers.

3.7 Grading tolerance and significant figures

Our default tolerance is 2%. However, our authors may adjust this value to force the student to answer with a certain number of significant figures if this is specified within the problem.

If a student's answer is outside the specified tolerance but within 5% of the program's answer, the answer will be counted incorrect, but the student will see the response, "You are close. It may be that you made a rounding error or used the wrong number of significant figures."

We recommend that students work to **at least one more significant figure than the answer requires**, and round off at the end.

Students are often confused about the definition of a significant figure. There are several useful online discussions, including at least one that drills students on recognizing significant figures. You can [customize the problem instructions](#) ^[22] to refer students to online discussions or drills.

3.8 Viewing grade choices

The grading choices for each assignment are visible to students on their Current Assignment page.

Introduction to Physics 2005

Chapter 5

Assignment is due at 12pm on Wednesday, May 25, 2005

Credit for problems submitted late will decrease to 0% after the deadline has passed.

There is no penalty for wrong answers to free response questions. Multiple choice questions are penalized as described in the online help.

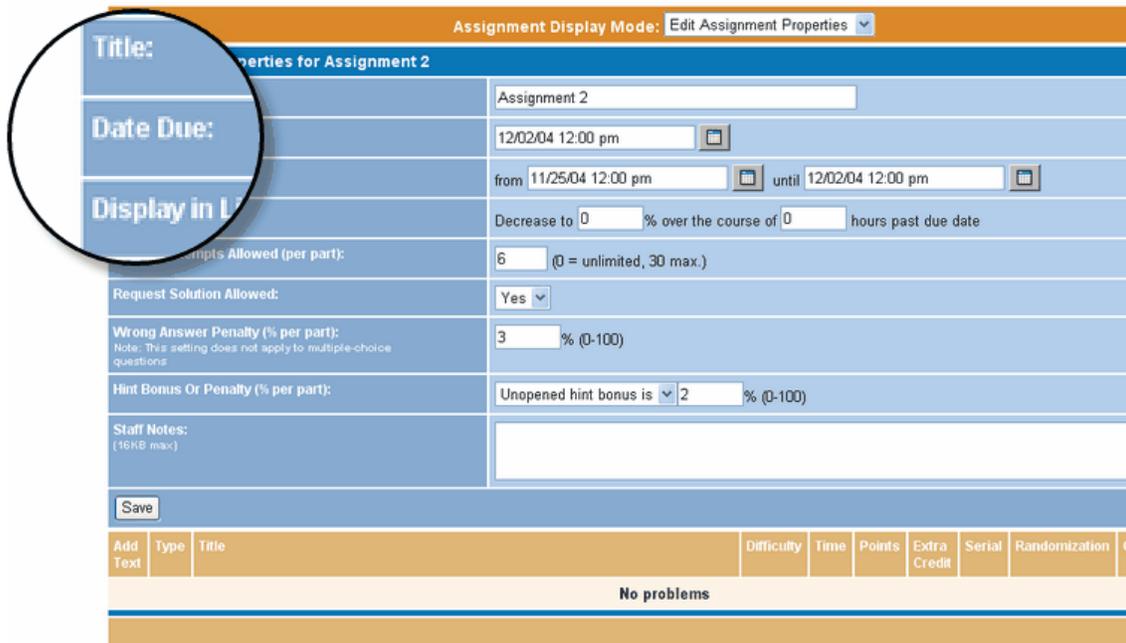
The unopened hint bonus is 3% per part.

You are allowed unlimited attempts per answer. 

3.9 Giving all students an extension

To extend the due date of an assignment for all students:

1. Click on **Properties** for the assignment, or select **Edit Assignment Properties** from the Assignment Display Mode Selector.
2. Enter a new due date for the assignment.
3. Click on **Save**.



Assignment Display Mode: Edit Assignment Properties

Title: Assignment 2

Date Due: 12/02/04 12:00 pm

Display in List: Decrease to 0 % over the course of 0 hours past due date

Attempts Allowed (per part): 6 (0 = unlimited, 30 max.)

Request Solution Allowed: Yes

Wrong Answer Penalty (% per part): 3 % (0-100)
Note: This setting does not apply to multiple-choice questions

Hint Bonus Or Penalty (% per part): Unopened hint bonus is 2 % (0-100)

Staff Notes: (16KB max)

Save

Add	Type	Title	Difficulty	Time	Points	Extra Credit	Serial	Randomization	
No problems									

3.10 Changing the point value of a problem

To change a grade for all students, change the point value of the problem. For instance, if students really do not understand a problem, you can make it a practice problem by changing the point value to 0:

1. Click on **Properties** for the assignment, or select **Edit Assignment Properties** from the Assignment Display Mode Selector.
2. The lower half of the page (tan) shows individual problems in the assignment.
3. Click on the **Points** pulldown menu opposite a problem to add credit points to the problem.
4. Click on **Save**.

Summary 2 problems											
Add Text	Type	Title	Difficulty	Time	Points	Extra Credit	Serial	Randomization	Order	Action	
	SB	The Atom	1	0m		<input type="checkbox"/>	<input type="checkbox"/>	--	1		
Determine number of electrons/protons/neutrons from given atomic number, plus general questions about atom structure											
	STP	Intensive Properties and Extensive Properties	1	0m	0	<input type="checkbox"/>	<input type="checkbox"/>	--	2		
Determine whether a given property is intensive or extensive											

The new point value of the problem is applied to all students' grades, whether or not the students have already submitted their assignments.

4 Assessing Assignments: The Assignment Summary

From week to week, you can check back on your students' performance on the assignments you have given them. By looking at students' performance on a specific assignment, you can answer questions such as:

- Was this assignment too short/long/easy/hard for these students?
- Did students have difficulty on specific problems?
- How well are my students doing on these problems, compared to all students?
- How well did this assignment work for my students?

Assignment Summary data provides a quick way of getting real data about your students' mastery of their assignments. It shows:

- Data about each problem: type, difficulty, estimated time, points assigned, whether the problem answer is a random number, and whether the problem must be completed after another problem
- Statistics about the performance of your class as a whole, for each part, subpart, and hint
- How difficult other classes found this problem
- How difficult your class found this problem
- For problems using symbolic math, the most common wrong answers for each part and subpart

By seeing these statistics for individual assignments and problems, you can assess how well the particular assignment is conveying the material.

In addition, you can assess how students are responding to the assignments by receiving emailed [survey comments](#)^[105] about the problems. "[Editing Class Information](#)"^[8] shows how to set this up.

4.1 Viewing properties of the assignment

At the top of the Assignment Summary screen, you'll see the due date, display until date, grading choices, and other properties of the assignment.

Assignment Display Mode: View Assignment Summary	
Assignment Summary for Chapter 2	
Class:	Introduction to Physics Spring 2005 MY TEST COURSE
Title:	Chapter 2
Date Due:	4pm on Friday, January 21, 2005 (no student extensions)
Display in List From:	4pm on Monday, January 3, 2005
Display in List Until:	4pm on Tuesday, June 21, 2005
Partial Credit:	Credit for problems submitted late will decrease to 0% after the deadline has passed.
Answer Attempts Allowed:	Students are allowed 8 attempts per answer.
Request Solution Allowed:	Students may request solutions (i.e. give up and view answer).
Wrong Answer Penalty: <small>Note: This setting does not apply to multiple-choice questions</small>	There is no penalty for wrong answers to free response questions. 
Hint Bonus Or Penalty:	The unopened hint bonus is 3% per part. 
Staff Notes:	(none)

Just below is displayed the total number of points the assignment counts for in the students' final averages.

Summary 6 problems (18 points)

These can be changed by changing the Assignment Display Mode to **Edit Assignment Properties**, editing what you wish to change, and clicking on **Save**. Points can be changed by editing the number of points in each problem.

4.2 Viewing data about each problem

On the lower part of the Assignment Summary screen, you can see specific data about each problem.

Type	Title	Difficulty	Time	Points	Extra Credit	Serial	Randomization
	Given Positions, Find Velocity and Acceleration	1	6m	2			--
My Class:		?	?				
 System Average							
Given a table of position versus time, identify graphs of an object's trajectory, velocity, and acceleration.							
	Going for a Drive	2	22m	2			--
My Class:		?	?				
 System Average							
Qualitative aspects of constant acceleration kinematics followed by quantitative questions. Uses applets.							
	Kinematic Vocabulary	2	9m	2			--
My Class:		?	?				
 System Average							
A series of questions designed to sharpen the understanding of terms used to describe motion.							

Type	Indicates whether the problem is SB (skill builder), STP (self-tutoring problem) or EOC (end-of-chapter problem).
Title	Shows title of the problem; click on the problem's title to see the problem and its solution, with comparative statistics about how your class and others did on each part.
Difficulty	Provides a rating of how difficult students find this problem on a scale of 1 (easy) to 5 (hard). The rating is based on the number of correct and wrong answers submitted as well as the number of hints and solutions requested. (Difficulty ratings are not available for some End-of-Chapter problems.)
Time	Provides the time estimate to complete this problem based on the system's average. (Time estimates are not available for some End-of-Chapter problems).
Points	Lists the number of points you assigned to this problem.
Serial	Indicates whether or not you have asked for this problem to be serialized in the assignment list.
Randomization	Indicates whether or not you have asked for a particular end-of-chapter problem to be randomized.

The [color bar](#) underneath each problem shows how your class did on that problem, compared with the average of all students who have completed the problem. (Note: Comparative statistics are not available during beta-test periods.)

4.3 Viewing comparative statistics for each problem, for your class and others

The Assignment Summary screen gives you statistical information about your students' performance on each problem, as well as how other classes all over the world did on the same problem.

- Before your students complete the assignment, you can view the average results for each problem for all students, in all universities, who have answered the same problem.
- After your students complete your assignment, you are able to compare your own class's results, per problem, with these average results. (Some End-of-Chapter problems are excluded from this summary data.)

A color bar is included for a quick visual guide to each problem's difficulty. This is how to interpret the color bar:



Color of bar	corresponds to
green	% of students who submitted the correct answer to this problem part
red	% of students who requested the solution to this part
orange	average # of wrong answers submitted per student for this part
gold	average # of hints requested per student for this part

Roll your mouse over the color bars to see the numbers and their meaning.

Note: Students are often motivated by seeing how well they have done compared to the average.

4.4 Viewing comparative statistics for each problem part

For each problem, you can drill down to view the performance of your class as a whole (for each part, subpart, and hint), and compare it against all students worldwide who have answered this question.

In addition, MasteringPhysics ranks the most common wrong answers whenever a symbolic math answer is requested.

1. On the **View Assignment Summary** screen, click on the title of the problem.

The view shows the complete problem text with all the hints and subparts opened, and the answers displayed.

Part A
How many squares are in this 2×2 grid?



The picture frame icon lets you know that an image goes along with this part. When it appears, click the icon to make the image appear in the lower right-hand corner of your screen. The image for this particular part should already be visible.

Enter your answer in numerical format in the box below and then click **submit** to submit your answer.

ANSWER:

Answer Stats:	Students	% Correct	% Req'd Solution	Wrong/student	Hints/student
Overall			(no data)		
MPSMITH0025			(no data)		

Wrong Answers for MPSMITH0025		
% Wrong	Answer	Response
NaN%	2*2	<p>Although the figure does include four, small 1×1 squares, there is also the one larger 2×2 square.</p> <p>This is an example of the kind of helpful response that the program often gives when you submit an incorrect answer. Go ahead and try again now that you know there is one additional square in the figure.</p> <p>The feedback box will automatically close on your next submission, but you can also close it by manually clicking <code>&#34;close&#34;</code> in the upper right-hand corner.</p>

If the part required symbolic math entry, you'll find the ranking of the most common wrong answers listed directly below the part statistics.

These wrong answer statistics pinpoint where students are going wrong and suggest ways to customize a question for a particular class. You can customize a question by giving it [customized instructions](#)^[22] or by editing it with the Authoring Tool.

Note: End-of-Chapter problems do not always include rich diagnostic information.

5 Assessing Students: The Gradebook

The Gradebook provides an automatic, centralized way of keeping track of students' grades.

The Gradebook provides more than simple tracking and averaging. In it, you can

- [View grades](#)^[43] of all students, groups of students, or individual students
- [View a student's work](#)^[45], including all answers, time each answer was entered, and time each problem was submitted
- [Edit a grade](#)^[47] for an individual student
- Give a student an [extension](#)^[48]
- [Download all grades as an Excel compatible comma-separated-values \(CSV\) file](#)^[49]

- [Print grades](#) 

5.1 Overview of the Gradebook

Each class's gradebook is automatically populated as students enroll in the class.

If you have more than one class, clicking on **Grades** takes you to the gradebook for the currently selected class.

- You can change your class selection by selecting a class from the **Class List** and then clicking **Grades**.

You see the list of your students on the left hand side of the table and a list of assignments across the top.

Roll your mouse over the assignment number to see the name and due date of the assignment.

Click on

- **Assignment Details** to see a list of each assignment with its due date, number of problems by category, and total points.
- **Grading Info** to display the Help topic, "[How the Program Calculates a Grade](#) .
- A student's name to get personal information about the student (e.g. email address, etc.).
- A student's grade to view full details about that student's work on that assignment.

Gradebook for MPSMITH0025																
Show Group: (All Enrolled) <input type="radio"/> View 25 per page <input type="radio"/> Download (as CSV) <input type="button" value="Submit"/>																
[Assignment Details Grading Info]																
Name (1-1 of 1 total) 	Student ID	Assignments														Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Knight-Student, Sarah	xxx	--	0	0	0	0	0	0	--	--	0	0	--	0	0	0
Average (for 1-1 of 1):		--	--	--	--	--	--	--	--	--	--	--	--	--	--	0

At the bottom of the page, you'll see class averages for each assignment. While an assignment is active, students may complain that their grade or their average is not up to date. This is deliberate, and avoids using large amounts of processing time on updating averages.

- Only completed, past-due assignments are included in averages.
- Class averages are calculated only after each assignment is due.
- Student grades are final only after an assignment due date has passed.

All grades are reported as a percentage of points assigned.

5.1.1 Viewing grades for a group of students

You can choose to view only the grades for some students, rather than for the whole class. To view only some students, make them a group. Then:

1. Click on **Gradebook** from the Class List, or select **View Gradebook** in the Class Display Mode Selector, or click on the Gradebook tab at the left of the screen.
2. Select a group from Show Group. In the case below, the Red Sox group has been selected.
3. Click on **Submit**.

Gradebook records appear for all students in the selected group.

Class Display Mode: View Gradebook						
Gradebook for MPSMITH0033						
Show Group: Red Sox		View 25 per page		Download (as CSV) Submit		
[Assignment Details Grading Info]						
Name (1-1 of 1 total)	Student ID	Groups	Assignments			Total
Smith, Sarah	random		1	2	3	
Average (for 1-1 of 1):			--	--	--	--

S

5.2 How grades appear in the Gradebook

Grades are reported in the Gradebook in a spreadsheet-like grid: student names on the left, assignment numbers on the top, and grades in the cells.

- A gray cell background indicates that an assignment is not yet due
- A white background indicates a student who has completed the assignment with a high grade.
- A background in shades of red shows students with low grades. The deeper the red, the lower the grade

Last1, First1	1		<i>(400)</i>	100	103	0	105	0	104	108	108	69	105	102	148
Last10, First10	10		<i>183</i>	100	78	0	70	0	60	79	83	29	103	72	88
Last100, First100	100		100	100	93	0	95	0	98	101	106	102	124	99	145
Last101, First101	101		92	100	0	0	0	0	0	0	0	0	0	0	0
Last102, First102	102		88	100	78	0	76	0	91	91	106	68	126	91	139
Last103, First103	103		100	100	103	0	101	0	100	104	107	105	127	99	147
Last104, First104	104		100	100	100	0	100	0	102	108	108	98	105	51	145
Last105, First105	105		100	100	104	0	104	0	103	103	108	105	104	102	145
Last106, First106	106		87	75	65	0	58	0	84	89	84	84	95	76	125
Last107, First107	107		100	100	97	0	90	0	94	108	108	105	115	100	147

Note: Students who consistently submit no work may have dropped the course. (These accounts may also have become [phantom students](#)^[103], a possible cheating method.) They should be [suspended](#)^[28]. Here, student First101 Last101 should be suspended.

In each cell corresponding to a particular student and assignment, you see the student's score.

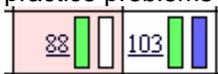
- Parenthesized) grades have had their due date extended.
- *Highlighted/italicized* grades have been manually modified

98	<i>83</i>	102
----	-----------	-----

Beside each score are one or two "thermometers": Only one thermometer will be visible if all problems are either practice only or assigned only.

- The green "thermometer" indicates number of **credit** problems the student has finished. If there

- are only credit problems in the assignment, only a green thermometer is visible
- The blue "thermometer" indicates number of **practice** problems finished. If there are only practice problems in the assignment, only a blue thermometer is visible



Click on any student's numeric score for a given assignment to [see details of their work](#)^[45] or to manually [edit their score](#)^[47] on that assignment.

5.3 Reviewing a student's answers and scores

In the Gradebook, you can review any work a student does in MP:

- Click on a student's grade in an assignment to display all the student's work in that assignment.
- Click on the title of an individual problem to see the student's work on that problem. You are able to see all answers the student submitted, the date and time when each answer was submitted, and the system response.

Often this information immediately explains a student's question about grading. It also may indicate that the student needs to work on a particular area of understanding.

Student (15 total)	Assignments													Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Student, A.	68	22	14	10	4	3	17	28	73	44	0	0	0	21
Student, B.	88	11	0	0	2	2	0	17	2	0	0	0	0	6

In the Gradebook you can also

- Edit a student's score
- Give a student an extension

5.3.1 Reviewing a student's work on an assignment

From the Gradebook, to review a student's work on an individual assignment:

Click on the student's grade for the assignment. You'll see a list of the problems. Beside each problem you'll see:

- Difficulty:** The problem difficulty score MasteringPhysics gives this problem. This is calculated from the scores and times of all students in all classes who have worked this problem.
- My Time:** The estimated amount of time the student spent on the problem and, if the problem has been finished, the time when it was finished. The time a student spent is estimated because a student may go away from a problem and return to it repeatedly.
- Points:** Possible point value of the problem, excluding bonuses for not taking hints.
- Awarded Points:** Points the student received, including bonuses for not taking hints.
- Score:** Student's percentage grade on this problem.

Assignment Grade for First102 Last102 in MPSMITH0001						
Week 4 homework (due 09/22/02 09:00 am) You will still receive full credit after the assignment is due.						
Type	Problem Title	Difficulty	My Time (Finished)	Points (*Extra)	Awarded Points	Score (Raw)
STP	Atwood Machine Special Cases	2	8m (9/17 4:46p)	0	0	99% (0%)
STP	Pulling Two Blocks	1	6m (9/16 6:49p)	5	5.1	102% (0%)
STP	Car on Level Turn	2	14m (9/18 10:23p)	5	5.15	103% (0%)
STP	Banked Frictionless Curve, and Flat Curve with Friction	3	12m (9/22 11:09a)	5	2.65	53% (0%)
STP	Two Masses, a Pulley, and an Inclined Plane	5	13m (9/21 3:49p)	5	5.9	118% (0%)
STP	Two Blocks and Two Pulleys	3	33m (9/22 11:04a)	5	4.05	81% (0%)
Summary:		2.67 (avg)	86m	25	22.85	91.4%

5.3.2 Reviewing a student's work on a problem or problem part

Clicking on an individual problem in a student's assignment will show you the problem as the student saw it, how the student answered, when the answers were logged, and what the system response was. Here is a part of a problem with the student's responses logged:

Part C

For the same special case (the block of mass m_1 not present), what is the acceleration of the block of mass m_2 ?
Express your answer in terms of g , and remember that an upward acceleration should be positive.

ANSWER:

Time	Proposed	Response
16 Sep 2002 6:54:26PM		Your answer should depend on the variable g
16 Sep 2002 6:55:17PM	-g	[CORRECT]

Unopened hints are noted as [UNOPENED]. Subparts that the student did not open are noted [NO SUBMISSIONS].

5.3.3 Reviewing a student's work for an entire course

To review a student's work for the whole course, click on the student's name in the Gradebook and see a summary of how they have done. assignment by assignment.

You can click on any underlined score and see the student's work on that assignment and on individual problems:

Scores for First102 Last102 in MPSMITH001						
Assignment	Date Due (*=Extension)	Completed				Score
		Credit	Extra	Practice	Total	
1. Cybertutor Tutorial	08/28/02 06:00 am	100% (1/1)	--	--	100% (1/1)	88%
2. Introduction to CyberTutor	08/28/02 10:00 am	--	100% (1/1)	--	100% (1/1)	100%
3. Week 1 homework	08/30/02 09:00 am	100% (3/3)	--	0% (0/6)	33% (3/9)	78%
4. Assessment questions for Wednesday Sept 4	09/04/02 01:00 pm	--	--	100% (2/2)	100% (2/2)	0%
5. Week 2 Homework	09/06/02 09:00 am	100% (5/5)	--	100% (2/2)	100% (7/7)	76%
6. Assessment question for Wednesday Sept 11	09/11/02 01:00 pm	--	--	100% (1/1)	100% (1/1)	0%
7. Week 3 homework	09/13/02 09:00 am	100% (5/5)	--	--	100% (5/5)	91%
8. Week 4 homework	09/22/02 09:00 am	100% (5/5)	--	100% (1/1)	100% (6/6)	91%
9. Week 5 Homework	09/27/02 09:00 am	100% (6/6)	--	--	100% (6/6)	106%
10. Extra credit potential energy problems	10/04/02 09:00 am	--	100% (3/3)	--	100% (3/3)	68%
11. Week 6 homework	10/04/02 09:00 am	100% (5/5)	100% (1/1)	100% (1/1)	100% (7/7)	126%
12. Week 7 homework	10/11/02 09:00 am	100% (5/5)	--	100% (1/1)	100% (6/6)	91%
13. Week 8 homework	10/18/02 09:00 am	100% (5/5)	100% (2/2)	--	100% (7/7)	139%

5.3.4 Editing a student's scores

If you want to adjust a student's score:

1. In the Gradebook, click on the student's score you wish to edit or review. A new window appears, displaying a breakdown of the entire assignment by each problem's score.
2. At the bottom of the page, under Grade Adjustment, adjust the student's score manually by typing in either a positive or negative number of points into the **Adjust Total Points** field and clicking **Apply Adjustment**.

Grade Adjustment	
Current Point Adjustment: +12.4 (total adj. pts. = 12.4)	
Adjust Total Points by (+/-): <input type="text"/>	<input type="button" value="Apply Adjustment"/>
Total Adjusted Grade: 83%	

The Current Point Adjustment and Total Adjusted Score (above and below the submit button) will reflect any manual changes submitted.

3. Click **Close** to finish.

Note: Adjust the student's score by **number of points**, not by percentage.

An edited score is highlighted and italicized in the Gradebook:

98	<i>83</i>	102
----	-----------	-----

Editing scores for all students at once is not implemented directly. Depending on what has happened and what you'd like to do, the following work:

- Turn the problem into a practice problem, for no points, so no one's score will count.
- Download the gradebook as a CSV file at the end of the semester and adjust the grade in Excel.

- Rewrite the problem using the Authoring Tool and substitute your new version. This will erase all students' work on the problem and allow them to try it again.,

5.3.5 Giving extensions

To give an individual student an extension for an assignment:

1. In the Gradebook, click on the grade of the student for the assignment.
2. Adjust the **Extend Due Date To** by typing in the new due date or using the calendar.
3. Click **Apply Extension**. The extension and new due date will be displayed.

To give an extension to an entire class, edit the due date of the assignment in [Assignment Properties](#)

5.4 If a student does not appear in the Gradebook

If a student does not appear in your Gradebook, he or she may have enrolled in the wrong course. Check the course ID of the course the student is in.

Suspended students continue to appear in your Gradebook, but they cannot submit work.

Disenrolled students appear in your Gradebook until they enroll in another course.

