SolidWorks and Part Finishing

oh my!
Blade boxes!

Fiona

Juliana

Mao

Sophia
Blade boxes!

Nathan Basigner

Nathan Boerner

Josiah

Layal
Sketch Model Design Critique!
Sketch Model Reviewers!
Sketch Model Feedback!
Sketch Model Feedback!

12-18 reviewers per team

sent on Slack

feedback is the important part, not the scores

old folks!

PLAYTESTING!
What's next?

- **Three ideas presentation**
  - March 6
  - 3 ideas per team

- **Mockup Review**
  - April 17
  - 1 concept, 2 models

- **Sketch model review**
  - March 20-22
  - 2 concepts, 4 models

- **Final PLAYsentations**
  - May 14
  - 1 final prototype
Decide on one toy concept

Labs this week
Exam!

1. you have 90 minutes

2. use the handout provided and show your work

3. it’s long, so be sure to check all questions first and answer strategically
Today!

Part Finishing (PDL)
- Camel
- Crocodile
- Goose
- Hedgehog
- Hippo
- Koala
- Llama
- Lobster

SolidWorks (here in 3-370)
- Ostrich
- Moose
- Narwhal
- Meerkat
- Panda
- Squid
- T-Rex
- Tiger

Meet in 3-370 again on Wednesday!
Team Estimation Game

How many Prudential Centers fit lying down across the Harvard Bridge?

What is the cost per popcorn kernel at the movie theatre?

How much energy does it take to brush your teeth (manually)?

Can you power a mechanical bull in your house on a standard wall outlet?

How long will it take to heat a hot dog with an Easy Bake Oven?
Estimation Game

How many Pru's across the Harvard Bridge?

Pru height?

~230m

Harvard bridge length?

~620m

between 2 and 3
Estimation Game

Cost per kernel of popcorn at the theatre?

price of bucket?

volume of bucket?

volume of popped corn kernel (packing factor)?

~0.25–1¢ per kernel
Estimation Game

Energy to brush?

How fast is your arm moving while brushing?

\[ E_k = 0.5mv^2 \]

How often do you change direction? How long should you brush?

0.5s, 120s

\(~120 \text{ J}\)
Estimation Game

Mechanical Bull in House?

power requirement for mechanical bull?

standard voltage in house?

standard circuit breaker current?

240V x 30A = 7200W
120V x 15A = 1800W

~ sure
Estimation Game

Hot dog in the Easy Bake?

Q = mC_pΔT

50–200g and 20–60°C

Power of Easy Bake

5-10 min without losses
Quiz!

What is your name?

What is energy? Units?

What is power? Units?

What are the top three sources of electricity in the USA?
Basics of CAD
When to use CAD?

- detailed planning
- calculating
- digital fabrication
When **not** to use CAD?

- quick prototypes
- organic shapes (yet!)
SolidWorks Basics
SolidWorks Navigation

- Command Bar
- Feature Tree
- Model Window
Simple Box

Select the “Front” plane
Create a new sketch
Create a “Center Rectangle” from the origin
Smart Dimension the length and width in inches
Change the View

Change the view to “Trimetric”

Use middle-click and drag to free rotate
Extrude

Extrude the sketch

Choose “Mid Plane”, and set to 3.125"
Modifying the Sketch

Delete the extruded feature (we’ll come back to that later)

Edit the sketch, draw a horizontal line below the box

Set the line as “for construction”

Dimension the line 0.275" below the box
Sketching the Wheel

Draw a circle, connecting the edge to the construction line so it is tangent

Dimension the circle 1" away from the front

Dimension the diameter as 42mm (notice it change to inches)
New Sketch

Create a new sketch on the “Front” plane
Use “Convert Entities”
Select the rectangle to convert (this brings it to the new sketch)
Extrude the box as before, with “Mid Plane” & 3.125"
Reference Plane

In the top menu, choose: “Insert > Reference Geometry > Plane”
Set the plane 0.10" away from the box face
New Sketch

Create a new sketch on the new reference plane
Use “Convert Entities” again
Select the circle to bring it onto this new sketch
Extrude the wheel

Extrude the wheel

Set the extrude as “Blind” and to 0.60"

Uncheck the box for “Merge result” — really, do it!
Round the Corners

Select the “Fillet” tool
Select the edges of the box to fillet
Set the radius to 0.25"
Round the Edges of the Wheels

Select the “Fillet” tool
Select the edges of the wheel to fillet
Set the radius to 0.125"
Mirror the Wheels

Select the “Mirror” tool

Choose to mirror about the “Front” plane

Go to “Bodies to Mirror”, then click on the wheel in the model window (you can check preview to see what will happen)
Mirror the Wheels

Select the “Mirror” tool again
Choose to mirror about the “Right” plane
Go to “Bodies to Mirror”, then click on the two wheels in the model window
Sketch the Canopy

Edit the original sketch on the “Front” plane
Sketch a line at an angle on the left side
Draw an arc tangent to the angled line and ending on the right, at the top of the car
Dimension from the edges: 1.70", 2.00", and angle of 25°
(Also, try dragging around the point on the left to change the shape of the canopy)
Extrude the Canopy

Create a new sketch on the “Front” plane
Use “Convert Entities” to bring over the canopy sketch
Draw a line to close the canopy shape
Extrude the canopy using “Mid Plane” and set to 2.25"
Uncheck the box for “Merge result”
Round the Edges of the Canopy

Make sure you unchecked the box for “Merge result” from the previous step

Fillet the top edges of the canopy to 0.35"
**Hide the Body**

Right click on the feature for the car body, and choose “Hide” to make it invisible.

Rotate the view to see the underside of the canopy.