Note: When a student switches from course to course in the middle of the semester, their grades appear only until they have enrolled in the new course. It is useful to back up students' grades by [exporting grades to a CSV file](#) whenever students are disenrolled.

Suspended students must be disenrolled before they can join another course.

5.5 If a student's grades are not logged in the Gradebook

If a student appears in the Gradebook, is submitting work, and is not disenrolled or suspended, but the work is not appearing as submitted in the Gradebook, it is probably a security issue on the student's computer or network.

The student should check the following:

- Does the student's computer meet the minimum system requirements, including screen resolution?
- Are popup blockers turned off? If not, disable your popup blocker
- Is Javascript enabled in your browser? If not, enable it
- Is this computer on a network (lab, library, etc.)? See if other users are having this problem
- Does the issue occur on another network or outside a network? Try from another computer
- Does the issue also happen on another browser? Try with Mozilla or Firefox (both these browsers are free and available at www.mozilla.org).

If none of these work, please have the student [contact us](#).

5.6 Printing the Gradebook

The Gradebook can be printed by using the Print function of your browser.

Because MasteringPhysics is frame-based, be sure to point to the correct frame before printing. Check first with Print Preview.

It is often useful to [export the Gradebook to a CSV file](#)^[49], then print.

5.7 Exporting grades from the Gradebook

MasteringPhysics allows you to export comma-delineated (CSV) scores to your computer.

1. Select all students or a group of students in the pull-down menu and click **Submit**.
2. Change the default from **View** to **Download** and click **Submit**.
3. Select **Save** when the pop-up window asks you if you wish to save to your hard drive.
4. Select the folder where you wish to save your data.
5. You may wish to change the name of this exported gradebook file, but you should preserve the .CSV file extension.
6. Open your saved file using any spreadsheet program that uses CSV files.

Caution: When you look for the MasteringPhysics file to open it in Excel, you may need to change the **Files of Type** setting to **View All Files**.

6 Entering Math in MasteringPhysics

Entering complex symbolic functions can be difficult from a computer keyboard. Because MasteringPhysics works over a number of operating systems and browser environments, it supports a very general-purpose math entry system, and provides extensive help in formatting and displaying math.

You should note the following about mathematical functions in MasteringPhysics:

- [Numbers](#)^[49]: answer tolerance, significant figures, answers required as string matches
- [Standard operators](#)^[50]
- [Order of operations](#)^[50]
- [Scientific notation](#)^[51]
- [Special functions](#)^[51]
- [Entering variables](#)^[51]
 - [Rollover help in entering variables](#)^[52]
 - [Help in formatting math: Display Math](#)^[52]
 - [Built-in calculator feature for numeric answers](#)^[53]

6.1 Numbers

Some questions in MasteringPhysics require simple numerical answers like 37 or 1.56.

- By default, a numerical answer to a question must be within 2% of the official MasteringPhysics answer in order to be graded correct. If you have computed the answer correctly, you can ensure that you are within 2% by entering it **using at least three significant figures**. If higher precision is required, or lower precision is allowed, it will be noted in the problem text.
- If your answer is within 2%, but does not exactly match the correct answer, it will be recorded as correct but the official correct answer will be displayed so that you can use it, if needed, in later

parts of the problem.

Note: Your answer may be graded incorrect if you have performed the correct calculation but rounded your answer to too few significant digits. Use at least three significant figures in your answers unless otherwise specified or unless the exact answer can be expressed using fewer than three significant figures.

Here are some other guidelines for numeric answers:

- If the program asks for several answers in a particular order, such as numeric order, your answers must appear in that order. MasteringPhysics uses string matching in grading this sort of answers and will grade them wrong if they are not in the proper order.
- MasteringPhysics may expect the answer in different units from the question. For example, a question may be asked in m/s and the answer asked for in cm/s.
- Do not include currency symbols or units with a numerical answer unless explicitly instructed to do so. Enter 5000 instead of \$5000, 10 instead of 10 feet
- Do not use commas for large numbers. Enter 125000 instead of 125,000. Commas are reserved for answers involving two or more numbers, such as the coordinates of a point in a plane. You'll be told when you need them.
- Do not use "E-notation" for large numbers. See the section on [scientific notation](#) ⁵¹.

6.2 Operators

MasteringPhysics allows you to use standard mathematical operators as part of your answer. The answer box is effectively a simple calculator with a syntax much like a normal scientific calculator or spreadsheet program. There are five operators available:

	Operator	Example
Addition	+	5+13
Subtraction	-	1.23-0.45
Multiplication	*	9.80*82
Division	/	22/7
Exponentiation	^	3^2

6.3 Order of operations

Occasionally you may find yourself entering mathematical expressions that include multiple operations such as $60/3*2^2/2$. In such cases, MasteringPhysics follows calculator-standard rules for the order in which mathematical operators are evaluated:

- Exponentiation has the highest priority.
- Multiplication and division have next priority.
- Addition and subtraction have lowest priority.
- Within each priority class, evaluation proceeds left to right, except exponentiation.

For the example above, these rules give:

$$\begin{aligned}
 60/3*2^2/2 &= \\
 60/3*4/2 &= \\
 20*4/2 &= \\
 80/2 &= \\
 40. &
 \end{aligned}$$

It is a good habit to use parentheses to control the order of operations. If you do not use parentheses,

your answer may be evaluated in a way you do not expect. For instance, what you might really have meant in the example above is

$$\begin{aligned} & (60/(3*2^2))/2 = \\ & (60/12)/2 = \\ & 5/2 = \\ & 2.5. \end{aligned}$$

6.4 Scientific notation

To enter numbers in scientific notation, use the multiplication and exponential operators. For example, to enter the number 15 billion = 15000000000, you would type: $1.5*10^9$.

Note: In some computer programming languages and software, a shorthand scientific notation for a number such as $1.5*10^9$ would be 1.5E9. **Do not use this notation in MasteringPhysics.** MasteringPhysics interprets the E as a variable.

6.5 Special functions

Mathematical answers can include special functions. The argument of the function can be a number, variable, or more complicated math expression as needed to answer the question. For easy reference, the supported functions are listed below.

Notes:

- All arguments and results of trigonometric and inverse trigonometric special functions are in radians.
 - The functions are case sensitive. When you enter them, be sure to use lowercase.
 - Do not use the ^ operator to enter inverse trigonometric functions. Expressions like $\sin^{-1}(x)$ are invalid and will not be recognized by MasteringPhysics
-
- abs(x) - absolute value
 - exp(x) or e^(x) - exponential
 - log(x) - common logarithm (base 10)
 - ln(x) - natural logarithm (base e)
 - sqrt(x) - square root
 - sin(x) - trigonometric sine
 - cos(x) - trigonometric cosine
 - tan(x) - trigonometric tangent
 - csc(x) - trigonometric cosecant
 - sec(x) - trigonometric secant
 - cot(x) - trigonometric cotangent
 - asin(x) or arcsin(x) - trigonometric arcsine
 - acos(x) or arccos(x) - trigonometric arccosine
 - atan(x) or arctan(x) - trigonometric arctangent

6.6 Variables

Variables needed in symbolic answers are always given in the problem text.

However, it is not always obvious at first glance how to type them in your answers. [Rolling your mouse over a variable](#) ⁵²⁷ will show you how.

Here is how to enter some common types of variables:

Variable	How to type it
a, b, c, x, y, z	a, b, c, x, y, z
v_0, f_k	v_0, f_k
$f(t)$	f(t)
$\vec{E}, \vec{E}(r)$	E_vec, E_vec(r)
\hat{x}	x_unit
$\alpha, \beta, \gamma, \delta,$ $\mu, \tau, \omega, \theta, \pi$	alpha, beta, gamma, delta, mu, tau, omega, theta, pi
Δ, Ω	Delta, Omega
$\delta T, \Delta T$	deltaT, DeltaT

Examples:

If the answer is...	Type...
$ax^2 + bx + c$	a*x^2+b*x+c
$\phi - \frac{2\pi}{T}$	phi-2*pi/T
$\frac{1}{2} \sin(2a)$	(1/2)*sin(2*a)
$\frac{\sqrt{xy}}{x+y}$	sqrt(x*y)/(x+y)
$\sqrt{v_f^2 - v_i^2}$	sqrt(v_f^2-v_i^2)
$\mathcal{E} \cos(\omega t) \hat{x}$	EMF*cos(omega*t)*x_unit
$\frac{\vec{E}(t + \Delta t) - \vec{E}(t)}{\Delta t}$	(E_vec(t+Deltat)-E_vec(t))/Deltat

6.7 Rollover help in displaying variables

If you are ever unsure how to type a particular variable, position your mouse over the variable anywhere it appears on its own in the problem (i.e. not as part of a larger mathematical expression).

A box appears indicating how you would type the variable in your answer.

For instance, positioning your mouse over \vec{E} in the problem displays **E_vec** in a small box.

6.8 Help in formatting math: Display Math

Using parentheses, multiple operators, a variety of variables and special functions can be confusing at first. MasteringPhysics, therefore, provides a Display Math button that will interpret your input and display it in formatted math using Greek symbols, sub- and superscripts, and fraction notation as it would appear in your textbook.

The Display Math feature allows you to review the notation and determine if you have entered your answer as desired.

6.9 Built-in calculator feature

MasteringPhysics automatically calculates the numeric value of expressions, if appropriate.

MasteringPhysics does require that if you are using the calculator feature, that the argument of any trig function must be in radians, not degrees. That is, if the assignment is to find the x-component of a vector of length 10 at 30 degrees above the horizontal, MasteringPhysics will accept "10*cos(pi/3)", but not "10*cos(30)".

Note that you are always free not to use the built-in calculator feature and simply enter the correct numerical value directly.

Make sure that you are calculating to the proper number of [significant figures](#)⁴⁹.

7 Creating and Editing MasteringPhysics Problems: The Authoring Tool

The Authoring Tool allows you to customize existing MasteringPhysics problems or create entirely new problems of your own. You may want to do this when

- An existing problem does not quite fit your needs
- Instructions or answers seem ambiguous to your students
- Your students want more hints or subparts in a problem
- Your class has already used a problem, and you want to assign a similar problem for review
- You want an entirely new problem on a topic not covered in the existing library

We recommend the following steps for becoming proficient with the MasteringPhysics authoring tool.

1. Install the editor (the hardest part of the process).
2. Start by looking at some existing problems in the Authoring Tool.
3. Then try editing one or more existing problems, to get familiar with authoring.
4. Finally, create new problems of your own.

7.1 System requirements

The Authoring Tool is based on the Altova Authentic® XML editing engine, which enables editing of a complex XML document inside a browser window. Each MasteringPhysics problem is formatted as an XML document.

The system requirements for authoring are stricter than those for MasteringPhysics:

- Under Windows, you must use **Windows NT, 2000, or XP**.
- Under Linux or the MacOS, you must use a **Windows emulator**. For recommended emulators, see http://www.xmlspy.com/support_platforms.html.
- You must use **Internet Explorer 5.5** or greater. The Authoring Tool will not function with any other browser.
- You must have a broadband connection. Dialup connections aren't fast enough for useful authoring.

Please remember to [add our site to your trusted sites](#)⁵⁴ in Internet Explorer.

7.2 Opening the Authoring Tool

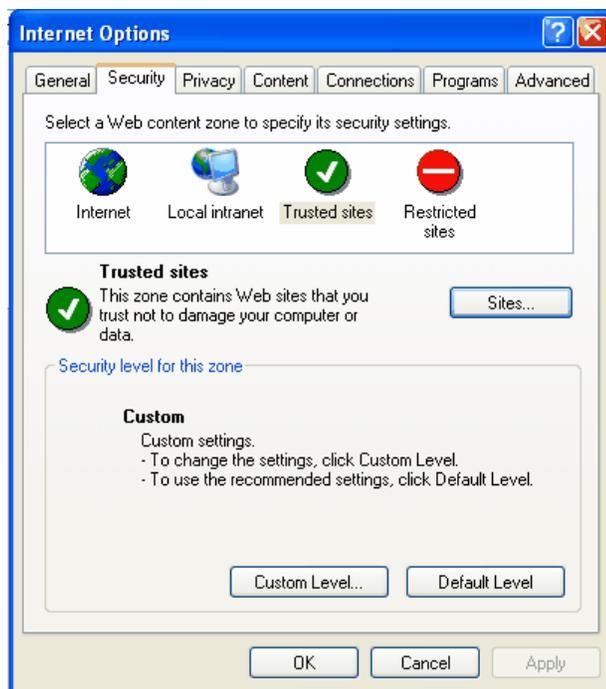
The first time you open the Authoring Tool, it will take some time (about 30 seconds) while the tool downloads a file to your computer.

As part of this download, you may be asked to trust content from Altova. Altova is the developer of the XML editor on which the Authoring Tool is based; this content is safe.

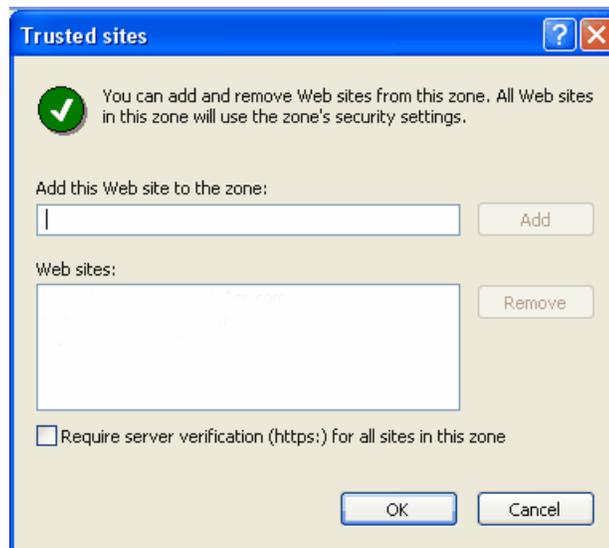
7.2.1 Setting MasteringPhysics as a trusted site

In general, opening the Authoring Tool will be seamless. If you are having any difficulty opening the Authoring Tool, you may need to make MasteringPhysics a trusted site in Internet Explorer.

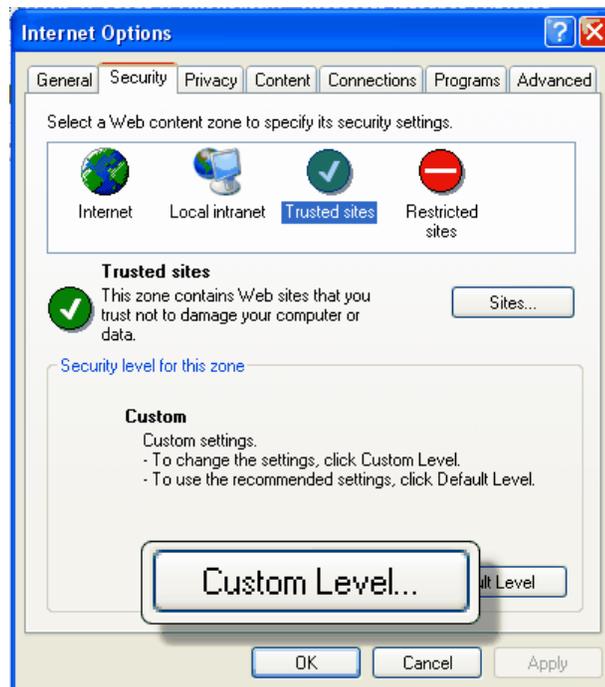
1. From the Tools menu, click on Internet Options.
2. Click on the Security tab.
3. Click on **Trusted Sites**.
4. Click on **Sites**.



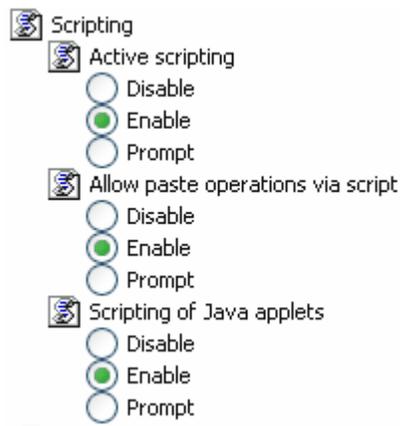
3. Add www.masteringphysics.com and click on OK.



4. From the Security tab, click on **Custom Level**.



5. Scroll to **Scripting** and set **Active scripting**, **Allow paste operations via script**, and **Scripting of Java applets** to Enable.



6. Click OK until the Internet Tools box closes.
7. Close and relaunch your browser.

7.3 Introduction to problem format

All problems in MasteringPhysics consist of a standard group of elements: a title, a description, an introduction, and one or more parts, which contain questions and answers. Parts of a problem can contain any type of answer, from multiple-choice to essay. Parts can contain other parts

Other optional elements may occur as well.

The simplicity and flexibility of the format make it easy to author problems in MasteringPhysics.

Each element of a problem is described below. **Bolded** elements must appear in every problem:

Element	Description
<u>Problem Title</u> 	The problem title, as it appears in the problem library and in assignments for students.
<u>Problem Description</u> 	The problem description. This description will appear in the library as a reminder of what the problem is about. Students do not see the problem description.
<u>varDefinition</u> 	The definition of a random numerical value that will be used in your problem. (See " Adding randomized variables " 
<u>Learning Goal</u> 	The learning objective of the problem.
<u>Problem Introduction</u> 	The text, images, and/or variables that set up the individual questions to follow.
<u>Part</u> 	A single question and answer. Problems may have any number of parts. Parts may contain other parts. Parts consist of:
Part text	The question a student must answer.

[Hint](#) ^[79]

Text that is displayed at the student's request. Hints provide information or suggestions that may be useful in solving a problem.

[Subpart](#) ^[80]

A part-within-a-part that breaks down the larger problem and guides the student toward a solution. Problem parts may contain zero, one, or multiple subparts.

[Answer](#) ^[82]

The answer to a part. Every part or subpart must have one answer.

The answer includes any text to appear in the answer box (i.e. options in a multiple-choice question), the correct answers, and any incorrect answers that have specific feedback associated with them.

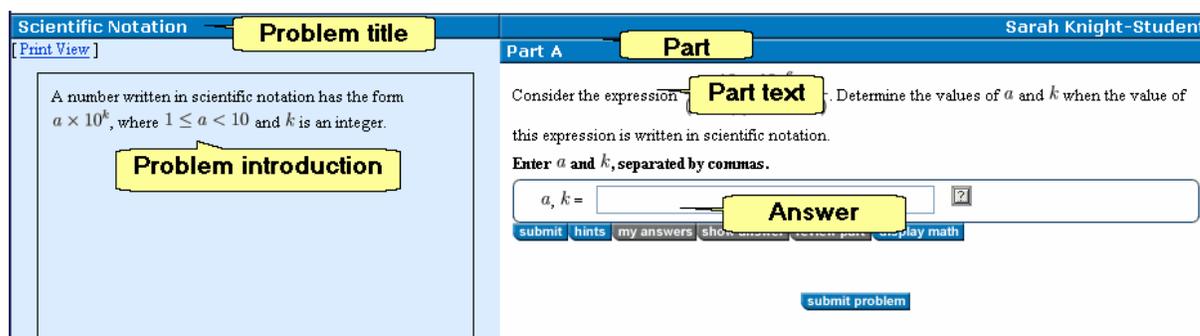
MasteringPhysics supplies several answer types, described in "[Answer types](#)" ^[82]."

[Transition](#) ^[89]

A section of text that provides new or additional information about the situation described in the Problem Introduction. Transitions can go between any two parts.

[Follow-up](#) ^[90]

Comments that appear after the correct answer to any part or subpart is obtained.



7.4 Authoring Tool user interface

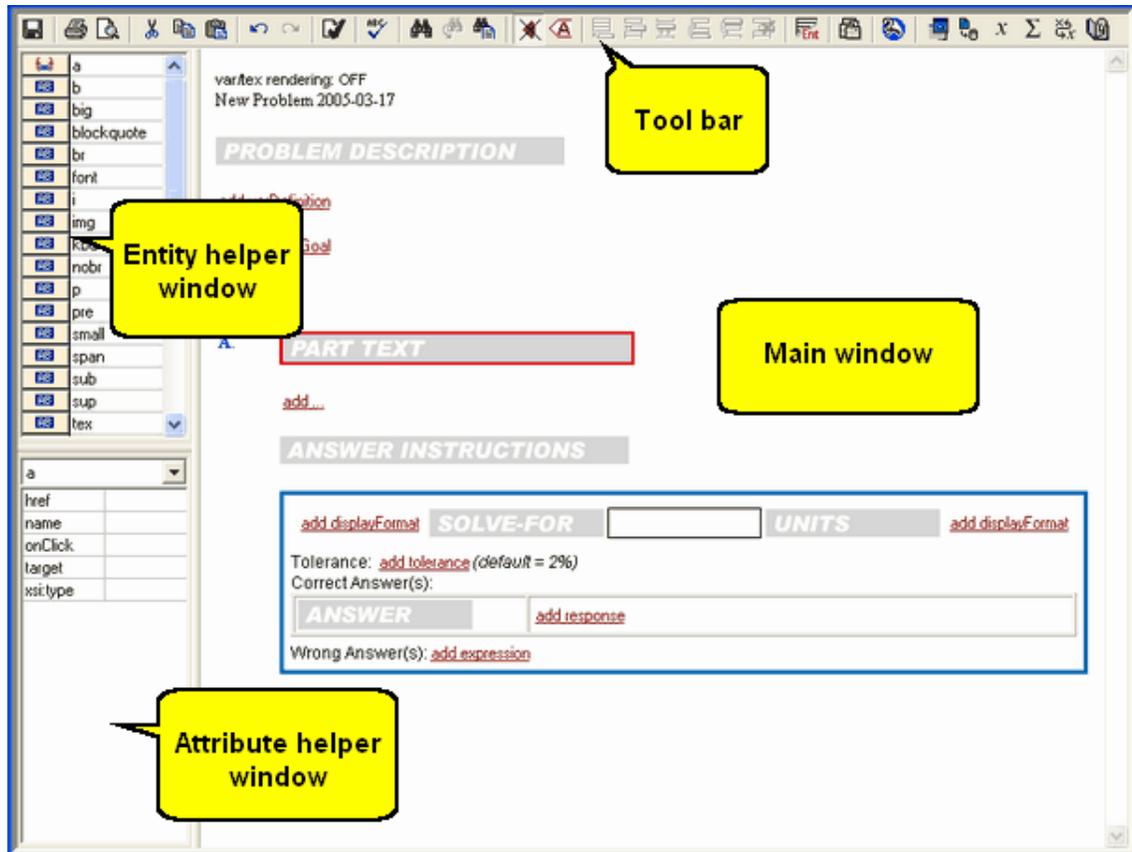
The Authoring Tool acts very much like an ordinary editor. However, it has special functionality for editing problem elements, applying HTML formatting, and adding symbolic and randomized variables and rendered mathematical expressions.

This short section introduces the ways that the Authoring Tool may differ from editors you've used previously:

- The Authoring Tool [main window](#) ^[58] and [toolbar](#) ^[58]
- [Simple editing](#) ^[59]
- [Adding](#) ^[60] and [removing](#) ^[61] problem elements
- [Adding](#) ^[61] and [removing](#) ^[62] formatting in (X)HTML
- Adding [symbolic variables](#) ^[63] and [randomized variables](#) ^[64]
- Adding [rendered mathematical expressions](#) ^[65]

7.4.1 Authoring tool windows

When you open the Authoring Tool, you see the following:



Main window

Presents the problem elements for editing..

[Toolbar](#)⁵⁸

Provides easy access to frequently used commands.

[Entity helper window](#)⁶¹

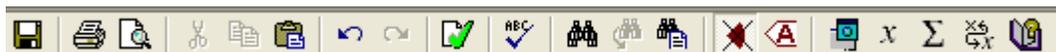
Lists formatting tags you can apply to the problem. Clicking the button next to the formatting tag name in this window applies that formula to whatever text is selected in the main window, or clears the format if it is already applied.

[Attribute helper window](#)⁶¹

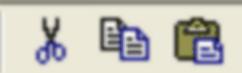
Lists attributes of the currently selected formatting tag.

7.4.2 The Toolbar

The toolbar makes common operations easily available.



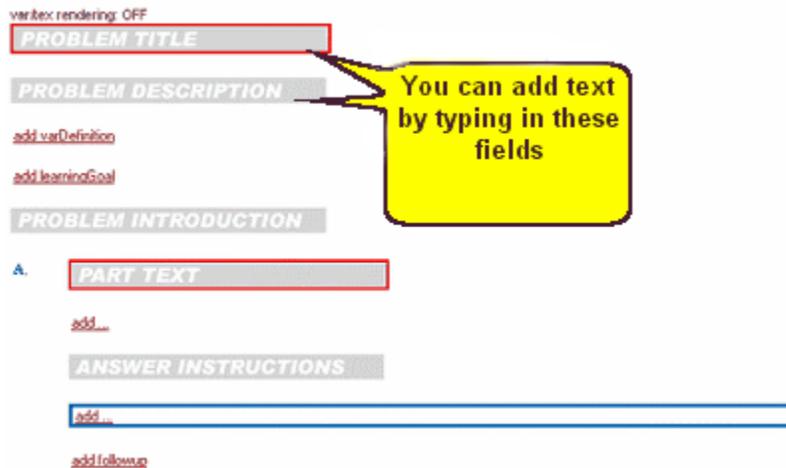
The following operations are available via the toolbar:

Icon	Meaning
	Saves your problem.
	Prints the problem as it appears in the main window.
	Previews the problem before printing.
	Perform the standard editing commands Cut, Copy, and Paste. Note that these commands work only on plain text, not on other problem elements such as hints, parts, and answers.
	Perform the standard editing commands Undo and Redo.
	(Validate) Checks your problem for any formatting errors. If there are any errors, they will be reported so that you can fix them. You will not be able to save a problem that has formatting errors.
	Checks the spelling of all text in your problem.
	Perform the standard editing commands Find, Find Next, and Replace.
	Hides XML markup.
	Shows XML markup.
	Previews the problem.
	Applies var formatting to the currently selected text. Equivalent to clicking "var" in the entity helper window.
	Applies TeX formatting to the currently selected text. Equivalent to clicking "tex" in the entity helper window.
	Toggles between an "editing" mode where you can change the var/TeX data and a "preview" mode where you can see the rendered version of the variable or TeX expression in the main window.
	Opens online help (this document).

7.4.3 Simple editing

To edit existing text in the authoring tool, select text you'd like to change and type over it as you would in a standard editor.

When you create a new (empty) problem, or add a new part to an existing problem, the fields where you can add new text are indicated by gray boxes with white labels. Click anywhere in any gray box and start typing to add text in that field.

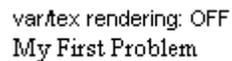


For example, to edit the problem title:

1. Click in the Problem Title field.



2. Type your title. As you type, the field disappears and your title appears.



As you edit your problems, save frequently to make sure your work has been preserved.

7.4.4 Adding problem elements

There are several different ways of adding elements like hints, parts, tables, and lists to your problem:

- While you are editing, you will see **Add...** links in various locations in the problem. Clicking on an **Add...** link brings up a menu of problem elements that can be added in that location.
- If you right-click anywhere in the problem, a pop-up menu appears, containing **Insert** and **Append** submenus listing all problem elements that can be added at that location. Inserting an element causes it to appear above or (if appropriate) within the element you clicked on. Appending causes the new element to appear below/after the element you clicked on.
- The Entity helper window also lists the problem elements that can be inserted, appended, or applied at the current cursor location.



Applies formatting to the currently selected text.



Clears formatting from the currently selected text.



Appends the element below or after the element you clicked on.



Inserts the element above or, if appropriate, within the element you clicked on

For example, to add a new main part to a problem:

- If the problem currently has no main parts, there will be an **Add...** link at the bottom of the editing window. Click this link and select **Part** from the dropdown menu.
- If the problem has one or more main parts already, do one of the following:
 - Right-click somewhere in the part above where you want to add the new part, and select **Append>Part** from the menu.
 - Click somewhere in the part beneath where you want to add the new part, and then click the  button next to **Part** in the entity helper window.

The Authoring Tool inserts the new part and adjusts part letters accordingly.

7.4.4.1 Removing problem elements

To remove a problem element, such as a part, right-click in the element, and select **Remove>Element name**, where *Element name* is the name of the element you wish to remove.

Note: Because elements can be embedded within each other (i.e. a hint embedded in a part), when you select **Remove** you may see a list of several elements. The topmost item in the list is the specific element you clicked on. The remaining elements are those within which the specific element is embedded. Selecting the item at the bottom of the list will remove the enclosing element and all of its sub-elements.

7.4.5 Formatting with (X)HTML

The Authoring Tool includes simple formatting through XHTML commands. They are very similar to HTML commands, but not identical.

Your formatting must match the XHTML standard for well-formedness or it will cause an error during validation. (See "[Common XML errors](#)"⁷⁵.)

To prevent XHTML errors, use the commands in the [entity helper window](#)⁵⁸ rather than trying to code by hand.

A E	a
A E	b
A E	big
A E	blockquote
A E	br
A E	font
A E	i
A E	img
A E	kbd
A E	noabr
A E	ol
A E	p
A E	pre
A E	small
A E	span
A E	sub
A E	sup
A E	table
A E	tex
A E	u
A E	ul
A E	var

When you select text in your problem, you can apply formatting to that text by clicking on the format name in the entity helper window. Only valid formatting commands appear. For example, you can select a word and click "i" to make it italic.

This entity helper window area also includes [the var command](#)⁶³, which indicates that the selected text is coded as a variable, and [the tex command](#)⁶⁵, which indicates that the selected text is in LaTeX coding.

To apply HTML formatting to a text selection:

1. Highlight a section of text.
2. Click the button in the entity helper window next to the formatting you want to apply.

or

1. Highlight a section of text.
2. Right-click on your selection and choose **Apply** > *formatting-type*, where *formatting-type* is the HTML formatting you wish to apply.

Some HTML elements have **attributes** that can be specified. For example, the anchor (link) element "a" has an attribute "href" that specifies the URL to be loaded when the anchor is clicked.

These attributes appear in the [attribute helper window](#)⁵⁸, where you can set their value.

For example, to insert a link in the form `<a href>`, select the text to be linked, select a, then select href, then fill in the URL being linked to. Here is the attribute helper window for the HTML command a:

a	
href	
name	
target	
xsi:type	

You can also insert entity tags (HTML formatting, var, and tex) by right-clicking anywhere in editable text, then selecting **Insert**. You will see a menu of available tags.

7.4.5.1 Removing formatting

To remove formatting, do either of the following:

- Right-click in the formatted region (e.g. in the middle of a word that has been italicized), then select **Clear** > *FORMATTING_TYPE*, where *FORMATTING_TYPE* is the formatting type of the HTML.
- Click in the formatted region and then click on the  button next to the type of formatting you want to remove in the entity helper window.

Note: Because formatting can be nested (e.g. a bolded text inside a region of italicized text), when you select **Clear** you may see a list of several different formatting types.

7.4.6 Adding symbolic variables

MasteringPhysics uses a special mechanism for coding variables in a problem. Rather than simply enter variables as plain or italicized text, you must flag variables by applying `var` formatting to the variable name.

Note: In the editor, **var-formatted text is shown with a gray background** so that variables can be easily identified. In this example, *x* is a variable:



The `var` formatting does two things:

- In the MasteringPhysics student view, it renders as symbols such as variables as vectors with an over-arrow, simple letter variables in italics, and Greek letters.
- When students click on or roll their mouse over the rendered variable name, it displays the alpha text that produced the variable.

For example, when `var` formatting is applied to the text `F_vec`, it is rendered as a capital F with a vector overarrow. In the student view, doing a mouse rollover on the rendered variable displays a pop-up window with the text "F_vec".

Students find this rollover feature very valuable in teaching them how to enter variables. We strongly recommend that every variable that might appear in an answer appear var-formatted somewhere in the problem.

Var-formatting is applied in the same way as [HTML formatting](#).

Refer to the following table for common variable codings and how they are rendered.

Var-formatted Text	Rendered Variable
<code>x unit</code>	\hat{x}
<code>E_vec</code>	\vec{E}
<code>E_cal</code>	\mathcal{E}
<code>v_0</code>	v_0
<code>E_initial</code>	E_{initial}
<code>alpha, beta, gamma, delta, mu, tau, omega, theta, phi, etc...</code>	$\alpha, \beta, \gamma, \delta, \tau, \omega, \theta, \phi$
<code>Delta, Omega</code>	Δ, Ω
<code>deltaT, DeltaT</code>	$\delta T, \Delta T$
<code>E_initial_vec</code>	\vec{E}_{initial}
<code>E_tot_vec(r_vec,t)</code>	$\vec{E}_{\text{tot}}(\vec{r}, t)$

7.4.7 Defining and using randomized variables

MasteringPhysics provides a mechanism for defining random numerical values to be used in your problem.

Each random value is defined using a varDefinition problem element. In the authoring tool, varDefinitions can be added just below the problem description, near the top of the problem. (See [Inserting new problem elements](#) ^[60].)

PROBLEM DESCRIPTION

[add varDefinition](#)

You constrain the random value by specifying a minimum, maximum, and step size.

When you add a new varDefinition, the following table (or a new entry in the table) appears:

Variable	Min	Max	Step	Units	Conv. factor	LaTeX
	add minValue	add maxValue	add valueStep	add unitsName	add unitsConversion	add latex

Attribute

Variable

Meaning

A variable name for the randomized value you are defining. You can control whether or not the variable name is displayed to the student as described below.

Min, max

The minimum and maximum values that this variable can take.

If min=max and step=0, this is a constant.

Step

Increments by which the randomized value can change in numeric view. The actual value that will appear in the problem is an integer multiple of this step size added to the minimum value.

If min=max and step=0, this is a constant.

Units

(Optional) The units for this value, using LaTeX coding (i.e. $\frac{m}{s^2}$). You can control whether or not the units are displayed to the student as described below.

Conversion

Formula for converting this value to some other system of units as part of an answer. It is necessary to use this text field whenever you have a variable that requires a unit change before it can be properly calculated by the answer engine.

For example, if you define an angle "theta" in degrees, and an answer later in the problem is: "sin(theta)", you must provide the conversion "theta*pi/180" in the varDefinition.

Remember that MasteringPhysics assumes that the argument of all trigonometric functions is given in radians, not degrees.

LaTeX Expression that overrides the default variable appearance with whatever is in this text box, just like the `latex` attribute of the `var-formatting` element. Setting the `latex` string here means that you don't need to set it for each instance of a `var`.

The `min`, `max`, and `step` fields can contain numbers or any mathematical function that is allowed as part of an answer. They can also depend on other defined variables. For example, if you have defined a variable `m1` that ranges from 10 to 20 kg and you want to define another mass that is some random value larger than `m1`, you could set

`min = m_1+1` and `max = m_1+11`

Note: MasteringPhysics evaluates variable definitions first to last. Thus you must define independent variables before defining the variables that depend on them.

You can define a constant by setting `min=max` and `step=0`.

Using randomized variables

To insert the random value at a particular location in the problem, you simply add `var`-formatted text that matches the variable name specified in the `varDefinition`.

To use the random value as part of an answer, simply enter the variable name as a symbol in that answer. For example, if you have defined random values for the variables `m_1` and `v`, you might enter the answer

`0.5*m_1*v^2`

A student working the problem will need to enter the correct numerical answer corresponding to the specific values for `m1` and `v` that were displayed in the problem.

Controlling the appearance of a randomized variable

Wherever you insert the variable in the problem, you can choose whether or not the variable name and units should appear ("m = 10 kg", "10 kg", or just "10") by setting the `showSymbol`, `showUnits`, and `showValue` attributes of the `var` element appropriately. Some of the more common settings are shown in the table below:

showSymbol, showUnits, showValue	Appearance
blank,blank,blank (default)	10 kg
1,blank,blank	m=10 kg
1,0,0	m
0,0,1	10

7.4.8 Adding mathematical expressions

MasteringPhysics allows you to enter mathematical expressions of any complexity using LaTeX via the `tex` formatting element. Simply enter the LaTeX coding directly into your problem and then apply `tex`-formatting to it. When the problem is rendered to the student, the `latex` coding will be compiled and rendered as a static image.

In the editor, `tex`-formatted text is shown with an aqua background so that mathematical expressions can be easily identified.

For example:

Use Newton's second law, $\vec{F} = m \vec{a}$, to solve this problem.

Below are the most common TeX codings we use:

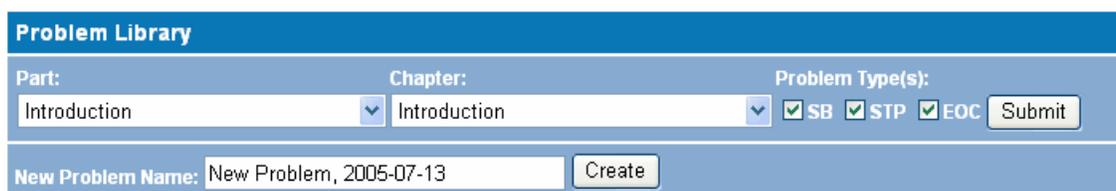
- [Sharing problems you have edited](#)⁷⁶

7.5.1 Creating a new problem

You can create your own problems by creating one from scratch or [editing](#)⁶⁷ one from the Problem Library.

To create a new problem:

1. Go to the Problem Library
2. Type in a problem name in the **New Problem Name** field. By default, the problem is named after its date of creation.
3. Click on **Create**.



The screenshot shows the 'Problem Library' interface. At the top, there is a blue header with the text 'Problem Library'. Below this, there are three dropdown menus: 'Part:' with 'Introduction' selected, 'Chapter:' with 'Introduction' selected, and 'Problem Type(s):' with three checked options: 'SB', 'STP', and 'EOC'. To the right of these dropdowns is a 'Submit' button. Below the dropdowns, there is a text input field labeled 'New Problem Name:' containing the text 'New Problem, 2005-07-13', and a 'Create' button to its right.

Your new problem will appear in the special "My Problems" section of the problem library.

7.5.2 Editing an existing problem

The easiest way to make your own customized problem is to edit an already existing problem. You cannot directly modify a problem in the library, but you can make a copy of a library problem that you can edit as you please

To begin editing an existing problem:

1. Select a problem from the Problem Library.
2. Click on the title of your chosen problem to preview the problem.
3. Select **Copy & Edit** from the **Action** dropdown menu.

Type	Title	Difficulty	Time	Action
	Introduction to Moments of Inertia		0m	(select action)

Introduction to Moments of Inertia

[Print View](#)

Learning Goal: To understand the definition and the meaning of moment of inertia; to be able to calculate the moments of inertia for a group of particles and for a continuous mass distribution with a high degree of symmetry.

By now, you may be familiar with a set of equations describing rotational kinematics. One thing that you may have noticed was the similarity between *translational* and *rotational* kinematics. Such similarities also exist in...

Intro 1 Intro 2

Part A

On which of the following do the moments of inertia of an object depend?

- A. linear speed
- B. linear acceleration
- C. angular speed
- D. angular acceleration
- E. total mass
- F. shape and density of the object
- G. location of the axis of rotation

Type the letters corresponding to the correct answers. Do not use commas. For instance, if you think that only assumptions C and D are correct, type CD.

[submit](#) [my answers](#) [show answer](#) [review part](#)

Consider the system of two particles, a and b, shown in the figure. Particle a has mass m , and particle b has mass $2m$.

Part B

What is the moment of inertia I of particle a?

MasteringPhysics creates a new problem that is a copy of the existing library problem and opens it in the [Authoring Tool](#)^[58]. This new problem appears in the special "My Problems" section of the Problem Library.

7.5.3 Changing minor wording

To edit existing text in the authoring tool, select text you'd like to change and type over it as you would in a standard editor.

If you are using HTML in your answer, see [Applying HTML Formatting](#)^[61]. If you are using [a symbolic variable](#)^[63] or [a mathematical expression to be rendered](#)^[65], see those sections.

7.5.4 Adding a part

To add a part, right-click anywhere in the previous part and select **Append>Part**.



7.5.5 Requiring that problem parts be opened in order

To require that problem parts be opened in a particular order:

1. Click anywhere in a part.
2. In the top pane of the [attribute helper window](#)⁵⁸, pull down the menu and select **Part**. A list of part attributes appears in the bottom pane of the attribute helper window.
3. Click on **OpenWhen**. A pulldown menu appears, listing the possible options.
4. Choose one of the options.



- previousFinished** The part can be opened only when the previous part has been finished.
- previousFinishedAll** The part can be opened only when all previous parts have been finished.
- previousOpen** The part can be opened only when the previous part has been opened.

(**Note:** For the first part of a problem, there are no previous parts and **OpenWhen** returns no values.)

A similar functionality is available for hints and subparts of a problem part; see "[Subpart](#)"⁸⁰.

7.5.6 Adding diagrams and images

To work well in MasteringPhysics, images must be as simple as possible. This takes thought, and you may need to split an image into several images.

- Image size must be no larger than 320 x 240 pixels.
- Text sizes should be as large as possible, and lines and arrows should be as thick as possible.
- Make your images accessible to visually impaired students. For instance:
 - Do not use color to indicate items of significance.
 - Use alt-text to provide a textual description of graphs and images.
 - Make your images available at a larger size or provide SVG versions of images for use by visually impaired students.

Images in the problem introduction or main parts are displayed to the student in the image pane in the lower left hand corner of the MasteringPhysics display.

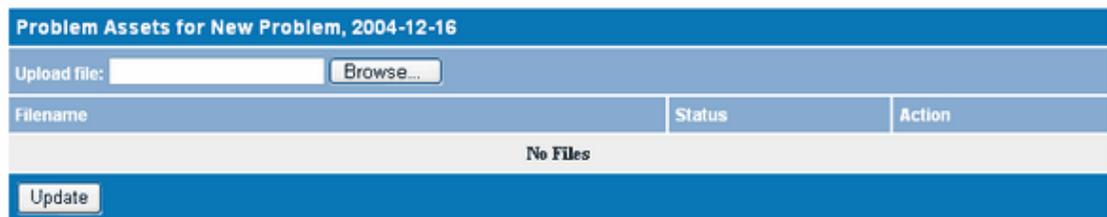
To add an image to a problem, you must first make the image an asset of the problem, then add the image itself into the proper place in the file.

First make it an asset:

1. Click on the **Action** dropdown menu at the top of the problem, and choose **Manage Assets**.



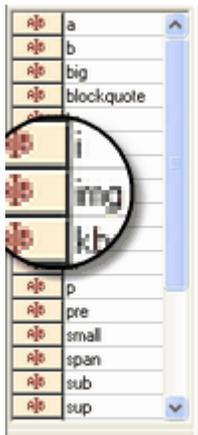
You see the Problem Assets screen.



1. Click on **Browse** and select the name of the image file.
2. Click on **Update**.

Then add the image to the problem:

1. Click on the **Action** dropdown menu and choose **Edit Problem**.
2. Edit the text.
3. At the location of your image, click on **img** in the entity helper window, or right-click and select **Insert>Img**.



4. A window prompts you for the image to insert. Enter the name of the image you previously made an asset, and save the problem.

A. Here is a first part with a problem in it. Here is an image:  doglet.gif 

In the main window, you'll see the problem with the edits you have made to it.

Type	Title	Difficulty	Time	Action
	My First Problem		0m	(select action) ▾

My First Problem Sarah Smith

[\[Print View\]](#)

Learning Goal: To learn the Authoring Tool.

This is the introduction.

Part A



Here is a first part with a problem in it. Here is an image: 

7.5.7 Adding an applet

To add an applet to a problem:

1. Make the applet an asset (see "[Adding diagrams and images](#)"⁷⁰). Alternatively, you can upload the applet to any server that is reachable from the Internet.
2. Link to the applet from within the problem. Make sure that your link is to a new page (that is, the href includes the attribute `target=_blank`).

7.5.8 Deleting parts of a question

To delete a part of a question:

1. Right-click anywhere in the part.
2. Select **Remove>Part**.

Note: Because elements can be embedded within a part, when you select **Remove** you may see a list of several elements. The topmost item in the list is the specific element you clicked on. The remaining elements are those within which the specific element is embedded. Selecting **part** removes the part and all of its sub-elements.

7.5.9 Changing an answer

To change the [wording](#) of an answer, simply edit the answer as you would in any text editor.

Symbolic expressions should be handled specially.

- To change or add a symbolic variable, look at the information in [Adding Symbolic Variables](#).
- To change a mathematical expression, look at the information in [Adding Rendered Mathematical Expressions](#).
- To use a random value as part of an answer, simply enter the variable name as a symbol in that answer. You must define the variable beforehand; see [Adding Randomized Variables](#).

7.5.10 Adding alternate answers

To add another correct answer:

1. Right-click on the answer box and select **Append>Expression**. There is no limit on the number of correct answers you can specify.



Note: Depending on the answer type of the answer you are editing, the answer box may look different than the one above.

To add a wrong answer:

1. Click on the answerbox (if there is already a wrong answer) or click on **Add Expression**.
2. Click on **Add Response** opposite the wrong answer to add a tutorial response.

The best answers anticipate the issues the students will have in solving the problem. Generally about six wrong answers will be sufficient, but this simple introductory problem requires more:

PRE-TEXT	$x =$ <input type="text"/>	UNITS	POST-TEXT
Tolerance: add tolerance (default = 2%)			
Correct Answer(s):			
<input type="text" value="4"/>	add response		
Wrong Answer(s):			
<input type="text" value="884"/>	This is the answer for the whole problem, not this subpart. Simply type this answer in the main answer box. (You receive full credit if you get the main answer right even if you've gotten some subparts wrong first.)		
<input type="text" value="1"/>	The correct answer is an even number.		
<input type="text" value="2"/>	The correct answer is larger.		
<input type="text" value="3"/>	The correct answer is an even number.		
<input type="text" value="10"/>	The correct answer is smaller.		
<input type="text" value="5"/>	The correct answer is an even number.		
<input type="text" value="6"/>	The correct answer is smaller.		
<input type="text" value="7"/>	The correct answer is an even number.		
<input type="text" value="8"/>	The correct answer is smaller.		
<input type="text" value="9"/>	The correct answer is an even number.		
<input type="text" value="442"/>	This is the correct answer to a later part of this problem.		

For full details on editing answers, see [Answer](#)⁸².

7.5.11 Adjusting the tolerance of numeric answers

Tolerance can be adjusted only for answers that require an [answer in the form of a number or mathematical expression](#)⁸⁶.

To adjust the tolerance of a numeric answer:

1. Inside the answerbox, click on **Add Tolerance**.
2. Edit the value. The value of the tolerance should be expressed in decimal notation, not percentages. For example, the default 2% tolerance is expressed as .02.

add displayFormal	SOLVE-FOR	<input type="text"/>	UNITS	add displayFormal
Tolerance: add tolerance (default = 2%)				
Correct Answer(s):				
ANSWER	add response			
Wrong Answer(s): add expression				

7.5.12 Adding a follow-up comment

Optional follow-up comments appear after the student has correctly answered an associated part or subpart. They add to the student's understanding of the problem.

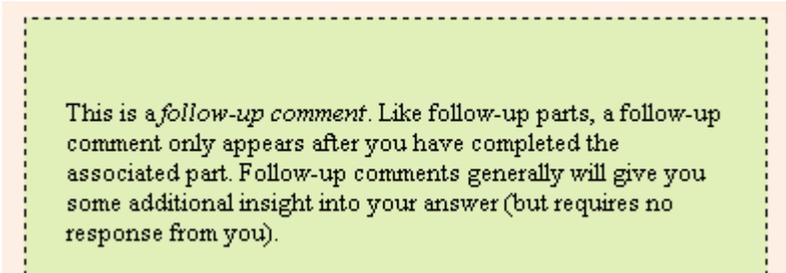
To add a followup comment, click on the "add followup" field:

[add followup](#)

Your followup comment appears in green:

This is a *follow-up comment*. Like follow-up parts, a follow-up comment only appears after you have completed the associated part. Follow-up comments generally will give you some additional insight into your answer (but requires no response from you).

In the problem as viewed, they are visible in green in a dotted box:



This is a *follow-up comment*. Like follow-up parts, a follow-up comment only appears after you have completed the associated part. Follow-up comments generally will give you some additional insight into your answer (but requires no response from you).

7.5.13 Saving your problems and deleting unwanted problems

To save any problem you are editing, click Save on the toolbar.

Your problems will be saved to the "My Problems" section of the Problem Library.

You will find all your problems in the "My Problems" section of the Problem Library, even problems that you have edited from problems in other chapters.

If you decide you don't want to keep a problem you've worked on, just save it to the Problem Library and then delete it with the Delete button next to the problem.

7.5.14 If your Authoring Tool session has timed out

MasteringPhysics times out your session if you have been idle for more than an hour. In the Authoring Tool, "idle" can mean that you haven't saved your problem for more than an hour.

It always pays to save early and often, but it's easy to recover if you haven't and your session times out.

If your Authoring Tool session times out, you will get an HTTP 302 error.

1. Keep your Authoring Tool window open.
2. Switch to the main MasteringPhysics window.
3. Log in again.

You will now be able to view and save your problem normally.

7.5.15 Assigning your problems

Your own problems are in the section of the Problem Library called **My Problems**.

Add them to an assignment just as you would other problems.

Problem Library				
Part:	Chapter:	Problem Type(s):		
MY PROBLEMS	MY PROBLEMS	<input checked="" type="checkbox"/> SB	<input checked="" type="checkbox"/> STP	<input checked="" type="checkbox"/> EOC <input type="button" value="Submit"/>
New Problem Name:		<input type="button" value="Create"/>		
Summary 2 problems found for Part [My Problems] / Chapter [My Problems] (SB+STP+EOC)				
Type	Title	Difficulty	Time	View
?	New Problem, 2004-12-16	?	?	Solution

Note for professors who are editing active problems:

If you edit one of your own problems that is already on an assignment, in order for students to see the new version of the problem you will need to unassign the problem, then reassign it. **This will erase whatever work students have done on the problem**, because the program sees it as a different problem.

7.5.16 Testing your problems

There are several steps to testing a problem.

Test for XML validity: Problems are written as XML documents. To test whether your problem is valid, click on the Validate XML icon in the Menu Bar:



The errors returned are XML errors. Since they are generated by the parser, they can be obscurely or misleadingly worded. For example, if an attribute does not have a closing quote, the parser often generates misleading errors. Usually the problem part will be indicated by cursor position and/or highlighting after the alert box is closed, and the position of the error is often a more useful clue than the text of the error message. (See "[Common XML errors](#)"⁷⁵.)

Test format: Preview the problem. Do the images and mathematical expressions appear correctly?

Test with students: Do this with any version of the question, from the original paper version onward. If possible, test with several groups of students, representing the range of skill levels you expect in your students.

- Test the wording of the question. Is it ambiguous?
- Are the solutions correct?
- Is there a possible correct answer that has not been provided for?
- Is the feedback appropriate for the wrong answers that students provide?
- If students are finding the question difficult, can it be divided into subparts that will make learning easier?

Once you assign your problem, keep track of how students use it via the various problem statistics offered by MasteringPhysics. Use student comments and feedback to improve the problem incrementally.

7.5.16.1 Common XML errors

HTML parsing is relatively lenient and forgiving. XML is designed to be much more well-formed.

Unfortunately, this means that many HTML files do not meet XML style guidelines. HTML must match the XHTML standard for well-formedness before it can be parsed by any XML parser.

Using entities and attributes in the Authoring Tool will keep you from most XML well-formedness

errors. However, if you are used to HTML, you may not immediately spot the ones that occur.

It is preferable to use the Authoring Tool's entities and attributes, rather than enter your own HTML, at least until you are familiar with the XHTML standard. (The XHTML standard is available on the [W3C](#) web site.)

Typical common errors include:

- Missing end tags, e.g. <P> with no </P>
- Missing closing slash on empty tags. For example, XHTML requires the forms and
; empty tags do not require closing slashes in HTML
- Missing quotes on attribute values, e.g.

7.5.17 Sharing the problems you have created

You can share your problems with other professors. If you make another professor an assistant in the course that contains the problems, he or she will be able to view and copy your problems from that course, either from My Problems or as part of assignments in which your problems appear.

7.6 Editing instructions for specific problem elements

This section contains instructions on editing specific element types:

- [Problem title](#) ⁷⁷
- [Problem description](#) ⁷⁷
- [varDefinition](#) ⁷⁷
- [Learning goal](#) ⁷⁷
- [Problem introduction](#) ⁷⁸
- [Part](#) ⁷⁸
 - [Hint](#) ⁷⁹
 - [Subpart](#) ⁸⁰
 - [Answer](#) ⁸²
 - [Transition](#) ⁸⁹
 - [Follow-up](#) ⁹⁰

var/tex rendering: OFF
New Problem 2005-03-17_142238

Problem title

PROBLEM DESCRIPTION — **Problem description**

[add varDefinition](#) — **varDefinition**

[add learningGoal](#) — **Learning goal**

PROBLEM INTRODUCTION — **Problem introduction**

A. **PART TEXT**

[add ...](#) — **Add part, hint, or subpart**

ANSWER INSTRUCTIONS — **Answer**

[add displayFormat](#) SOLVE-FOR [add displayFormat](#) UNITS

Tolerance: [add tolerance](#) (default = 2%)

Correct Answer(s):

ANSWER [add response](#)

Wrong Answer(s): [add expression](#)

[add followup](#) — **Follow-up**

7.6.1 Problem Title

This is the problem title as it appears in the Problem Library.

The problem title must be plain text (no HTML) and must not begin or end with a space.

7.6.2 Problem Description

This description will appear in the library as a reminder of what the problem is about. It is not visible to students.

It must be plain text (no HTML) and must not begin or end with a space.

7.6.3 varDefinition

Variables that may take random values are defined using a varDefinition problem element

See [Adding Randomized Variables](#) ⁶⁴.

7.6.4 Learning Goal

The Learning Goal is an optional element that describes to the student the learning objective of the problem.

7.6.5 Problem Introduction

The problem introduction describes the situation and introduces all variables that will be needed to express and/or compute the solution to the questions in the parts to follow.

This element is optional, but is a standard part of most problems.

The text in the problem introduction can include HTML-formatted elements, variables, images, and/or mathematical expressions.

If you do not include a problem introduction, this section will read "See problem at right."

7.6.6 Part

Parts are the primary element of a MasteringPhysics problem. Problems must contain at least one main part.

Each part consists of text that presents a question and an answer field where the student answers that question. The part text describes any specific features of the situation not given in, or changed since, the problem introduction. It also asks the question for the part.

PART TEXT

[add...](#)

ANSWER INSTRUCTIONS

[add...](#)

[add followup](#)

See the [Answer](#)⁸² section for the different answer types available in MasteringPhysics.

Parts can optionally contain:

Answer instructions

These provide any special information on how the student is to format their answer, which variables to use, etc.

[Hints](#)⁷⁹

Hints are optional text that provides additional guidance to students who are initially unable to answer the question.

[Subparts](#)⁸⁰

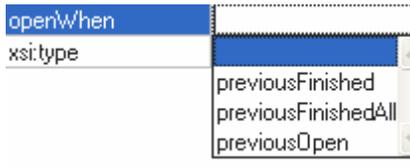
Subparts are optional tutorial problems that help students work toward the answer for the whole part.

Follow-up

Follow-up text appears only after the student has correctly answered or has requested the solution to the part. The follow-up can therefore provide information that would give away the preceding answer.

Add follow-up text by clicking the **Add follow-up** link underneath the answerbox.

You can restrict access to a particular part until certain conditions are met. To restrict when a part may be open, edit the openWhen attribute of the part. The options are:



- The previous part is finished: This part will be visible to the student as soon as the student has finished the immediately previous part by answering it correctly or requesting the solution.
- All previous parts are finished: This part will be visible to the student as soon as the student has finished all previous parts by answering them correctly or requesting the solution.
- The previous part is open: This part will be visible to the student as soon as the immediately previous part or transitions is visible.

7.6.7 Hint

A hint is text that is displayed at the student's request and provides information or suggestions that may be useful in solving a problem.

- Note: A **hint** is a block of text that you provide to the student while a **part** is a sub-problem, typically a step along the way to the solution. When you simply intend to give a student textual guidance, choose **Hint**.

Add hints using the **Add...** link between the part text and answer instructions fields. When you click this link, you will have the option to add either a hint or a part.



Hints contain

Tagline The hint tagline is a short description of the content of the hint, which is displayed to students before they decide whether to view the hint text or not.

It is important to have appropriately descriptive taglines so that students are confident that they will be opening a hint that is relevant to them.

Typical taglines are "How to approach the problem", "Formula for angular momentum", or "Which conservation law to use". (Note that there are no periods at the end of hint taglines.)

Text The actual text of the hint.

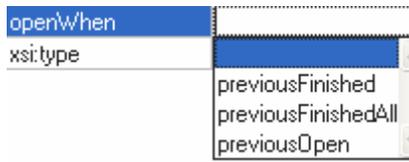
Hints should usually be independent of other hints and subparts. (Students often don't work hints and subparts in order, and don't open all of them.)

If you want to make the hint part of a sequence, edit the openWhen attribute of the hint. Until a hint is opened, its tagline is not displayed to the student, and the student cannot open the hint to view its contents. (The behavior is similar to [displaying problem parts in order](#).)

To specify when a student can open a hint:

1. Click anywhere in the hint.
2. In the top pane of the [attribute helper window](#)⁵⁸, pull down the menu and select **Hint**. A list of attributes appears in the bottom pane of the attribute helper window.
3. Click on **openWhen**. A pulldown menu appears, listing the possible options.
4. Choose one of the options.

The options for openWhen are:



- The previous hint is finished: This hint will be visible to the student only when the student has answered the immediately previous subpart correctly, or requested the solution, or read the previous hint within the current enclosing part.
- All previous hints/subparts are finished: This hint will be visible to the student only when the student has read, answered correctly, or requested the solution to all previous hints/subparts within the current enclosing part.
- The previous hint/subpart is open: This hint will be visible to the student once the student has opened the previous hint/subpart within the current enclosing part.

If no option is specified, a student can open hints in any order.

7.6.8 Subpart

A subpart breaks down the larger problem into one or more simpler tutorial steps that guide the student toward a solution. Subparts provide one of the most powerful learning tools in MasteringPhysics.

- Note: A **part** is a sub-problem, typically a step along the way to the solution, while a **hint** is simply text that provides conceptual guidance. When you intend to give a student a tutorial subproblem, choose **Part**.

Unlike main parts, subparts are always optional; that is, the student can choose not to work any or all subparts and instead proceed directly to the main answer.

Add subparts using the **Add...** link between the part text and answer instructions fields. When you click this link, you will have the option to add either a hint or a part.



Subparts contain

Tagline The subpart tagline is a short description of the content of the subpart, which is displayed to students before they decide whether to view the subpart.

It is important to have appropriately descriptive taglines so that students are confident that they will be opening a subpart that is relevant to them.

Taglines may contain TeX-formatted expressions or `<var>` tags.

The first word in the tagline should be capitalized; all others should be lowercase.

Text The part text of a subpart should describe any features of the question not given in, or changed since, the introduction.

Subparts should usually be independent of other hints and subparts. (Students often don't work hints and subparts in order, and don't open all of them.)

If you want to make the subpart part of a sequence, edit the `requestableWhen` attribute of the subpart. Until a subpart is requestable, its tagline is not displayed to the student, and the student cannot open the subpart to view its contents. (The behavior is similar to [displaying problem parts in order](#).)

To specify when a student can request a subpart:

1. Click anywhere in the subpart.
2. In the top pane of the [attribute helper window](#), pull down the menu and select **Part**. A list of attributes appears in the bottom pane of the attribute helper window.
3. Click on **requestableWhen**. A pulldown menu appears, listing the possible options.
4. Choose one of the options.

The options for `requestableWhen` are:



- The previous subpart is finished: This subpart will be visible to the student only when the student has answered the immediately previous subpart correctly, or requested the solution, or read the previous hint within the current enclosing part.
- All previous hints/subparts are finished: This subpart will be visible to the student only when the student has read, answered correctly, or requested the solution to all previous hints/subparts within the current enclosing part.
- The previous hint/subpart is open: This subpart will be visible to the student once the student has opened and viewed the previous hint/subpart within the current enclosing part.
- The previous hint/subpart is requestable: This subpart will be requestable when the previous hint/subpart, if any, is requestable.

If no option is specified, a student can request subparts in any order.

(Note: For the first subpart of a part, **RequestableWhen** returns no values.)

7.6.9 Answers

Every part or subpart in MasteringPhysics contains one answer, which is represented in the answer element. (It may also contain a set of [answer instructions](#).)

An answer element has a type. Different answer types are used for different purposes:

- Use the string answer type for questions whose answer consists of a word, phrase, or fixed string of letters such as "ACDF" or "1246," representing multiple correct answers to a problem. Note that the string question can often be more educationally effective than a multiple choice question since it decreases a student's ability to guess.
Note: Please follow the MasteringPhysics convention that, when a student is asked for a set of correct answers, the answer must be in alphanumeric order.
- Use the symbolic answer type to ask for a symbolic expression involving variables/constants given in the problem, standard functions, numbers and well-known constants. The symbolic answer type is also used for purely numeric answers.
- For standard multiple-choice answers in which there is only one correct answer, use radio buttons.
- Use pull-downs preferentially for fill-in-the-blank questions.

[Instructions for each answer type](#) are given separately.

7.6.9.1 Answer instructions

Answer instructions are not required. The answer instructions, if present, should be stand-alone, should consist of complete sentences, and should remind students what they are calculating. They should indicate the variables that the student may use in the answer.

- "Calculate the ratio between X and Y to four significant figures."

The answer instructions may list more variables than are needed in the answer.

Answer instructions should spell out the units in which the answer is expected.

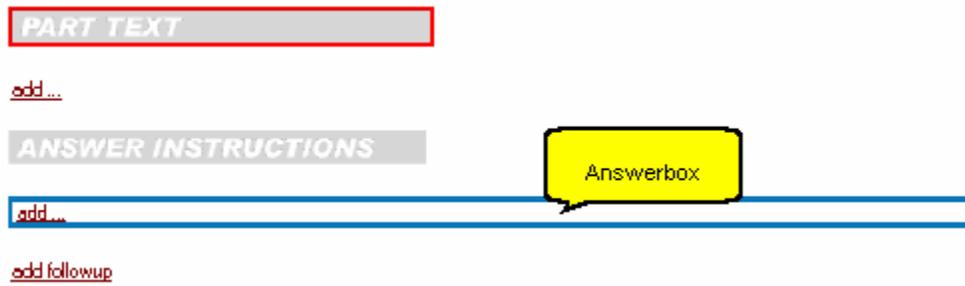
Nothing related to the scientific basis of the problem should appear in the answer instructions. If it does, move that text into the part description.

Answer instructions should not offer help with how to enter math expressions, scientific notation, constants, etc. These are already available to the student in the online Help.

7.6.9.2 Answer types

The answer element governs the answer: what type of answer it is, the correct answer(s), and the incorrect answer(s) with the feedback students receive.

In the authoring tool, the answer element is displayed inside a bordered rectangle, the answerbox, underneath the answer instructions:



When you click on the **Add...** link in the answerbox, a dropdown menu appears, allowing you to select which type of answer you want to use for this part.

The options are:

- [solutionString](#)^[83]: An answer consisting of a text string, usually a single word like "energy" or a string like "ABDE"
- [solutionStringSet](#)^[85]: An answer consisting of two or more strings (students enter the strings separated by commas).
- [solutionSymbolic](#)^[86]: An answer consisting of either a single number ("10.5") or an algebraic expression ("0.5*m*v^2").
- [solutionSymbolicSet](#)^[87]: An answer consisting of two or more numbers or algebraic expressions. Student enter the numbers/expressions separated by commas
- [solutionMultipleChoiceRadio](#)^[88]: A multiple choice answer presented to the student as radio buttons. Any long multiple-choice answer should be in the form of radio buttons
- [solutionMultipleChoiceSelect](#)^[89]: A multiple choice answer presented to the student as a dropdown menu (usually for fill-in-the-blank single-word options)
- [solutionEssay](#)^[89]: An essay answer.

Below are instructions for coding answers of each type.

solutionString

Use this answer type for questions that require an answer in the form of a text string. MasteringPhysics uses case-insensitive string matching to determine whether the student's submission agrees with the answer that you code.

When you use this answer type for a list (e.g. ACDE), instruct students that the answer must be in alphabetical or numeric order, and make sure that your correct answer is in alphabetical or numeric order.

When you add an answer of type solutionString to your problem, the following appears:



The **add displayFormat** link allows you to customize the appearance of the answerbox when it is displayed to the student. When you click "add displayformat", a "pre-text" field will appear to the left of the answerbox, and a "post-text" field will appear to the right of the answer box. Any text you enter in

these fields will appear to the left and right of the answer field when it is displayed to the student.

Enter the correct answer to the question in the gray box marked **Answer**. You can add additional correct answers by right-clicking on the answer box and selecting **Append>expression**. There is no limit on the number of correct answers you can specify.

The screenshots below show a string answer with pre-text and post-text and two alternative correct answers coded. The first shows this answer in the authoring tool, the second as it appears to the student.

In the authoring tool:

Fill in the blank

[add...](#)

Enter the word that correctly completes the sentence.

A screenshot of the MasteringPhysics authoring tool interface. The question text is "A rectangle has sides." Below the question, there is a section for "Correct Answer(s):" containing two rows. The first row has the answer "4" and an "add response" button. The second row has the answer "four" and an "add response" button. Below this is a section for "Wrong Answer(s):" with an "add expression" link.

[add followup](#)

As it appears to the student:

A screenshot of the MasteringPhysics student interface. At the top right, the name "David Kokorowski" is displayed. Below it, the section "Part A" is shown. The question text is "Fill in the blank" followed by "Enter the word that correctly completes the sentence." The question itself is "A rectangle has sides." At the bottom, there are four buttons: "submit", "my answers", "show answer", and "review part".

You may also specify a list of wrong answers and a response to be displayed to the student who enters one of the wrong answers. Click on the **Add expression** link next to the label **Wrong Answer(s)** to specify a new wrong answer and response. Fill in the answer and response boxes for the wrong answer in the same way as for the correct answer.

Here is a set of answers and responses:

$x =$	<input type="text"/>	POST-TEXT
Correct Answer(s):		
4	RESPONSE	
Wrong Answer(s):		
884	This is the answer for the whole problem, not this subpart. Simply type this answer in the main answer box.	
1	The correct answer is an even number.	
2	The correct answer is larger.	
3	The correct answer is an even number.	
5	The correct answer is an even number.	
6	The correct answer is smaller.	
7	The correct answer is an even number.	
8	The correct answer is smaller.	
9	The correct answer is an even number.	
10	The correct answer is smaller.	
442	This is the correct answer to a later part of the problem.	

solutionStringSet

The solutionStringSet answer type is identical to the solutionString answer type except that the correct answer involves two or more text strings, labeled "terms". The student enters the required number of terms separated by commas.

When you add an answer of type "solutionStringSet" to your problem, the following appears:

add displayFormat	<input type="text"/>	add displayFormat
Correct Answer(s):		
Term 1:	ANSWER	add response
Wrong Answer(s): add expression		

By default, only the first term in the answer is displayed. You can add additional terms by right-clicking on the answer field for term 1 and selecting **Append > value**. There is no limit on the number of terms in the answer.

The screenshots below show an example stringSet answer in the authoring tool and as it appears to the student.

In the authoring tool:

List the two-dimensional geometrical objects that have three, four, and five sides respectively.

[add...](#)

ANSWER INSTRUCTIONS

add displayFormat	<input type="text"/>	add displayFormat
Correct Answer(s):		
Term 1:	triangle	add response
Term 2:	rectangle	
Term 3:	pentagon	
Wrong Answer(s): add expression		

[add followup](#)

As it appears to the student:

Part A

List the two-dimensional geometrical objects that have three, four, and five sides respectively.

submit
my answers
show answer
review part

solutionSymbolic

Use this answer type for questions that require an answer in the form of a number or mathematical expression. MasteringPhysics uses algebraic expression matching to determine whether the student's submission agrees with the answer that you have coded.

Thus, if the correct answer is $0.5 \cdot m \cdot v^2$ and a student enters $v \cdot m \cdot (v/2)$, the program grades that answer as correct.

When you add an answer of type **solutionSymbolic** to your problem, the following appears:

add displayFormat	SOLVE-FOR	<input type="text"/>	UNITS	add displayFormat
Tolerance: add tolerance (default = 2%)				
Correct Answer(s):				
ANSWER	add response			
Wrong Answer(s): add expression				

All the sub-elements that **solutionSymbolic** shares with **solutionString** behave the same way in both answer types (see [solutionString](#) ⁸² for details). The elements new to **solutionSymbolic** are:

- **solveFor**: Similar to the pre-text field except that if you enter anything in the solve-for field (typically the variable that the student is solving for) then an equals sign is automatically added between this field and the answerbox.
- **Units**: This field can be used only to indicate the units in which a numeric answer should be expressed.

- **Tolerance:** For numerical answers, MasteringPhysics considers a student's answer correct if it matches the coded answer to within 2%. You can override this tolerance by clicking on the **Add tolerance** link and specifying another value. For example, to specify a 1% tolerance, you would enter "0.01".

Notation

Symbolic answers should be given in standard MAPLE notation ("Excel notation").

Caution: Although MasteringPhysics allows students to omit parentheses and multiplication signs in their answers, authors must not use such shortcuts. For example, when coding the product of "a" and "(b+c)", the correct syntax is "a*(b+c)" rather than "a(b+c)". The latter is interpreted to mean that a is a function of b+c.

Arithmetic operators

MasteringPhysics recognizes the standard arithmetic operators "+, -, *, /" along with the exponentiation operator "^".

Order of Operations

Note the following as you code your answers:

1. Terms inside the most deeply nested set of parentheses are evaluated first.
2. Exponents are evaluated next. They are always evaluated from right to left. For example, 3^{2^2} is evaluated as $3^{(2^2)}$, but $3/2/2$ is evaluated as $(3/2)/2$.
3. Multiplication and division are evaluated next, from left to right.
4. MasteringPhysics evaluates addition and subtraction last, from left to right

Randomized Variables

An answer of type solutionSymbolic may be a function of any or all of the randomized variables as defined using the varDefinition element. Note that you cannot mix randomized variables with non-randomized variables in the same answer.

Recognized Functions

The functions in the table below may appear as part of a symbolic answer.

Caution: The arguments of trigonometric functions are expected in radians, not degrees.

- abs(x) - absolute value
- exp(x) or e^(x) - exponential
- log(x) - common logarithm (base 10)
- ln(x) - natural logarithm (base e)
- sqrt(x) - square root
- sin(x) - trigonometric sine
- cos(x) - trigonometric cosine
- tan(x) - trigonometric tangent
- csc(x) - trigonometric cosecant
- sec(x) - trigonometric secant
- cot(x) - trigonometric cotangent
- asin(x) or arcsin(x) - trigonometric arcsine
- acos(x) or arccos(x) - trigonometric arccosine
- atan(x) or arctan(x) - trigonometric arctangent

The functions are case sensitive. When you enter them, be sure to use lowercase.

solutionSymbolicSet

The solutionSymbolicSet answer type is identical to the [solutionSymbolic](#)^[82] answer type except that the correct answer involves two or more numbers/expressions, labelled "terms". The student enters the required number of terms separated by commas.

See the discussion of [solutionStringSet](#)^[82] for information on how to input multi-term answers.

solutionMultipleChoiceRadio

Use this answer type for multiple-choice questions that you want to present to the student as a set of radio buttons from which they choose a single correct answer.

When you add an answer of type solutionMultipleChoiceRadio to your problem, the following appears:

The screenshot shows the configuration interface for a multiple-choice question. It includes a 'PRE-TEXT' field, an 'Options:' table with 'OPTION' and 'VALUES' columns, a 'POST-TEXT' field, a 'Correct Value(s):' table with 'VALUE' and 'add response' columns, and a 'Wrong Value(s):' table with 'add expression'.

Pre-text and post-text function in the same way as each of the other answer types above.

The Options/Values table is where you enter the different options in your multiple choice question. You may enter as many options as you like. The options can include HTML formatting and tex-formatted mathematical expressions. To add additional options, right-click in the option box and select **Append>option**.

For each option you must specify a unique, numeric value ("1", "2", "3", and so on).

To specify which option(s) are correct, enter the value corresponding to the correct option(s) in the "Correct Value(s)" table. As with the other answer types, you can enter a unique response to be displayed to the student for each correct value.

Similarly, you may specify wrong values and a response to be given for each (you do not need to list the incorrect values in the "Wrong Value(s)" table unless you want to script a wrong answer response).

The screenshot shows the completed configuration for a multiple-choice question. The 'PRE-TEXT' is 'Three equals:'. The 'Options:' table has four rows: 'two + one' (value 1), 'two + two' (value 2), 'three + zero' (value 3), and 'four + zero' (value 4). The 'POST-TEXT' is empty. The 'Correct Value(s):' table has two rows: '1' and '3', each with an 'add response' button. The 'Wrong Value(s):' table has two rows: '2' and '4', each with the response 'That gives four!'.

solutionMultipleChoiceSelect

Use this answer type for multiple-choice questions that you want to present to the student as a drop-down menu from which they choose a single correct answer.

The only difference between this answer type and [solutionMultipleChoiceRadio](#)⁸² is that the options are displayed to the student in the form of a dropdown menu. HTML formatting and TeX-formatted mathematics cannot be displayed in the dropdown menu.

This answer type is best suited to multiple-choice questions where the options are single words or short phrases.

solutionEssay

Use this answer type when students are to write essays.

This answer type displays a field into which the student can type an answer. It is best suited to short essays.



Essay Rows:

Essay Answer Key:

Essay Rows is the number of lines of text allowed for the student's answer. The default is 6.

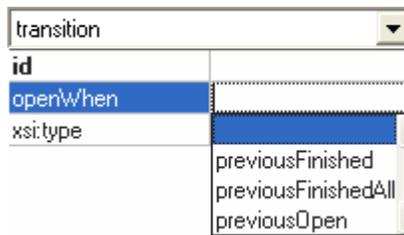
Essay Answer Key is optional and is returned if the student requests the solution.

7.6.10 Transition

A transition is an optional section of text that provides new or additional information about the situation described in the Problem Introduction. The transition may introduce a new twist to the problem ("Now add friction to the system") or a new case to consider ("Imagine the spherical shell is replaced by a solid sphere").

The transition appears between main parts, and the new information provided should be relevant only to the parts that appear after it.

You can use the "Display this transition when" dropdown to restrict access to a particular part until certain conditions are met:



- The previous part/transition is finished: The text of this transition will be visible to the student as soon as the previous part has been answered successfully or its solution requested.
- All previous parts are finished: The text of this transition will be visible to the student only when all of the previous parts have been answered successfully or their solutions have been requested.
- The previous part/transition is open: The text of this transition will be visible to the student as soon as the immediately previous part or transition is visible.

Transitions can optionally include a tagline, which is simply an informational heading that is displayed to the student above the transition text. Click **Add tagline** to include a tagline with your transition.

7.6.11 Follow-up

A follow-up is optional final text that appears after the part is answered correctly. It makes a pedagogical point about a problem, part, or subpart.

To add a followup comment, click on the **add followup** field, then type.

[add followup](#)

Your followup comment appears in green:

This is a follow-up comment. Follow-up comments appear after you have completed the associated part. They will generally give you some additional insight into your answer, but require no response from you.

8 FAQs for Professors

Creating assignments

- I currently seem to have access to only Skill Builders and Self-Tutoring Problems. What do I have to do to get [access to End-of-Chapter problems](#)?
- How do I [view an assignment as a student](#) would see it?
- Why am I [missing problems when I copy an assignment](#)?
- How do I report a [problem with the content](#) of MasteringPhysics?

Enrollment

- How do I [create a student account for myself](#) (an instructor)?
- [How do I add a TA to a course?](#)
- Why am I getting the message "[Invalid Assistant Teacher ID\(s\)](#)"?
- Why can't my students [register](#)?
- Why didn't my student get a [registration confirmation](#)?
- Why are all my students [disenrolled](#) from my course overnight?
- How can [students update their student IDs, passwords, or other information](#)? How can I change my password?
- Why isn't my student getting [email about a forgotten password](#)?
- Why is [registration/login slow at the beginning of semesters](#)?

Grading

- [How are problems scored](#)?
- What is the [difference between hints and subparts](#)?
- I set the wrong answer penalty to zero. [Why are my students losing points](#) when they do reach the correct answer?
- What is the [grading tolerance](#) used for MasteringPhysics?

Students and assignments

- The gradebook gives students' scores as percents. How do I view their [raw scores](#)?
- Can a student [submit a problem accidentally](#)?
- [Can students see the solutions that I have worked out](#)?
- Can a student [resubmit a problem](#)?
- Can a [student's grades follow them from one class to another](#) if a student switches courses?
- Can I [change a problem's point value](#) after an assignment's due date?
- Can I [extend a due date](#) after the initial due date has passed?

Miscellaneous

- How do I ["unlock" the answers](#) to a set of problems after the due date for the assignment has passed? I don't want students to see answers immediately after they submit them.
- How can I [get feedback emails](#) from students, or send them to my TAs? How can I avoid getting feedback emails from students?

Display

- How do I [change the font size](#) on my browser?
- Why are some [figures cut off](#) when I view them?
- How do I know if [Flash is properly installed](#)?
- Why can't I see [hints/diagrams](#) in Student view?

Creating assignments

I currently seem to have access to only Skill Builders and Self-Tutoring problems. What do I have to do to get access to End-of-Chapter problems?

If you have bought the standalone product (for instance, if your students are using another text), you have access only to SB and STP problems.

If you accidentally registered for standalone, contact your sales representative at <http://www.aw-bc.com> for an instructor access code for the appropriate book.

How do I view an assignment as a student would see it?

Click on the assignment you want to view.

At the top of the page, select **View as Student** from the Assignment Display Mode Selector.

Why am I missing problems when I copy an assignment?

MasteringPhysics is designed to avoid assigning the same problem to a single class more than one time.

If you copy problems you have previously used to a new assignment in the same class, MasteringPhysics will not show those problems in the new assignment.

How do I report a problem with the content of MasteringPhysics?

Send email to [Customer Support](#)..

Before you do so, you may want to read this FAQ and [How to write a good bug report](#)^[105].

Enrollment**How do I create a student account for myself (an instructor)?**

1. [Email your sales representative](#)^[111] (as you did when requesting an instructor code) and request a student access code.
2. Go to the login screen.
3. Instead of logging in, [register](#)^[111]. Use a new login name and password--not your instructor login name and password. Use the access code you have been given.

This creates for you a new identity as a student. You can then register as a student for your own class.

How do I add a TA to a course?

Look under [Adding TAs to a course](#)^[101].

Why am I getting the message "Invalid Assistant Teacher ID(s)"?

Make sure that you are entering the teacher's correct login name exactly as it appears on the TA's class properties page.

Why can't my students register?

Check to be sure that [Allow Students to Enroll](#)^[61] is set to Yes.

Why didn't my student get a registration confirmation?

It is likely that the student mistyped his/her email address. Please have him or her visit <http://www.aw-bc.com/techsupport> and complete the appropriate online form.

Why are all my students disenrolled from my course overnight?

Check to make sure that your [class expiration date](#)^[61] is set to some time in the future (this should be a few days after grades are due).

Check to be sure that [Allow Students to Enroll](#)^[61] is set to Yes.

How can students update their student IDs, passwords, or other information? How can I change my password?

Students can update most of their information themselves, including their passwords. Here is how:

1. Go to the login page, but don't log in.
2. Instead, click on **View Your Account Summary**.
3. Enter login and password on the Account Summary page.
4. Make corrections one by one.
5. Click on **Save** after each.

To update their student IDs, they'll need to do the following:

1. Log in as usual.
2. Once logged in, manually change the URL in the (same) browser location bar to:
`http://session.masteringphysics.com/myct/userProperties`
3. Update the Student ID field and click **Save**.
4. Click **Back To Home**.

Why isn't my student getting email about a forgotten password?

It is likely that the student mistyped his/her email address. The student should report this to Addison-Wesley on the same page as they ask for their password, [here](#).

Why is registration/login slow at the beginning of semesters?

Registering via the Login/Password Page for MasteringPhysics is handled by servers that are used across all of Pearson Education products. The first two weeks of September are the peak registration season (approximately 200,000 new registrations!). You may experience a slow logging in or registration process during that time.

However, this is not indicative of the speed of MasteringPhysics itself, which runs on a different set of servers.

Once the peak registration season has passed, logging in should be swift throughout the remainder of the year.

Grading

How are problems scored?

MasteringPhysics uses the following rules in grading students:

- Every correct main part of a problem counts for 1 point. For example, if a problem has six parts, A-F, MasteringPhysics treats it as if it is worth 6 points.
- If the question has subparts, students receive partial credit for each subpart they answer, even if they are unable to obtain the answer to the main part.
- If the student requests the solution to a subpart or exceeds the number of possible answers to a subpart, they will lose a percentage of credit, even if they are able to obtain the answer to the main part.

When teachers set up assignments, they may choose to:

- Penalize wrong answers or limit the number of allowed answers.
- Penalize students for using hints and reward them for not using hints.

These values apply to the entire assignment.

They also apply to subparts; if wrong answers are penalized in main parts, they are also penalized in

subparts.

Multiple choice questions are specially graded:

- **If the question is multiple choice, students lose $1/(n-1)$ points, when n is the number of options to choose from, for each unique wrong answer they submit.**
- **This "guessing penalty" is true even if professors do not otherwise charge for wrong answers.**

After the entire problem has been completed, the student's total points are divided by the maximum points for the problem equal to:

$$\text{Max_points} = \text{number of main parts}$$

This ratio is their score for the problem, and can be greater than 1 if the student got mostly correct answers without using any hints and the hint bonus is on.

In the student's view of the assignment, this score will appear as a percentage next to any problem that the student has completed.

What is the difference between hints and subparts?

Hints are text that help students solve the larger problem. Not all problems have hints.

- Teachers may select whether students are penalized for using hints or whether students can get extra points by not using hints.

Subparts are smaller parts of the problem, that the student solves on the way to solving the main part(s) of the problem. Not all problems have subparts.

- Failing to answer a subpart, or requesting the answer to a subpart, is penalized according to the grading algorithm.

I set the wrong answer penalty to zero. Why are my students losing points when they do reach the correct answer?

With the wrong answer penalty set to zero, there are two ways for students to lose points even if they submit the correct answer.

- If the question is multiple choice, students lose $1/(n-1)$ points, when n is the number of options to choose from, for each unique wrong answer they submit. This guessing penalty does not change even when the wrong answer penalty is set to zero.
- If students request the solution to a subpart for a problem with n subparts, they will lose $1/(n+1)$ of the credit for that part.

What is the grading tolerance used for MasteringPhysics?

Our default tolerance is 2%. However, our authors may adjust this value to force the student to answer with a certain number of significant figures if this is specified within the problem.

If a student's answer is outside the specified tolerance but within 5% of the program's answer, the answer will be counted incorrect, but the student will see the response, "You are close. It may be that you made a rounding error or used the wrong number of significant figures."

We recommend that students work to at least one more significant figure than the answer requires, and round off at the end.

Students are often confused about the definition of a significant figure. There are several useful online discussions, including at least one that drills students on recognizing significant figures.

Students and assignments

The gradebook gives students' scores as percents. How do I view their raw scores?

You can view a student's raw score for a particular assignment by clicking on the student's grade for that assignment in your gradebook. Here, you will be able to see the breakdown of the score by problem.

You can click on a problem's title in the list that appears to see how many hints, subparts, and solutions the student requested for that problem as well as how many wrong answers s/he submitted.

Can a student submit a problem accidentally?

Our program is designed to prevent students from accidentally submitting a problem.

If a student hits the "submit problem" button before they have completed all parts to a problem, they will be prompted with a window, "You haven't answered # parts of this problem. Are you sure you want to submit the problem for grading?" Students then must click OK to submit the problem.

Students should be sure that they submit their solutions to each part of a problem, using the "Submit" button below each answer field, before clicking the Submit Problem button.

Can students see the solutions that I have worked out?

No. Only persons with instructor access, whom you have given access to your course, can see your solutions.

Can a student resubmit a problem?

Once students submit a problem, they are able to see the correct answers to all parts and subparts of the problem as long as the assignment is still active on their assignment list.

For this reason, students cannot rework a problem they have submitted.

Note, however, that instructors can rework a problem. Click on Reset at the upper right of the problem to discard your previous solution.

Can a student's assignment grades follow them from one class to another if a student switches courses?

There is currently no way to automatically transfer a student's grades when s/he switches courses. However, you can manually enter students' scores in the gradebook for the class to which they transferred.

To do this:

1. Go to your gradebook.
2. Click on the bar next to the student's name corresponding with the assignment for which you'd like to enter the student's grade. At the bottom of the window that appears, you will see the field, **Adjust Total Points by (+/-)**.
3. Enter the number of points the student earned when they first completed the assignment.

Can I change a problem's point value after an assignment's due date?

Yes.

1. Click on **Properties** for the assignment, or select **Edit Assignment Properties** from the Assignment Display Mode Selector.
The lower half of the page (tan) shows individual problems in the assignment.
2. Click on the **Points** pulldown menu opposite a problem to add credit points to the problem.
3. Click on **Save**.

Students' scores will be automatically recalculated based on your new point or credit changes.

Can I extend a due date after the initial due date has passed?

Yes.

1. Click on **Properties** for the assignment, or select **Edit Assignment Properties** from the Assignment Display Mode Selector.
2. Enter a new due date for the assignment..
3. Click on **Save**.

Miscellaneous**How do I "unlock" the answers to a set of problems after the due date for the assignment has passed? I don't want students to see answers immediately after they submit them.**

We hope students will be seeing the correct answers if they successfully work the problem for themselves. MasteringPhysics coaches 90% of the students to the correct answer, although some do give up and click the Show Answer button for a particular part during their progress.

If you want to disable the Show Answer button, you can do so and then reactivate it after the assignment is due. Disable it before you display the assignment.

To reactivate it:

1. Click on **Properties** for the assignment, or select **Edit Assignment Properties** from the Assignment Display Mode Selector.
2. Make sure the display in list dates extend beyond the assignment due date. This allows students to access their previously submitted homework to review their work. We recommend the **Display in List** end date is set to the last day of the semester. *
3. Change the **Show Answer** button from No to Yes.
4. Click on **Save**.

* A student can only complete a problem once, so having the Display in List date on for the entire semester allows the student to review their work and to open up all the Hints (now called Review Part) buttons at no penalty to their score. This helps them to understand the problem better during review.

How can I get feedback emails from students, or send them to my TAs? How can I avoid getting feedback emails from students?

When submitting a problem for grading, the student can also submit feedback comments. If you do not want to receive this feedback, leave the **Contact email** field blank on the Contents page.

If the **Contact email** field is left blank, students still see the same end of question survey with the comment text area, but they do not have the **Please respond to my comment via email** checkbox available. Their comments are recorded in the database and reviewed periodically by our content developers, but not emailed to you. We do not respond to these comments individually.

You can enter the email address of a TA in the **Contact email** field. You can also enter multiple email addresses, separated by commas.

If you include your own email in addition to those of one or more TAs, you can instruct the TAs to respond to the individual student comments, but still have the comments available yourself to review

Display

How do I change the font size on my browser?

In Internet Explorer 6.0:

1. Go to **Tools>Internet Options**, then click on the **Accessibility** button in the lower left corner of the window that comes up. The third box under **Formatting** in the window that comes up will be labeled **Ignore Font Sizes Specified on Web pages**.
2. Check this box.
3. Then, go to **View>Text Size** and select the text size you'd like.

In Mozilla Firefox, go to **View>Text Size** and increase or decrease the font size.

In Safari, go to **View** and choose **Make Text Bigger** or **Make Text Smaller**.

Why are some figures cut off when I view them?

Check on the System Requirements page (link from your home page) to make sure that your screen resolution is at least 1024x786. You can change this setting on most computers under **Control Panel>Display**.

How do I know that Flash is properly installed?

Check on the System Requirements page (link from your home page). If you cannot see flashing text in the box, install the latest Flash viewer.

Why can't I see hints/diagrams?

Try the following:

- Please make sure your computer meets system requirements.
- Is your screen resolution 1024x768 or above? If not, reset it
- Are popup blockers turned off? If not, disable your popup blocker
- Is Javascript enabled in your browser? If not, enable it
- Is this computer on a network (lab, library, etc.)? Check to see if other users are having this problem
- Have you tried to replicate the issue on another network or outside a network? Try from another computer
- Have you tried to replicate the issue on another browser? Try with another browser, such as Mozilla or Firefox

If none of these work, please [contact us](#).

9 Help on Help

Help is available by clicking on the **Help** tab on the navigational bar at the top of the window.

Because MasteringPhysics runs on many platforms, Help is distributed as standard HTML files. It is also available as HTMLHelp and printable PDF files; see "[Getting HTMLHelp or printed Help](#)."

Inside Help:

- Click on Table of Contents to see the contents of Help.
- Click on Keyword Index to search Help by keyword.
- Search through a page by using your browser's Search function.
- Bookmark pages by using your favorite bookmark utility.

A question mark inside a box indicates that contextual help is available:



If you have questions or comments about the help files, please [contact us](#).

10 Getting HTMLHelp or printed Help

Help is also available as:

- [HTMLHelp](#) for Windows users
- [Adobe Acrobat PDF](#): a printable manual

11 Best Practices for Professors

This section brings together some best practices from top-flight MasteringPhysics professors and instructors across the country and abroad:

- Use your [homepage](#) or [welcome message](#) effectively.
- Talk about the MasteringPhysics [Socratic tutorial method](#).
- Make the [grading process](#) clear.
- [Set appropriate grading strategies](#) to support your teaching style.
- [Assign "Introduction to <PRODUCTNAME>"](#).
- [Set student expectations](#) about MasteringPhysics. Students' experience of MasteringPhysics changes markedly over the semester.
 - Set expectations about what MasteringPhysics needs from students
 - Set expectations about Web-based programs.
- [Compare your students' work with averages](#); they like to know when they are doing well.
- [Use statistics on individual parts](#) to catch student misunderstandings quickly and easily. (You can use the Authoring Tool to customize a question with a new response.)
- Prevent and identify [student cheating](#).
- Use [prebuilt assignments](#) and [reference classes](#) to add value to your teaching from semester to semester.

11.1 Set student expectations

Statistically only about 20% of students like MasteringPhysics in the first weeks of the course. This is not surprising; students dislike physics homework in general, they have to do more work because MasteringPhysics is tutoring them, and the combination of unfamiliar, difficult material and a new way of working can initially make them unsure of themselves.

However, according to studies of classes using MyCyberTutor, the tutoring engine on which MasteringPhysics is based:

- The figure rises to over 90% student approval by the last weeks
- Student grades rise by about 27% in the lab
- In actual courses, student grades rise by 5-7 points--a full grade

Simply knowing this can make the class work better.

Here are some other strategies:

- Have the whole class do "Introduction to MasteringPhysics" and discuss the assignment
- Talk about the differences between MasteringPhysics problems and printed problems.
- At the beginning of the semester, assign relatively short assignments, due frequently.
- Allow unlimited wrong answers at the beginning of the semester. Encourage students to experiment.
- Reassure students that, at least initially, most students spend more time on MasteringPhysics assignments than on older paper-based homework, because they are getting more feedback, having more chances to get the right answer, and learning more.
- To help visual learners, assign ActivPhysics problems or Skill Builder and Self Tutoring problems with built-in animations.

Please [send your comments, suggestions, and questions to us](#), and encourage students to use our Customer Service Web site and form as well.

11.2 Explain what MasteringPhysics does

MasteringPhysics is an online problem solving "tutoring" system. The system guides students through the solution of multi-step problems, removing roadblocks with wrong-answer-based feedback and on-demand hints. It includes multi-step problems that incorporate a wide variety of answer types, including symbolic math, fill-in-the-blank, numerical, and multiple-choice.

The system encourages students to work through problems, moving incrementally toward a procedural understanding of problem types.

A major reason professors adopt MasteringPhysics is that it allows them to track student progress and prevent students from falling too far behind. Color coding reveals students in trouble or problem areas for the class as a whole.

Published studies of students using MyCyberTutor, the tutoring engine associated with MasteringPhysics claim that MyCyberTutor significantly improves in students' conceptual understanding and problem-solving skills, helps them learn more in less time, and helps them get better exam scores when compared with traditional written and hand-graded homework.

Significantly improved scores on area-specific standardized tests have been observed in the field.

MasteringPhysics provides several problem mechanisms that can be assembled into weekly

homework assignments. These include

- Skill Builders (SB): These offer detailed worked examples with multiple hint-giving options that focus on improving conceptual understanding or developing key skills. Hints and feedback on these problems have been developed from detailed educational research of students solving these problems and are ranked according to the most common difficulties at each step.
- Self-Tutoring Problems (STP): These are "standard" homework problems that provide similar individualized help as a result of an incorrect answer or when requested. Including hints and simpler sub-problems, Self-Tutoring Problems help bridge the gap between worked examples and textbook end-of-chapter questions. They develop the student's ability to solve more complex multi-step problems and motivate them in this process with immediate feedback and grading. They also give students an accurate measure of how well they understand the material and where they need to study further.
- End of chapter problems (EOC): These do not have hints or tutoring elements.

For information on the research background of MasteringPhysics, visit:

- The "Overview Movie" and "Getting Started Movies" at [<URL>](#). The last Getting Started movie shows a student walkthrough of a problem.
- <http://RELATE.mit.edu/> for information about past and current educational research being conducted on or using MyCyberTutor technology, the engine on which MasteringPhysics runs. Select reprints of published articles are also available.
- <http://www.uffedtech.com>, the website of Effective Educational Technologies, developers of MyCyberTutor.

11.3 Assign "Introduction to MasteringPhysics" early

Before tackling the homework assignments, your students should finish the assignment labeled "Introduction to MasteringPhysics" in order to learn symbolic notation, navigation, and other basics of the system.

The notation teaches students to create vectors, unit vectors, Greek letters, subscripts, superscripts, mathematical constants and physical constants.

Other concepts include hints, serialized parts, randomized answers, Submit Answer, Submit Problem, the math display function, and the My Answers button.

11.4 Use a class home page

A class home page is a very efficient way of communicating with your class and integrating MasteringPhysics with your whole course. Link to your home page from the MasteringPhysics Welcome screen, which you can edit in the class properties.

- [Sample code](#)  for a welcome screen message

Here are some topics that appear in successful MasteringPhysics home pages.

Course information

- Overview of the course

- Grading policy
- Prerequisites; what the students should know before taking this course
- Office hours
- Discussion sections

Weekly work

- Schedule
- Homework
 - Readings
 - MasteringPhysics homework
 - Other work

How MasteringPhysics fits into the course

- What MasteringPhysics does
- How to register for the course
 - Course ID (students need this to enroll in the course)
 - Student ID (how students should identify themselves for the gradebook; you control this field)
 - How to get a student access code (necessary to buy if student has a secondhand text; not necessary with a new text)
- Other tutorial help students can use

Exam and grade information

Other links

- Online references
- Other physics courses and tutorials, such as the ActivPhysics tutorial applets

11.5 Use recommended grading strategies

If you are a first-time MasteringPhysics user, we strongly recommend that you stick with the default values for wrong answer penalty (3%), hint (2% bonus for unused hints), and number of attempts (unlimited).

These defaults are based on extensive experience from professors who've used the system at other schools. These values have been found to be the most effective in terms of motivating students.

- Unlimited attempts let students experiment with various solutions. Some students learn by triangulation.
- A small bonus for not using hints and subparts gives students just enough incentive to try to answer the question without the hint first, but not so much they won't open a hint when they really get stuck. A lost bonus is more palatable to many students than a penalty, even though they effectively amount to the same thing.
- A small penalty for wrong answers discourages students from simply guessing wildly. Because MasteringPhysics often gives helpful feedback when a student makes a mistake, it is especially important to ensure that every answer they submit is one that they have some intellectual commitment to.

If you decide to adjust the settings, MasteringPhysics provides enormous flexibility to support your teaching goals and methods. As you decide on your best grading strategy, keep these points in mind:

- If you do not give a small bonus for unopened hints we have found that students who would otherwise think more carefully about the problem will simply open all the hints first since they are free. Giving a bonus for unused hints is one way to provide an incentive for thinking first, without

- putting students off.
- If you do not **either** include some penalty for wrong answers **or** limit the number of attempts, students who would otherwise think more carefully about the problem will tend to guess and hope that MasteringPhysics will give them some useful feedback as they wander toward the answer. However, some students actually learn this way.
 - If you limit the number of attempts, a reasonable limit is 8 or 9. Our research has shown that 99% of students who ultimately obtain the correct answer to a problem typically do so within 8 or fewer answer attempts. 5 or fewer attempt is too few for many students' learning styles.
 - We highly recommend giving some credit for late assignments. If you give partial credit for late assignments, you provide incentive for students to finish problems even if they need to take extra time. Studies of MasteringPhysics students have shown that they will return to problems even well past the due date, for instance at the end of the semester, to review and finish work they didn't understand originally.

Note: The same penalties that apply to main parts of problems apply to subparts of problems. That is, if you charge 3% of possible credit for a wrong answer to a main part, students will also be charged 3% for a wrong answer to a subpart.

11.5.1 Using hints and subparts

Hints are textual comments designed to help students who can't figure out how to approach a problem.

Subparts break the problem down into a series of simpler steps. They are a tutorial through a problem.

- Typically, hints, particularly a first hint, help students figure out how to start a problem and what physical principles to employ.
- Subparts of a question ask for interim results along the way to the solution, showing what procedure to employ.

When students request hints or subparts, you may choose to penalize them slightly; if they do not open hints or subparts, you may give them a little extra credit. This is the [default hint bonus or penalty](#)^[6]. We recommend that this percentage be set to 3% if you use it at all, and that you give them a bonus rather than exacting a penalty.

Often students think that charging a penalty for using hints is unfair, since hints are a tutorial. However, statistically speaking, it's worth while for them to bet the 3%; students who use hints do roughly 27% better on final answers than students who do not.

Students who can't complete all subparts of a problem should complete as many as they can, since each subpart helps the student learn what procedure to employ (and each gains the student partial credit).

See "[Grading of tutorial problems: problem parts, hints, and subparts](#)"^[32] for more on grading.

11.6 How to prevent student cheating

Students cheat in MasteringPhysics just as they do in other physics courses. A recent study found that up to 40% of handwritten physics homework was copied. Other studies suggest that a similar level of cheating occurs with other online homework systems, in particular those that grade only final answers (making cheating very easy).

There are a plethora of online opportunities for students to get answers. Students also buy solutions manuals online.

So cheating is already a major problem.

MasteringPhysics can't prevent that. But it does discourage it by providing partial credit, simpler subproblems, and wrong-answer feedback. MasteringPhysics's Gradebook allows instructors to [view every answer a student gives](#)^[46], [see the timing of every answer](#)^[46], and [look at how groups of students answer questions](#)^[43]. MasteringPhysics makes it much easier to catch a cheating student and thus helps to prevent cheating.

Most encouragingly, MasteringPhysics prevents cheating by rewarding work. Many schools have already reported significantly higher FCI gains and class-final scores as a result of using MasteringPhysics. Students are working more problems and learning more, and this is borne out in their finals.

Here are some of the methods that students use to cheat, how to catch them, and how to prevent cheating:

Sacrificial lambs

In a cheating method common to all online homework systems, a number of students get together and sacrifice one of their number per problem part, or per problem, in order to get the correct answer. That student guesses at the answer, taking the penalty for incorrect answers or requesting the answer. The other students then copy that answer.

Prevention and cure:

- If this occurs in a class, a group of students will all be getting fairly good scores in most of their symbolic problems, but each of them will get a dismal score in one problem or one assignment. On problems and assignments in which they do well, students may appear to be spending only seconds or minutes on getting the correct answer.
- If you suspect that several students are cheating together, simply make a special [group](#)^[27] for them, look at their work together, and see whether suspicious patterns emerge.
- Grades on numeric problems for these students will be, in general, considerably lower.
- [Randomizing numeric problems](#)^[24] will catch many of these students. Randomizing is encouraged.

The phantom student: One student, two accounts

A variant on the sacrificial lamb is the phantom student, who appears in the class roster but gets a bright red Gradebook row of very low grades or zeros. This "student" usually requests the solution to problems. Other students then copy the solution.

Student (10 total)	Assignments													Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Student, A.	68	22	14	10	4	3	17	28	73	44	0	0	0	21
Student, B.	88	11	0	0	5	3	0	17	2	0	0	0	0	6

Students whose gradebook line is in red may have dropped the course, or may be phantom students.

Single students, or a group of students, may buy a phantom student, or may take over or "rent" a student account from a student who has dropped the course.

Prevention and cure:

- Check your gradebook regularly against your class, and [suspend](#)^[28] students who do not appear to be in the class.

Students who allow themselves to be used as "phantoms" are stuck with the grades they get.

Instructor accounts

Students try to get instructor accounts so that they can look up the solutions to problems. Typically, they will attempt to buy them on eBay or other online auction sites.

Prevention and cure:

- In general, we have found that these "instructor accounts" are out-of-date or invalid. However, it is illegal to buy or sell instructor manuals or accounts, which remain the property of Addison-Wesley. Addison-Wesley trolls online sites for these sales and promptly takes action, which may include locking out the account and contacting the instructor whose account it originally was.
- If the online seller is offering illegal instructor accounts, Addison-Wesley also contacts the online auction site.
- Addison-Wesley tracks every new instructor registering in MasteringPhysics. If the account looks suspect, it may be locked out until the instructor can be contacted for further clarification.
- Students have the option of returning the (invalid) product to the original online vendor. However, the online vendor often fails to reimburse them and the student's money is lost. Addison-Wesley cannot reimburse the student for something that was sold to them illegally and not by Addison-Wesley.
- Of course, students can buy secondhand texts, which saves them money. However, the only way to get reliable student access codes is from [<URL>](#). As far as we can tell, it is also the cheapest way.

We're always interested in new and ingenious ways students cheat. If you think you've found one, please [let us know](#).

12 MasteringPhysics Technical Support

For technical support related to registration or log-in, please visit <http://www.aw-bc.com/techsupport> and complete the appropriate online form.

Addison-Wesley/Pearson technical support is available Monday-Friday, 9am to 6pm, Eastern Time (US and Canada) by calling 800-677-6337.

For all other questions regarding MasteringPhysics, please contact us via the Customer Service email link at http://www.masteringhelp.com/mp/mp_index.html. This page also contains announcements and frequently asked questions that may solve your problem right away.

MasteringPhysics technical support is also available Monday-Friday, 9am to 5pm Eastern Time (US and Canada) by calling 888-547-4415. (We prefer contacting us via the [quick form](#) at http://www.masteringhelp.com/mp/mp_index.html--it is usually faster and more reliable.)

12.1 How to write a good bug report

When you think you see an issue with a problem, please send a report about it via our [quick Customer Service form](#).

(Don't send a [comment](#)¹⁰⁵; they won't be seen immediately.)

The more specific information we have, the more quickly we can solve your issue. For a full bug report, it's good to have as much as possible of the following.

The bolded information is the most vital. We need all that information. However, we've often seen problems explained by the computer configuration or the detailed report.

- **Assignment name/number and problem name/number**
- **Name of person(s) affected**
- **Course ID and textbook (textbook name is critical when reporting EOC problems)**
- **Description of problem: What's wrong?**

Computer information:

- **Operating system and version**
- **Browser name and version**
- Amount of RAM
- Amount of free disk space
- Type of connection (dialup, DSL, etc)
- Any recent changes to computer? (Added programs, installed WinXP SP2, etc)
- Any other server/software issues at same time?
- Is this computer on a network such as a computer lab, library, etc.? Do other MasteringPhysics users see the same problem?
- Do you see the same problem on a computer that is not on the same network?

Detailed incident report:

- **What happened**
- Date and time of what happened
- What you were doing before the issue occurred
- What you were trying to do
- What you expected to happen
- Anything you did to recover (refreshed/reloaded page, etc)
- Was it successful?
- Is the issue currently occurring?

(Adapted from the Mozilla bug reporting guidelines.)

12.2 Writing survey comments vs reporting an issue

After each problem, students are invited to write survey comments about the problem.

These are not issue reports. **MasteringPhysics Technical Support does not see these comments in real time.** We use them at the end of the semester, when all the survey comments are automatically forwarded. They help us in evaluating and rewriting problems for our next release.

If the person sending the survey comment checks "Would you like this comment to be emailed to your class administrator?"

- If the professor's email address is in the [Contact Email](#)⁸ field of the class information, survey

comments are forwarded to the professor.

- If there is an address other than the professor's address, survey comments are forwarded to that address.
- If there is no email address in the Contact Email field, comments are not forwarded.

To send issue reports, time-sensitive suggestions, and questions to MasteringPhysics Technical Support, please fill in our [quick Customer Service form](#).

If you are receiving survey comments and find a time-sensitive one, please [email it to us](#)..

The image shows a "Problem Survey" form with the following sections:

- Problem Survey** (Section Header)
- How much did you learn (or usefully review) from this problem?
Very little ○ ○ ○ ○ ○ Very much
- How difficult was this problem?
Very easy ○ ○ ○ ○ ○ Very hard
- Please tell us your impressions of this problem. Did you have any special frustrations? Was it helpful?
[Text input area]
- Would you like this comment to be e-mailed to your class administrator?
 Yes
- Submit Survey (Button)

13 Appendix A: Student Help

This version of Help is given to students.

If you find students are confused by anything in it, please [email comments to us](#)..

13.1 Introducing MasteringPhysics

MasteringPhysics is an online tutorial system, the first Socratic tutoring system developed specifically for students like you. It is the result of years of detailed studies of how students actually work problems, and where they get stuck and need help.

MasteringPhysics has proven educational benefits. Studies show students who used the tutorial system associated with MasteringPhysics significantly improved their scores on final exams and standardized tests, when compared with students in hand-graded courses.

MasteringPhysics provides you with individual, instantaneous feedback, specific to your wrong answers, at each step of solving a problem. When you get stuck, you have access to simpler sub-problems and hints.

Your professor has chosen MasteringPhysics because of this individualized, effective, 24/7 tutorial, and also because students themselves like the course and recommend it to other students. In the first couple of weeks of the course, when you've just begun to learn not only the course material but MasteringPhysics as well, you may wonder why. To begin enjoying MasteringPhysics as fast as possible, read "[Five Ways to Improve Your Grade with MasteringPhysics](#)".

This student information includes:

- [Registering, Enrolling, Logging In, and Logging Out](#)
- [Dropping and Adding Courses](#)
- [Using MasteringPhysics](#)
- [Entering Math](#)
- [Five Ways to Improve Your Grade with MasteringPhysics](#)
- [Technical Support](#)

13.2 Registering in MasteringPhysics

Apart from anything you should do with your standard course registration procedure, you will need to do several things to get started in MasteringPhysics:

- [Get a valid email address and student access code](#).
- [Find out your student ID and course ID](#) from your instructor.
- [Register for the course](#). You will need the ZIP code or postal code of your educational institution. You will also need to pick out a login name and password.
- [Enroll in the course](#).

13.2.1 What you will need before you register

To register you will need:

- [A valid email address](#).
- [Your course ID](#).
- [Your student ID](#).
- [A Student Access Code](#).

A valid email address

If you do not have a valid email address yet, contact your school's technology center or set up a free account on a site that offers this service, such as Yahoo or Hotmail.

When you register, **make sure you enter your email address correctly**. If you forget your password, this is the email address that your password information will be sent to.

Course ID

Your professor will give you this. It enrolls you in a specific MasteringPhysics class. **You cannot edit this field after you record it**, so please pay very careful attention to the code your instructor gives you.

Student ID

Ask your instructor how you should record your student ID. Your instructor will use this information to track you in the course gradebook. If you are in any doubt, double-check with your instructor.

Student Access Code

This is a six-"word" printed code supplied beneath the pull-tab inside your MasteringPhysics Student Access Kit. It is valid for registering one student.

Once you are registered, your code is valid for two years. You won't need to buy another student access code.

If the tab in this kit has been pulled back, the code may no longer be valid. If you buy a secondhand textbook, any code supplied with it is probably not valid. In either case, you can purchase a Student Access Code online using a credit card.

To purchase access online:

1. Go to www.masteringphysics.com.
2. Click on the title of your textbook.
3. Click on **Buy Now** and follow the instructions.

13.2.2 Registering

Registering for MasteringPhysics is simple and takes about 5 minutes.

Note: In September, over 200,000 students register on this site; **registration times may be longer.**

You may be able to register simply by following the online instructions available online at www.masteringphysics.com.

If you prefer written instructions, use this as your guide.

- Onscreen boxes marked with an asterisk (*) are required.
- For help in registering, click on the ? icon.
- If your online registration session is interrupted, you can go back and restart. Your student access code is valid until you have successfully registered.
- If you need to change anything during registration, use the Back button to return to the previous registration page. You will not lose any information you have entered.
- If you have bought a student access code for the same product within the past 2 years, your access code is still valid. You don't need to register. Simply [enroll](#) in your new course.

Student Access Code

1. Go to www.masteringphysics.com and click on the title corresponding to your textbook. If you do not see your textbook, click on **Standalone**.
2. Click on **Register**. (If you bought a used textbook, you can buy a student access code by clicking on **Buy Now**.)
3. Pull back the tab on the inside front cover of your Student Access Kit to reveal your student access code, or use the student access code you have bought online.
4. Type your student access code into the boxes, one "word" per box. Do not type dashes.
5. Select Returning User or New User.
You are a "returning user" if you have used a Pearson Education online site or course materials that accompanied a textbook published by Addison-Wesley, Allyn & Bacon, Benjamin Cummings, Longman, or Prentice-Hall.

Contact Information

1. Enter your contact information. If you are a returning user, these boxes are pre-filled. Check to make sure that the information is current, and edit it if it is not.

Your registration confirmation will be sent to the email address you enter. Communications from your instructor may also be sent to this email address. **Make sure your email address is valid** and use an email address you check regularly.

2. Enter your school's ZIP code (US) or postal code (international). You can find this on your school's Web site.
3. Click on **Next**.

Academic Institution

1. Select your school from the **Institution Name** list.
2. If your school's name does not appear, scroll to the bottom of the list and click on **Other**.
3. Type the name of your school in the **Institution Other** box and the city where the school is located in the **City** box.
4. Select the name of your state or province from **State/Prov**. If it doesn't appear on the list, click on **Other** at the end of the list and type the name of your province, state, or other area in the **Other** box.
5. Select the name of your country from **Country**. If it doesn't appear on the list, click on **Other** at the end of the list and type the name of your country in the **Other** box.
6. Click on **Next**.

Login Name and Password

1. Enter your desired login name. You can use any combination of letters and numbers plus the underscore (_) character. Don't use blank spaces. For example: jsmith_1986.
 2. Enter your password. You can use any combination of letters and numbers plus the underscore (_) character. Don't use blank spaces.
 3. Make a note of your login name and password.
 4. Select a question and enter the answer to verify your identity if you ever forget your login name or password and need to request them.
 5. Click on the **License Agreement** link to open and read the license agreement in a new window.
 6. Click on **I agree** in the original window to confirm that you agree with the terms and conditions of the license.
 7. Review your registration information. If everything is accurate, click on **Next** to process your registration. If not, edit your registration information.
- Note:** Be very careful to get the correct registration information.
8. If your login name or password is already in use, you will be asked to choose another one.

You will receive an email confirmation of your registration at the email address you have just given.

If necessary, you can [change your student ID](#)^[109] and [other information \(such as your login name\)](#)^[110] after you have registered and enrolled. However, it's harder to [change your course](#)^[112] once you have enrolled

13.2.2.1 Changing your student ID

Here is how to change your student ID:

1. Log in to MasteringPhysics as usual.
2. Once logged in, manually change the URL in the (same) browser location bar to:
`http://session.masteringphysics.com/myct/userProperties`
3. Update the Student ID field and click **Save**.
4. Click **Back To Home**.

13.2.2.2 Changing your email address, password, name and other information

To change your student ID:

1. Go to the login screen, but don't log in.
2. Under LOGIN NAME and PASSWORD, click on **View Your Account Summary**.

Now you will be asked to log in.

When you log in, you'll see a page called Account Summary.

3. Click on whatever information you would like to change. (You'll make each change on a separate page.)
4. Click on **Save** at the bottom of each page you update.

Note: Allow an hour or so for changes to propagate through the system, more at the beginning of semesters.

13.2.3 Enrolling in a course

To enroll in a course, you will need your instructor's course ID and your student ID. Your instructor will tell you the correct course ID and will tell you what student ID to enter.

Your instructor may wish you to follow specific instructions on how to enter your student ID. For instance, it may be the same as your college ID, the last four digits of your social security number, or something else.

Note: Make sure you have the correct course ID and student ID. You can [change your student ID](#) ^[109] and [other information](#) ^[110] later, but if you enter the wrong course code, you've [enrolled in the wrong course](#) ^[112].

First Time User?
Register here with your Access Code to establish your Login Name and Password.
Register
Want to buy access online? Click below to use your credit card.
Buy Now

Established User?
If you have already registered an account, log in here.
Login Name

Password

Log In
[Forgot your Login/Password?](#)
[View your account summary](#)
[Select a different product](#)

[Product Support](#) | [Purchase Subscription](#)

1. Enter your name in the **Login Name** field.
2. Enter your password in the **Password** field.
3. When you are prompted, enter your course ID and your student ID.

Congratulations! You have completed registration and have enrolled in a course.

13.2.4 Logging in

Logging in

To log in to your course:

First Time User?
Register here with your Access Code to establish your Login Name and Password.
Register
Want to buy access online? Click below to use your credit card.
Buy Now

Established User?
If you have already registered an account, log in here.
Login Name

Password

Log In
[Forgot your Login/Password?](#)
[View your account summary](#)
[Select a different product](#)

[Product Support](#) | [Purchase Subscription](#)

1. Enter your name in the **Login Name** field.
2. Enter your password in the **Password** field.

You will be automatically taken to your course homepage.

If you forget your login name or password, click on **Forgot your Login/Password?** You will be asked

to verify your identity and will then receive an email with your login name and password.

13.2.5 Logging out

To log out:

1. Click on **Log Out** in the upper right corner of your screen.

When you have finished your MasteringPhysics session, log out rather than just closing your browser window. This is particularly important in a computer lab or library setting.

13.2.6 Dropping and Adding MasteringPhysics Courses

Your subscription grants you access to one MasteringPhysics course at a time. However, as with any course, you can change sections and classes, drop the course, or enroll in a different course.

Apart from any paperwork you should do with your course registrar, here is what you should do to drop and add MasteringPhysics courses:

- [Changing a section](#)^[112]
- [Changing classes in the same course](#)^[112]
- [Dropping a course](#)^[112] (and optionally adding a new one)

You should also know

- [What happens at the end of a course](#)^[113]

13.2.6.1 Changing a section

If your professor has set up the various parts of your class as sections, you can change sections very easily.

Consult your professor for details. He or she simply changes your section; nothing else needs to be done.

13.2.6.2 Changing classes

To change your course in mid-semester, you must be disenrolled from your first MasteringPhysics course before you can enroll in another.

1. Ask the instructor of your first MasteringPhysics course to disenroll you from the course.
2. **Also ask the instructor to keep a record of your grades so far in the course.** Your grades do not transfer automatically; however, your new professor can manually add your grades to his/her gradebook.

Once your first instructor has disenrolled you, you can [enroll in a new course](#)^[110], just the way you enrolled in your first course, by entering your new instructor's course ID and following his/her instructions on entering your student ID.

13.2.6.3 Dropping a course

If you drop the course, please let your instructor know so that the program does not enter a series of failing grades for you.

Once you have dropped the course, you can add a new course in the same semester. The procedure is the same as for [changing classes in the same course](#)^[112].

Your registration is good for 24 months and can be used in a subsequent semester.

Note: If you are not dropping the course but for some reason cannot complete your assignments for some period of time, please let your instructor know so that you will not be [suspended](#)^[113].

13.2.6.3.1 Suspension

Students who may have dropped the course are suspended; that is, their accounts are temporarily locked.

If you have not submitted work recently, your account may be suspended until the instructor determines whether you have dropped the course.

You will be able to submit work again once you are re-enrolled, and your previous grades will not be affected.

However, if assignments are due during the period you are suspended, you are not automatically given an extension on those assignments.

Contact your instructor to have a suspension removed.

13.2.6.4 What happens at the end of a course

At the end of your first MasteringPhysics course, you will be automatically disenrolled.

You can then [enroll](#)^[110] in another MasteringPhysics course. Your subscription to MasteringPhysics is good for 24 months, long enough for several courses.

Note: Once you are disenrolled from a course (for example, on the end date of the course), you can no longer submit work to the course. Keep track of the end date of your course and submit all your MasteringPhysics work before that date.

Students who have been [suspended](#)^[113] may not automatically become free to enroll elsewhere.

If you have been enrolled in a previous course and can't enroll the next semester, your previous professor probably did not set the end date of the class correctly, so you are still "enrolled" in the previous course. Contact your course professor, or, if that is not possible, [contact customer support](#).

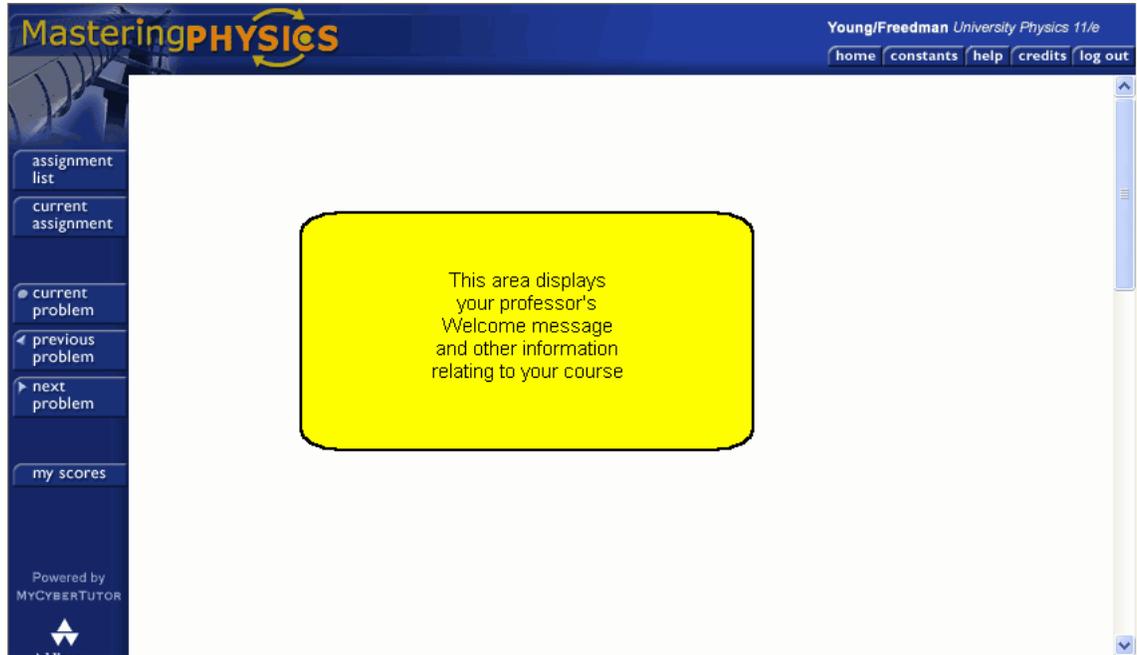
13.3 Using MasteringPhysics

This introduction to using MasteringPhysics covers:

- [The Welcome screen and navigation tabs](#)^[114]
- [Working problems](#)^[115]
 - [Looking up constants](#)^[114]
 - [Entering math](#)^[117]
 - [Submitting problems](#)^[116]
 - [Submitting assignments](#)^[116]
 - [Reviewing your answers](#)^[116]
 - [Reviewing your grades](#)^[117]

13.3.1 Welcome screen and navigation tabs

When you log in to the course, you will see the Welcome screen. Depending on the welcome message your professor has set up, the contents of the screen may differ.



On the top you will see five tabs:

Tab	Action
Home	Takes you to the Welcome screen.
Constants	Displays a list of physical constants.
Help	Opens this Help file.
Credits	Shows developers' credits for MasteringPhysics.
Log Out	Logs you out of MasteringPhysics. We strongly recommend logging out at the end of a session.

On the left you will see six tabs:

Tab	Action
Assignment list	Displays a list of assignments for your class.
Current assignment	Returns you to the last assignment you selected, if you've moved to other pages.
Current problem	Returns you to the last problem you selected, if you've moved to other pages.
Previous problem	Takes you to the previous problem on the current assignment.

Next problem	Takes you to the next problem on the current assignment.
My scores	Takes you to a display of your scores for each assignment. Note: Check this regularly. If your scores aren't being posted, please report it to Customer Service .

13.3.2 Working problems

To start an assignment

1. Click on **Assignment List**.
2. Click on the current assignment.
3. Click on the name or number of a problem to start work on it.

You can print the problem and work on it offline, or keep the problem open as you work. Some problem parts are not visible until you have completed previous problem parts. When you print the problem, those parts will not print until you have completed the previous parts.

When you are ready to submit an answer:

1. Enter it in the answer field.
2. Click on **Submit**. You will either see **Correct**, in green, or get some feedback about your answer.

The screenshot shows a user interface for entering an answer. It features a text input field with the label "area =". To the right of the input field is a small square icon with a question mark. Below the input field are four buttons: "submit", "my answers", "show answer", and "display math".

Besides **Submit**, you will see the following tabs:

Tab	Action
Hints (not present in all problems)	Displays hints ^[126] and subparts if they are available for this question. (For the answer above, hints are not available and the Hints tab is not displayed.)
My answers	Shows your previous answers. Grayed out until you have submitted at least one answer.
Show answer	Requests the solution to the problem. Use only as a last resort; if you request the solution, you will get no credit for the problem or part. Your instructor has the ability to disable this feature.
Display math	Renders the math you have entered. Useful for checking if you have actually entered what you thought you did.

Notes:

Try your answers to each part as you work them out, so that you can take advantage of the MasteringPhysics [Socratic method](#)^[127] and of [hints](#)^[126].

Read "[How Grading Works](#)"^[122] to ensure that you know when you can guess and when not to.

You can find out about [entering math](#)^[117] here.

13.3.3 Submitting problems

Once you have got all parts of a problem correct, it is automatically submitted for credit.

If you get some parts of a problem correct and request the solution to the others, it is automatically submitted for (partial) credit.

If you are up against the deadline and you have not finished the problem, you have two choices:

- Submit it manually by clicking on **Submit Problem** at the bottom of the problem. **Note: Once you have submitted a problem, you can do no further work on it.**
- Do not submit it, continue to work on it, and submit it late. Your professor may charge a late penalty, which you can find out about by [viewing the grading choices](#)^[126] at the top of the assignment screen.

Which option you choose will depend on how large a late penalty your professor charges. Statistically, you almost always get more credit if you submit a problem late than submit it incomplete.

13.3.4 Submitting assignments

Once you have answered all problems in an assignment correctly, it is automatically submitted for credit.

If you are up against the deadline and have not finished the assignment, you have two choices:

- Submit it manually by clicking on **Submit Assignment** at the bottom of the assignment. **Note: Once you have submitted an assignment, you can do no further work on it.** You will get credit for the problems and problem parts you have answered correctly.
- Do not submit it, continue to work on it, and submit it late. Your professor may charge a late penalty, which you can find out about by [viewing the grading choices](#)^[126] at the top of the assignment.

It almost always gains you more to submit an assignment late than submit it incomplete.

Extensions

In exceptional circumstances, your professor is able to modify the due date for your assignment. Contact him or her for more information.

13.3.5 Reviewing your work

Once you have submitted a problem, you can review the work you did on it.

1. Click on the tab **My Scores** at the left of the screen or on the assignment list.
2. Then click on the name or number of the problem. You will see all your answers.

Reviewing your work at the end of the semester is a very good way to prepare for final tests.

13.3.6 Reviewing your grades

Click on the tab **My Scores** at the left of the screen to see your grades for each assignment.

From this screen you can also review your work by clicking on an assignment and drilling down to a problem name or number.

Final grades are calculated only after the assignment is due. Before then, your scores may not reflect the work you have done, but your answers will.

Note: MasteringPhysics uses weighted averages for your scores (that is, a problem or assignment that is worth a greater number of points counts for more in your average). Your professor may modify your scores in calculating your final grade, for instance by dropping low grades or using an unweighted average. For that reason, the average the program calculates may not be the same as an unweighted average.

Note: Because MasteringPhysics is an Internet-based product, problems with Internet connections may occasionally interfere with the posting of scores. This occurs very rarely. However, to be safe, **please check your scores regularly**, and do not discard your rough calculations until the end of the course.

13.4 Entering Math

Entering complex symbolic functions can be difficult from a computer keyboard. Because MasteringPhysics works over a number of operating systems and browser environments, it supports a very general-purpose math entry system, and provides extensive help in formatting and displaying math.

You should note the following about mathematical functions in MasteringPhysics:

- Numbers: answer tolerance, significant figures, answers required as string matches
- Standard operators
- Order of operators
- Scientific notation
- Special functions
- Entering variables
 - Rollover help in entering variables
- Help in formatting math: Display Math
- Built-in calculator feature for numeric answers

13.4.1 Numbers

Some questions in MasteringPhysics require simple numerical answers like 37 or 1.56.

- By default, a numerical answer to a question must be within 2% of the official MasteringPhysics answer in order to be graded correct. If you have computed the answer correctly, you can ensure that you are within 2% by entering it **using at least three significant figures**. If higher precision is required, or lower precision is allowed, it will be noted in the problem text.
- If your answer is within 2%, but does not exactly match the correct answer, it will be recorded as correct but the official correct answer will be displayed so that you can use it, if needed, in later parts of the problem.

Note: Your answer may be graded incorrect if you have performed the correct calculation but rounded your answer to too few significant digits. Use at least three significant figures in your answers unless otherwise specified or unless the exact answer can be expressed using fewer than

three significant figures.

Here are some other guidelines for numeric answers:

- If the program asks for several answers in a particular order, such as numeric order, your answers must appear in that order. MasteringPhysics uses string matching in grading this sort of answers and will grade them wrong if they are not in the proper order.
- MasteringPhysics may expect the answer in different units from the question. For example, a question may be asked in m/s and the answer asked for in cm/s.
- Do not include currency symbols or units with a numerical answer unless explicitly instructed to do so. Enter 5000 instead of \$5000, 10 instead of 10 feet
- Do not use commas for large numbers. Enter 125000 instead of 125,000. Commas are reserved for answers involving two or more numbers, such as the coordinates of a point in a plane. You'll be told when you need them.
- Do not use "E-notation" for large numbers. See the section on [scientific notation](#)¹¹⁹.

13.4.2 Operators

MasteringPhysics allows you to use standard mathematical operators as part of your answer. The answer box is effectively a simple calculator with a syntax much like a normal scientific calculator or spreadsheet program. There are five operators available:

	Operator	Example
Addition	+	5+13
Subtraction	-	1.23-0.45
Multiplication	*	9.80*82
Division	/	22/7
Exponentiation	^	3^2

13.4.3 Order of operations

Occasionally you may find yourself entering mathematical expressions that include multiple operations such as $60/3*2^2/2$. In such cases, MasteringPhysics follows calculator-standard rules for the order in which mathematical operators are evaluated:

- Exponentiation has the highest priority.
- Multiplication and division have next priority.
- Addition and subtraction have lowest priority.
- Within each priority class, evaluation proceeds left to right, except exponentiation.

For the example above, these rules give:

$$\begin{aligned}
 60/3*2^2/2 &= \\
 60/3*4/2 &= \\
 20*4/2 &= \\
 80/2 &= \\
 40. &
 \end{aligned}$$

It is a good habit to use parentheses to control the order of operations. If you do not use parentheses, you could find that your answer is evaluated in a way that you do not expect. For instance, what you might really have meant in the example above is

$$\begin{aligned}
 (60/(3*2^2))/2 &= \\
 (60/12)/2 &= \\
 5/2 &= \\
 2.5. &
 \end{aligned}$$

13.4.4 Scientific notation

To enter numbers in scientific notation, use the multiplication and exponential operators. For example, to enter the number 15 billion =15000000000=1.5×10⁹, you would type: 1.5*10^9.

Note: In some computer programming languages and software, a shorthand scientific notation for a number such as 1.5*10⁹ would be 1.5E9. **Do not use this notation in MasteringPhysics.** MasteringPhysics will interpret the E as a variable.

13.4.5 Special functions

Mathematical answers can include special functions. The argument of the function can be a number, variable, or more complicated math expression as needed to answer the question. For easy reference, the supported functions are listed below.

Notes:

- All arguments and results of trigonometric and inverse trigonometric special functions are in radians.
 - The functions are case sensitive. When you enter them, be sure to use lowercase.
 - Do not use the ^ operator to enter inverse trigonometric functions. Expressions like sin⁻¹(x) are invalid and will not be recognized by MasteringPhysics
-
- abs(x) - absolute value
 - exp(x) or e^(x) - exponential
 - log(x) - common logarithm (base 10)
 - ln(x) - natural logarithm (base e)
 - sqrt(x) - square root
 - sin(x) - trigonometric sine
 - cos(x) - trigonometric cosine
 - tan(x) - trigonometric tangent
 - csc(x) - trigonometric cosecant
 - sec(x) - trigonometric secant
 - cot(x) - trigonometric cotangent
 - asin(x) or arcsin(x) - trigonometric arcsine
 - acos(x) or arccos(x) - trigonometric arccosine
 - atan(x) or arctan(x) - trigonometric arctangent

13.4.6 Variables

Variables needed in symbolic answers are always given in the problem text.

However, it is not always obvious at first glance how to type them in your answers. [Rolling your mouse over a variable](#) ⁽¹²⁰⁾ will show you how.

Here is how to enter some common types of variables:

Variable	How to type it
a, b, c, x, y, z	a, b, c, x, y, z
v_0, f_k	v_0, f_k
$f(t)$	f(t)
$\vec{E}, \vec{E}(r)$	E_vec, E_vec(r)
\hat{x}	x_unit

$\alpha, \beta, \gamma, \delta,$ $\mu, \tau, \omega, \theta, \pi$	alpha, beta, gamma, delta, mu, tau, omega, theta, pi
Δ, Ω	Delta, Omega
$\delta T, \Delta T$	deltaT, DeltaT

Examples:

If the answer is...	Type...
$ax^2 + bx + c$	$a*x^2+b*x+c$
$\phi - \frac{2\pi}{T}$	$\text{phi}-2*\text{pi}/T$
$\frac{1}{2} \sin(2a)$	$(1/2)*\sin(2*a)$
$\frac{\sqrt{xy}}{x+y}$	$\text{sqrt}(x*y)/(x+y)$
$\sqrt{v_f^2 - v_i^2}$	$\text{sqrt}(v_f^2-v_i^2)$
$\mathcal{E} \cos(\omega t) \hat{x}$	$\text{EMF}*\cos(\text{omega}*t)*x_unit$
$\frac{\vec{E}(t + \Delta t) - \vec{E}(t)}{\Delta t}$	$(E_vec(t+\text{Deltat})-E_vec(t))/\text{Deltat}$

13.4.7 Rollover help in displaying variables

If you are ever unsure how to type a particular variable, position your mouse over the variable anywhere it appears on its own in the problem (i.e. not as part of a larger mathematical expression).

A box appears indicating how you would type the variable in your answer.

For instance, positioning your mouse over \vec{E} in the problem displays **E_vec** in a small box.

13.4.8 Help in formatting math: Display Math

Using parentheses, multiple operators, a variety of variables and special functions can be confusing at first. MasteringPhysics, therefore, provides a Display Math button that will interpret your input and display it in formatted math using Greek symbols, sub- and superscripts, and fraction notation as it would appear in your textbook.

The Display Math feature allows you to review the notation and determine if you have entered your answer as desired.

13.4.9 Built-in calculator feature

MasteringPhysics automatically calculates the numeric value of expressions, if appropriate.

MasteringPhysics does require that if you are using the calculator feature, that the argument of any trig function must be in radians, not degrees. That is, if the assignment is to find the x-component of a vector of length 10 at 30 degrees above the horizontal, MasteringPhysics will accept "10*cos(pi/3)", but not "10*cos(30)".

Note that you are always free not to use the built-in calculator feature and simply enter the correct

numerical value directly.

Make sure that you are calculating to the proper number of [significant figures](#)^[117].

13.5 Five Ways to Improve Your Grade with MasteringPhysics

Statistically, 80% of students don't like MasteringPhysics in the first week of the course. That's because the program makes you work in a different way. Instead of waiting for your assignment grades, you get immediate feedback--which means you may be working harder on the assignment initially, as hard as if you were working with a tutor.

It also means you learn more and do better in your course. In actual classes, students who use the tutoring engine associated with MasteringPhysics have gotten final grade increases of 5-7 points (a full grade!). Lab studies have shown increases in comprehension and grade averages of between 27% and 40%.

Over 90% of our students not only like MasteringPhysics by the end of the course, but would recommend it to other professors and students.

We're very proud of that.

But we do want you to start liking your experience as soon as possible.

Here are the easiest ways not only to like MasteringPhysics, but to maximize your grade in MasteringPhysics and in your course as a whole:

- Find out [why MasteringPhysics works](#)^[121]
- Learn how [grading](#)^[122] works
- Do what the program says, because [it's just a program](#)^[128]
- MasteringPhysics is [Web-based](#)^[130], so get your assignment in early
- Here are some ways [you can avoid being cheated](#)^[130]

And a bonus:

- You too can use Technical Support! Read all about it [here](#)^[137].

13.5.1 Why MasteringPhysics Works

Students learn in a wide variety of ways. Individual tutoring is not usually available, and is prohibitively expensive. But, using modern computer-aided analysis, it's possible to provide useful feedback for individual wrong answers. This is what MasteringPhysics does.

The method it uses is called the Socratic method.

- You are presented with a problem.
- You give an answer. Either you're right, or
- You get a question or comment back. So you think a bit, then
- You try again, and get another answer, until
- You reach the correct answer.

In general, it takes a bit more time to do homework like that, because you're interacting more with the homework. You're not just giving one answer, hoping it's right, and waiting to find out until the homework is handed back. You're giving multiple answers, and getting feedback immediately.

That feedback gives you a better sense of what the problem is really about and how you should be

thinking about it as you solve it.

You really do learn more.

You get correct answers a larger percentage of the time, and you learn how to think about classes of problems.

The problems you see in MasteringPhysics are not always exactly like the problems in your textbook. Your answers will not always be in the same form as they would be in paper-based homework; MasteringPhysics is a computer program, so it requires you to input things in a form it can understand. (See [It's a Program](#)^[128].) So you have to give it something to get something.

But it actually does give you back as much as you put in.

By the end of the course, over 90% of students who have used MasteringPhysics want to use it again.

We look forward to giving you that experience too.

13.5.2 How Grading Works

MasteringPhysics's grading scheme is complex because it can be; the program calculates all grades and doesn't mind the work. It is also designed to give you the maximum possible credit for the work you put in.

Here is everything you always wanted to know about grading:

- [Types of problems, and what credit you get for them](#)^[122]
- [How MasteringPhysics grades your problems](#)^[123]
- How to find out what [grading choices](#)^[126] your professor has made (due dates of assignments, too)
- [Why not to guess on multiple-choice answers](#)^[126]
- [Should I take hints?](#)^[126]

13.5.2.1 Types of Problems

There are three basic types of problems in MasteringPhysics:

Skill Builders (SB)

Improve conceptual understanding or develop a key skill. They are detailed worked examples that provide multiple forms of help including:

- Optional textual **hints**
- **Subparts**, simpler sub-problems that help you toward a procedural understanding of the problem.
- Specific **feedback** for wrong answers submitted

The hints and feedback have been developed from detailed studies of how other students have gone about solving these problems and their most common difficulties at each step.

Self-Tutoring Problems (STP) "Standard" multi-part, multi-step homework problems that provide individualized feedback and help similar to that in Skill Builders.

Self-Tutoring Problems are designed to help you bridge the gap from following worked examples to tackling real end-of-chapter problems.

End-of-Chapter (EOC) Problems

Additional problems adapted from problems in specific textbooks.

Some of these problems can be assigned in two ways:

- With randomly generated numbers and variables
- Algebraically, with symbolic math answers.

For maximum grades:

- Don't guess on multiple-choice questions unless you have to, because you'll always lose points if you're wrong.
- Guess (in an educated way) on skill-builders and self-test problems; statistically, you'll do better even if your professor charges for wrong answers.
- Always take hints and do subparts until you know the final answer. Statistically, students who take hints and do subparts do significantly better, even if hints are charged for.
- If you don't know the answer to one part of a self-tutoring problem, do the rest of the parts; you get credit for any part you do right.

13.5.2.2 How Grades are Calculated

In grading terms, there are two kinds of problems in MasteringPhysics:

- End-of-chapter problems, which simply ask a question and ask for a response.
- Tutorial problems, which include Skill Builders and Self-Tutoring Problems.

You have two paths through tutorial problems.

1. If you understand the problem immediately, you can simply answer each problem part.
2. If you don't, the problem itself provides tutoring on how to solve it.

Essentially, SB and STP problems allow you to choose between answering the question immediately and getting tutored on the answer.

This is not an either-or decision. If you try to answer the question and don't get it right, you can open hints and subparts and be tutored on how to approach the problem.

The tutoring that SB and STP problems provide includes:

- Optional textual **hints**
- **Subparts**, simpler sub-problems that help you toward a procedural understanding of the problem.
- Specific **feedback** for wrong answers submitted

Grading reflects these differences in kind. EOC problems are graded as you'd expect. But tutorial problems are graded to give you the maximum credit for getting any part of the answer right.

The general rules for grading are:

1. Each main part of a tutorial problem is worth 1. If you answer the main part correctly, you immediately get full credit, 1.
2. When a problem part has subparts, the possible points you can get are divided equally between all subparts and the main part. That is, the answer to any subpart counts for $1/n$; the answer to the final part also counts for $1/n$. There's no extra weight given to the answer to the main part.
3. You must provide an answer to each main part of the problem. This is not optional.

4. You can choose not to open a subpart, or open it but not answer it. You can also stop submitting answers after submitting one or more answers.
5. When you get the main part right, you get credit for all subparts unless you've maxed out on the number of allowed wrong answers for a subpart, or requested the answer to it.
6. When you can't answer the main part correctly, you still get credit for all subparts you have answered correctly.

You do not lose any credit for wrong answers other than whatever wrong answer penalties your professor charges and the penalty for wrong multiple-choice answers. You do not lose all credit unless you use up all of your answer attempts or max out on wrong answers to multiple-choice questions.

Hints don't count toward a student's grade unless the professor gives a bonus for not using them (or, rarely, a penalty for using them). Feedback is free.

Here are some simple cases, where the professor is not charging for hints or wrong answers.

For example, suppose a problem part has

- 1 textual hint
- 3 subparts, each with 1 question to answer
- 1 final answer

Case 1:

Student answers all subparts correctly and also gets the final answer. Each subpart counts for 1/4 of the possible grade. Student has answered 3 subparts and the final answer correctly, for a total of 4 out of 4. Student gets 4/4, or full credit.

Case 2:

Student opens subpart 1, answers it, understands how to work the problem, doesn't bother with the other 2 subparts, goes right on and answers final question right. The student has correctly answered 1 subpart and the final answer, and gets credit for having answered the other 2 subparts correctly, for 4/4, or full credit.

Case 3:

Student opens subpart 1, answers it correctly, goes directly on to final answer but gets that wrong (without exceeding the number of allowed answers). Student then goes back, opens other subparts, and works them before succeeding in answering the main part. Student eventually gets 4 out of 4 answers correct, for full credit.

Case 4:

Student answers all subparts correctly but never gets the final answer. Student gets 3 out of 4 answers correct, for 3/4 credit. (This is a rare case; most students who answer all the subparts correctly will get the final answer as well.)

Case 5: Deferred credit

Student does not answer main part correctly, works 1 subpart correctly, but does not work the other subparts. When assignment is due, student is credited with only 1 out of 4 answers correct, for 1/4 credit.

- However, if professor gives partial credit for late work, student can go back anytime until the end of the course and work the other subparts for additional credit, even if student has exceeded allowed answers on main part.

Case 6: The only case in which student is guaranteed to lose credit:

Student requests solution for a main part or a subpart.

- If student requests solution to a subpart, the student gets no credit for the subpart even if the main part is correct.
- If student gets subparts right but requests solution to the main part, s/he gets credit for those subparts but not for the main part.

It is not allowed to request the solution to the main part before opening all hints and subparts.

Professors may choose to modify this grading scheme in several ways. They can:

- [Charge for opening hints and subparts or give credit for not opening them](#)^[125]. This charge or credit is assessed per hint/subpart.
- Charge for wrong answers
- Limit the number of allowed answers. Mistakes in formatting are not counted as wrong answers
- Give only partial credit, or no credit, for late assignments

[Can answering a subpart wrong affect my grade if my professor doesn't charge for opening hints or subparts?](#)^[125] Yes, it can.

Multiple choice questions are specially graded:

- **If the question is multiple choice, you lose $1/(n-1)$ points, when n is the number of options to choose from, for each unique wrong answer you submit.**
- **This "guessing penalty" is true even if professors do not otherwise charge for wrong answers.**

Professors can't modify this.

After you've finished the entire problem, your total points are divided by the maximum points for the problem equal to:

$$\text{Max_points} = \text{number of main parts}$$

This ratio is your score for the problem, and can be greater than 1 if you got mostly correct answers without using any hints and the hint bonus is on.

This score appears as a percentage next to any problem that you have completed.

When your final grade average is computed, MasteringPhysics weights the average. That is, if assignment A is worth 10 points and assignment B is worth 20, assignment B's grade is worth twice assignment A's grade in your final average.

13.5.2.2.1 Wrong answers on hints

Students often believe that "no penalty for opening hints" or subparts is the same as "no penalty for answering subparts incorrectly."

If your professor does not charge for opening hints or subparts, but does charge for wrong answers, you will be charged for a wrong answer to a subpart, just as you would be for a main part.

This is not a penalty for using hints. It is simply a standard penalty for a wrong answer.

Any other choices your professor makes (for instance, about number of allowed answers) also apply to subparts.

Subparts are different from main parts in only two ways:

- Students do not have to open a subpart (and may receive a bonus for not opening it).
- If students open a subpart, they do not have to answer it.

13.5.2.3 Grading of Multiple-Choice Questions

Just to say this again:

Multiple choice questions are graded differently from other questions:

- If the question is multiple choice, you lose $1/(n-1)$ points, when n is the number of options to choose from, for each unique wrong answer you submit.
- This "guessing penalty" is true even if professors do not otherwise charge for wrong answers.

The "guessing penalty" is charged to avoid the likelihood of simply guessing your way to a right answer.

13.5.2.4 Extra Credit Problems

Your professor may assign optional extra credit problems.

You can't lose points on these problems, but you can gain extra credit. They're always worth doing.

13.5.2.5 Viewing Your Professor's Grade Choices

Your professor's grading choices for each assignment are visible on the Current Assignment page:

Introduction to Physics 2005

Chapter 5

Assignment is due at 12pm on Wednesday, May 25, 2005

Credit for problems submitted late will decrease to 0% after the deadline has passed.

There is no penalty for wrong answers to free response questions. Multiple choice questions are penalized as described in the online help.

The unopened hint bonus is 3% per part.

You are allowed unlimited attempts per answer. 

This means:

- Assignment is due at 12 PM May 25. (Note: "12 PM" is noon, because "12:01 PM" is one minute after noon.)
- After the deadline has passed, you get no credit for the assignment.
- There is no penalty for wrong answers.
- Unopened hints are worth 3% extra credit.
- You are allowed unlimited wrong answers.

All these values can be configured by your professor, and may change from assignment to assignment.

13.5.2.5.1 Should I take hints and do subparts?

Yes, when you need to.

Hints and subparts are the famous "tutorial" part of MasteringPhysics. If you can't get the answer to the question immediately, hints and subparts are designed to lead you toward the right answer through a series of simpler steps.

Your professor may choose to charge for opening hints and subparts, or give a bonus for not opening them. (See "[How Grades are Calculated](#)"^[123].)

You can tell whether your professor is charging the hint penalty by [viewing grade choices](#)^[126]. The

charge is by hint or subpart. If the hint penalty is on, you'll be charged that percentage of your score for requesting hints. If the bonus is on, you'll receive extra credit for any hint or subpart you don't open.

In other words, if you open a hint or subpart, you bet a small percentage of your possible score that you will get enough information from the hint to answer the rest of the question correctly.

Tip: Statistically speaking, it's worth while to bet; students who use hints and do subparts do roughly 27% better on final answers than students who do not.

If you can't figure out how to get the final answer, take all hints and complete as many subparts as you can. Each subpart gains you partial credit even if you don't get the whole answer correct.

13.5.2.5.2 Can I get points taken off for wrong answers on hints?

Yes, even if your professor does not charge for opening hints or subparts.

Students often believe that "no penalty for opening hints" or subparts is the same as "no penalty for answering subparts incorrectly."

If your professor does not charge for opening hints or subparts, but does charge for wrong answers, you will be charged for a wrong answer to a subpart, just as you would be for a main part.

This is not a penalty for using hints. It is simply a standard penalty for a wrong answer.

13.5.2.5.3 What if my grades don't add up?

Your apparent grade before the assignment is due may not reflect your actual grade on the assignment.

This is because **actual class statistics are calculated only after the assignment is due.**

Until the assignment due date passes, partially completed assignments

- May not be reflected in your grade
- Are not counted in the class average.

If your professor uses essay questions, the assignments containing them will be marked as provisionally scored until the essay grade is entered.

If you can't see your answers, though, there may be cause for concern. (Something may have caused your answers to be dropped between your computer and our servers.)

1. Check to see if you have a popup blocker running. The Hints and My Answers window are popup windows and will not display with some popup blockers.
2. Check "[Security Issues and Solutions](#)"^[135]. If Javascript isn't enabled, your answers may not be posted correctly.
3. If neither of those work, [contact Technical Support](#)

13.5.2.6 Late Assignments

This is how the late penalty works:

If your professor sets the partial credit on an assignment to "Decrease to 50% over the course of 12 hours past due date", then:

- A problem submitted at any point before the deadline receives full credit.
- A problem submitted between 0 and 12 hours after the deadline receives an amount of credit that

decreases linearly from 100% to 50% depending on when the problem was submitted:

- 1 hour after deadline = $50\% + 50\% * (12-1)/12 = 95.8\%$
- 2 hours after deadline = $50\% + 50\% * (12-2)/12 = 91.7\%$
- 3 hours after deadline = $50\% + 50\% * (12-3)/12 = 87.5\%$
- 6 hours after deadline = $50\% + 50\% * (12-6)/12 = 75\%$...and so on
- A problem submitted 12 or more hours after the deadline receives 50% credit (i.e. $0.5 * \text{original score on the problem}$).

A problem submitted *much* later than 12 hours after the deadline still receives 50% of possible credit. That is, if it is due in November but submitted in December it still receives 50% of possible credit.

So, if you're looking for extra points at the end of the semester, you can go back and finish unfinished problems.

If you have not finished an assignment by the deadline, you can submit the unfinished assignment in order to avoid late penalties (if your professor charges them). But you may not wish to. Weigh the amount of credit you will lose against the possibility of completing the assignment and getting credit for additional problems.

Once you've submitted an assignment, you can't submit it again.

If you have a good reason for submitting an assignment late, you can ask your professor for an extension.

13.5.3 It's a Program

MasteringPhysics is a program, not a human being. It provides excellent feedback, but it has its limitations and it takes getting used to. Every once in a while, you just have to indulge the nice program.

Here are some things you need to know.

What's a good basic introduction to the program?

Do "Introduction to MasteringPhysics"; if your professor doesn't assign it, ask him or her to add it. It is the single best introduction to how the program works. Make sure you read the green-highlighted material after each problem.

- [What you should learn from "Introduction to MasteringPhysics"](#)^[130]

How do I enter math? How do I use the math palette?

Read and bookmark the whole section on [Entering Math](#)^[117]. You'll be glad you did. .

- Learn about entering vectors, unit vectors, Greek letters, subscripts, superscripts, mathematical constants and physical constants in "Introduction to MasteringPhysics."
- [Order of operations](#)^[118] can make a correct answer wrong. Use parentheses and explicit multiplication signs even when you think you don't need them.
- Learn about significant figures. Many MasteringPhysics problems request the answer to a specific number of significant figures. (The default is 3 significant figures.)

What does feedback do? Why isn't it more detailed?

Whenever you submit an incorrect answer, MasteringPhysics gives you as detailed feedback as it has in its database.

It's very good, but it's written by human beings and sometimes it isn't perfect. We are improving feedback all the time, so if you can't understand feedback after you've thought about it, please submit a [comment](#)^[138] or [contact Customer Service](#).

Note: We review comments at the end of a semester, as we upgrade and review our problem library; therefore they are not responded to individually. If you have a time-critical issue, send it to Customer Service.

Why do I have to submit some answers in alphabetic order or numeric order? My answers were correct, just not in the right order.

For efficiency, MasteringPhysics uses string matching in answers of this sort.

Why isn't the question in MasteringPhysics the same as the question in the book?

MasteringPhysics is used with several textbooks. We often modify questions to make them more effective online.

Why do I have to give answers in radians?

MasteringPhysics expects any argument of a trigonometric function (sin, cos, tan, etc.) to be given in radians, not degrees (where 1 degree= $\pi/180$ radians).

MasteringPhysics always requires that if you are using the calculator feature, that the argument of any trig function must be in radians, not degrees. That is, if the assignment is to find the x-component of a vector of length 10 at 30 degrees above the horizontal, MasteringPhysics will accept " $10 \cdot \cos(\pi/3)$ ", but not " $10 \cdot \cos(30)$ ".

Note that you are always free not to use the built-in calculator feature and simply enter the correct numerical value directly.

Your answer will be graded correct as long as it is algebraically and trigonometrically equivalent to the program's answer, even if it looks different.

The program will convert answers if it can. If you try the answer " $\cos(180)+x$ ", for example, the program converts the argument of the cosine from degrees into radians by multiplying by $\pi/180$. But it is not always clever enough to know how to convert complicated expressions from degrees into radians, so you should always use radians for angles unless explicitly directed not to in a problem.

There are several useful degrees-to-radians conversion tools online. Ask your professor to suggest one.

I have a problem with the system (an answer is wrong; I can't see answers; I can't reach MasteringPhysics). How can I send bug reports to MasteringPhysics?

You'll find quick basic answers 24/7 at our Help Web site, [here](#). (If for any reason you can't find this site, go to the URL <http://www.masteringhelp.com>, then select your product and whether you are an instructor or a student.)

If your issue isn't solved, you can send a description of the problem to MasteringPhysics Customer Support by clicking on Contact Us. We are open and solving your issues M-F 9AM-5PM Eastern time.

13.5.3.1 What You Should Learn from "Introduction to MasteringPhysics"

You should learn

- How to submit an [answer](#), a [problem](#), and an [assignment](#)
- [Using the My Answers function to view your previous answers](#)
- [How to work a problem to maximize your grade](#)
- [When to guess and when not to guess](#)
- [What the difference is between a main part, a subpart, and a hint](#)
- [How to enter vectors, unit vectors, Greek letters, subscripts, superscripts, and mathematical constants](#)
- [Where to look up how to enter vectors, etc.](#)
- Where to find the table of physical constants: On the **Constants** tab at the top of the Welcome page
- Why to use [radians](#) rather than degrees
- Why to submit answers in [alphabetic and numeric order](#)

13.5.4 It's Web-Based

Because the Internet does go down from time to time, it pays to get your homework in early.

Because MasteringPhysics is Web-based, you should check your system requirements from the Welcome page to ensure your system is properly configured.

- If graphics aren't completely visible, check your screen resolution.
- If you're having any other display problems, try reloading your browser window or changing browsers. Here are three reliable, free browsers:
 - Firefox (extremely reliable and secure; our first choice) is available [here](#).
 - Netscape is available [here](#).
 - Mozilla is available [here](#)

(**Note:** Regrettably, we currently do not support Windows XP SP2; it causes security and display problems under IE. We recommend Firefox as a secure, robust browser alternative.)

Important:

Please check **My Scores** after every assignment.

- Incorrectly set [security levels](#), either on your computer or on a network, can occasionally interfere with scores being posted. If your scores are not appearing, check [here](#) for solutions.

At any time, please feel free to contact Customer Support for answers to questions or problems. You can reach us through [the student FAQs page on the site](#); check the list of FAQs. Email us if your issue isn't solved (click on **Contact Us** at the left of the page)..

13.5.5 Cheating

It's possible to cheat in any course. We've discovered some truly ingenious ways to cheat.

At the risk of sounding too high-minded, though, we recommend actually doing the work.

The MasteringPhysics tutorial teaching method is designed to help you learn and succeed. A nice, though unforeseen, consequence is that, on average, cheaters' grades are lower by about a full grade than honest people's.

At times you may be victimized by cheaters. Here are two things to watch out for:

- Another student tells you he wants to "try out" MasteringPhysics and do a few problems, "just to see how it works." He is actually borrowing your login name and password to try out answers. The cheater gets caught, your account is flagged, you may be suspended from the course, and you are victimized because all the wrong answers count against your grade. (They cannot be erased.)
- You buy an access code online, perhaps on eBay or some other online service. We monitor these offers. Almost universally they are bad access codes, and none of the offers is cheaper than buying a legal, reliable access code through our registration site. You can save money without risk by buying a secondhand text and a new access code.

13.6 Frequently Asked Questions

Enrollment

Why am I not receiving confirmation e-mails when I register?

Often when instructors or students aren't receiving confirmation e-mails, it is because the spam filtering system at the university is sending these e-mails to a junk folder.

If you do find your registration confirmation in your junk folder, you may want to contact the e-mail administrator at your university to make sure that it is allowing e-mails from the domain `pearsoned.com`.

It is also possible that you entered the wrong email address when you registered. Click on **View Your Account Information** on the Login screen, and check your email address. (Check it directly [here](#).)

I'm still enrolled in my class from last semester. How can I switch into a new class?

When you log-in, if you still see the course code for your previous semester's class, contact your previous semester's professor and tell them:

"Your class is still active. Because students are unable to be in more than one MasteringPhysics class at the same time, students who were enrolled in your class last semester are unable to register in a new class this semester.

"To deactivate your class, please click the properties link on your class list. You'll see a page from which you can change the expiration date of the class."

Once your professor has done this, the next time you log in, you will be asked to provide the class ID for your new course.

How can I change my student ID?

1. Log in to MasteringPhysics as normal.
2. Once logged in, manually change the URL in the (same) browser location bar to:
`http://session.masteringphysics.com/myct/userProperties`
3. Update the Student ID field and click **Save**.

4. Click **Back To Home**.

How can I change the name, user name, password, or e-mail address associated with my account?

1. Go to the login screen, but don't log in.
2. Under LOGIN NAME and PASSWORD, click on **View Your Account Summary**.

Now you will be asked to log in.

When you log in, you'll see a page called Account Summary.

3. Click on whatever information you would like to change. (You'll make each change on a separate page.)
4. Click on **Save** at the bottom of each page you update.

Note: Allow an hour or so for changes to propagate through the system. At the beginning of semesters, allow 24 hours.

Using the software

Why do I get points off for multiple-choice wrong answers when my professor doesn't take off for wrong answers?

The program takes off $1/(n-1)$ points, where n was the number of options to choose from, for each unique wrong multiple-choice answer you submit. So if there are 4 multiple-choice answers, and you guess wrong once, it will take $1/3$ off your score

This "guessing penalty" is invoked only on multiple-choice answers.

It's always invoked, to prevent random guessing, even when your professor does not take off points for other sorts of wrong guessing.

There's often an initial confusion about the difference between asking for hints, requesting solutions, and making multiple-choice guesses.

- Hints are suggestions that help you find a solution. They aren't penalized unless your professor decides they should be (and s/he can give extra points for not taking hints).
- Subparts are simplified problems that help you find a solution. (For historical reasons, they are

- also sometimes called hints.)
- Grading on subparts is the same as on main parts.
 - Guessing on multiple-choice answers is always penalized.
 - Requesting the solution isn't penalized, but you don't get any credit for the problem.

If I try to enter answers to multipart problems all at once, the first time I click Submit on a subpart, my other answers are erased.

Enter and submit answers one at a time.

I'm not getting credit for a problem that I did.

Remember to click on the **Submit Problem** button after you have submitted and checked the answers to all parts of the problem.

[Try these other solutions](#)^[135].

Why do EOC problems in MasteringPhysics have different constants than they do in the book?

The software randomizes the constants, so your numbers may not be the same as those in the book or the ones your study buddy has.

How many decimal places should I take my answer to?

For numerical results, make sure that you have enough decimal places of accuracy in your result.

Always enter answers to [three significant figures](#)^[117], unless explicitly stated otherwise. To guarantee there's no problem, use four figures (when available) throughout your calculation, then round the answer to three figures.

A good general rule is that your answer should have the same number of decimal places as in the input data, except if the first digit in your answer is 1. In that case, you should use one more decimal place in your answer.

In intermediate steps, it is generally a good idea to keep more decimal places of accuracy than in your final result in order to avoid round-off error.

Note that in many calculations, the **sign** of the result is important. If you think that your numerical answer is correct, but the system won't accept it, it may be that your sign is wrong. An intermediate sign may also be wrong; the system message "Check your signs" doesn't always mean that the final sign is wrong.

Notation

The book uses \hat{i} and \hat{j} for vectors. That doesn't work for MasteringPhysics.

MasteringPhysics uses x_{unit} instead of \hat{i} , and y_{unit} , Z_{unit} instead of \hat{j} , \hat{k} .

What units should we use?

Always assume MKS units, unless explicitly stated otherwise.

How do I know whether the software wants me to type a vector, or whether it just wants a constant (the value of the component)?

If the requested variable is shown with a little vector symbol on it (and no absolute value brackets), then the answer should be a vector, even if it's just a single component.

A vector symbol looks like a small arrow over the variable: \vec{E} (See "[Variables](#)"^[119].)

How do I indicate...?

See [Entering Math](#)^[117] for a full discussion of entering math symbols.

For answers that require a mathematical expression, indicate multiplication with the asterisk symbol, e.g., x multiplied by y should be written $x*y$.

To indicate subscripts and superscripts use the underline and hat symbols in front of the subscript or superscript. For example, you might write the electron mass symbolically as m_e , and x squared should be written x^2 .

To indicate a vector quantity, use `_vec` following the quantity, e.g., the position vector should be written `r_vec`. To indicate a unit vector, use `unit` instead of `vec`, e.g., the unit vector in the direction of the position vector should be written `r_unit`.

For a square root, use `sqrt`, e.g., square root of x should be written `sqrt(x)`.

Greek letters are indicated by just writing out the name in Roman letters, e.g., `pi`, `mu`, `epsilon`, `sigma`, `theta`, etc

Display

How do I change the font size on my browser?

In Internet Explorer 6.0:

1. Go to **Tools>Internet Options**, then click on the **Accessibility** button in the lower left corner of the window that comes up. The third box under **Formatting** in the window that comes up will be labeled **Ignore Font Sizes Specified on Webpages**. Check this box.
2. Then, go to **View>Text Size** and select the text size you'd like.

In Mozilla Firefox, go to **View>Text Size** and increase or decrease the font size.

Why are some figures cut off when I view them?

Check on the System Requirements page (link from your home page) to make sure that your screen resolution is at least 1024x786. You can change this setting on most computers under **Control Panel>Display**.

If you are using one or more extra browser toolbars, for instance an anti-spoofing toolbar or the Firefox Bookmarks toolbar, you will have less screenspace than normal and figures may be cut off. Temporarily close extra toolbars.

Why can't I see hints/diagrams/My Answers?

Try the following (or look [here](#)^[135]):

- Check on the System Requirements page (link from your home page) to make sure that your computer meets minimum system requirements.
- Is your screen resolution 1024x768 or above? If not, reset it.
- Are popup blockers turned off? If not, disable your popup blocker.
- Is Javascript enabled in your browser? If not, enable it.
- Is this computer on a network (lab, library, etc.)? Check to see if other users are having this problem.
- Have you tried to replicate the issue on another network or outside a network? Try from another computer.
- Have you tried to replicate the issue on another browser? Try with another browser, such as Mozilla or Firefox.

Why can't I see applets?

Your computer may not meet the minimum system requirements, your browser may be out of date, or you may not have the correct Flash plugin. Check on the System Requirements page (link from your home page) for system requirements, supported browser versions, and the Flash plugin.

13.6.1 Security Issues and Solutions

If you cannot see hints or submit answers, your computer may have its security levels incorrectly set. Here are some possible solutions:

- Check on the Welcome page, under System Requirements, to make sure that your computer meets minimum system requirements.
- If you have a popup blocker, disable it.
- If Javascript isn't enabled, enable it. (See [below](#)^[136].)
- If you've upgraded XP to SP2, uninstall it. We have seen graphics issues with SP2, and it is also associated with security issues. According to recent surveys, over 10% of all SP2 machines and over 14% of all academic SP2 machines are experiencing significant issues. We do not support XP SP2 at this time.
- If that doesn't work, try a clean reinstall of your browser, or try another browser. We aren't seeing problems with Netscape, Mozilla, or Firefox. They're all free. Firefox seems to be particularly robust:
 - Netscape: <http://www.netscape.com>
 - Mozilla: <http://www.mozilla.org/products/mozilla1.x/>
 - Firefox: <http://www.getfirefox.com>
- If this computer is on a network (such as a library or computer lab), are other people seeing the same problem? Does the same problem occur with a computer not on the same network? If everyone on the network is having the same problem, it's a network security issue.

Network Security Issues:

In rare cases, educational networks identify students' MasteringPhysics answers as insecure communications, and stop all answers getting through to us. This is due to network security issues.

Usually it's promptly caught when an alert student realizes that their answers are not being posted to **My Scores**.

Be alert. Check **My Scores** after every assignment. If you don't see your answers, please [contact us](#)..

To enable Javascript

Internet Explorer 5.X

1. Open Internet Explorer.
2. Select *Internet Options* from the *Tools* menu.
3. In *Internet Options* dialog box select the *Security* tab.
4. Click Custom level button at bottom. The Security Settings dialog box will pop up.
5. Under Scripting category enable *Active Scripting*, *Allow paste options via script* and *Scripting of Java applets*
6. Click *OK* twice to close out.
7. Hit *Refresh*.

Internet Explorer 5.2 for Macintosh OSX

No longer supported.

Internet Explorer 5 for Macintosh OS9

No longer supported.

Internet Explorer 6.X

1. Open Internet Explorer.
2. Select *Internet Options* from the *Tools* menu.
3. In *Internet Options* dialog box select the *Security* tab.
4. Click Custom level button at bottom. The Security settings dialog box will pop up.
5. Under Scripting category enable *Active Scripting*, *Allow paste options via script* and *Scripting of Java applets*
6. Click *OK* twice to close out.
7. Hit *Refresh*.

Netscape 7.1

1. Open Netscape.
2. Select *Preferences* from the *Edit* menu.
3. Click the arrow next to *Advanced*.
4. Click *Scripts & Plugins*.
5. Check *Navigator* beneath "Enable Javascript for".
6. Click *OK*.
7. Click *Reload*.

Mozilla 1.X

1. Open Mozilla.
2. Select *Preferences* from the *Edit* menu.
3. Click the arrow next to *Advanced*.
4. Click *Scripts & Plugins*.
5. Check *Navigator* beneath "Enable Javascript for".
6. Click *OK*.
7. Click *Reload*.

Firefox

1. Open Firefox.
2. Select *Options* from the *Tools* menu.
3. Select Web Features.
4. Click *Enable Javascript*. It will be enabled by default.
5. Check *Navigator* beneath "Enable Javascript for".
6. Click *OK*.

Safari (currently not supported)

13.7 Help on Help

Help is available by clicking on the **Help** tab on the navigational bar at the top of the window.

Because MasteringPhysics runs on many platforms, Help is distributed as standard HTML files.

Inside Help:

- Click on Table of Contents to see the contents of Help.
- Click on Keyword Index to search Help by keyword.
- Search through a page by using your browser's Search function.
- Bookmark pages by using your favorite bookmark utility.

A question mark inside a box indicates that contextual help is available:



Help is also available as:

- [HTMLHelp](#) for Windows users
- [Adobe Acrobat PDF](#): a printable manual

If you have questions or comments about the help files, please [contact us](#).

13.8 Technical support

For questions related to physics or your physics class, talk with your instructor.

For technical support related to registration or log-in, please visit <http://www.aw-bc.com/techsupport> and complete the appropriate online form.

Addison-Wesley technical support is available Monday-Friday, 9am to 6pm, Eastern Time (US and Canada) by calling 800-677-6337.

For all other questions regarding MasteringPhysics, you'll find quick basic answers 24/7 at our Help Web site, <http://www.masteringhelp.com>. Select your product, then select "Help for Students."

- You can reach FAQs directly [here](#).
- Check the [Frequently Asked Questions](#) ⁽¹³⁾ here as well.

If your issue isn't solved, you can send a description of the problem to MasteringPhysics Customer Support by clicking on **Contact Us** from any page. We are available M-F 9AM-5PM Eastern time.

- We provide help, usually within one business day, on all technical issues (such as the accuracy of an answer). During peak registration periods, answers may take longer.
- We don't answer questions about physics; your professor or TA is able to answer those questions.

13.8.1 Writing survey comments vs reporting an issue

After each problem, students are invited to write survey comments about the problem.

These are not issue reports. **MasteringPhysics Technical Support does not see these comments in real time.** We use them at the end of the semester, when all the survey comments are automatically forwarded. They help us in evaluating and rewriting problems for our next release.

If the person sending the survey comment checks "Would you like to receive a reply to your comment via email?"

- If the professor's email address is in the Contact Email field of the class information, survey comments are forwarded to the professor.
- If there is an address other than the professor's address, survey comments are forwarded to that address.
- If there is no email address in the Contact Email field, comments are not forwarded.

Send issue reports, time-sensitive suggestions, and questions to Technical Support via [the quick form on our Web site](#).

Problem Survey	
How much did you learn (or usefully review) from this problem?	
Very little	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> A great deal
How difficult was this problem?	
Very easy	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Very hard
Please tell us your impressions of this problem. Did you have any special frustrations? Was it helpful?	
<input type="text"/>	
Would you like to receive a reply to your comment via email?	
<input type="checkbox"/>	Yes, please respond.
<input type="button" value="Submit Survey"/>	

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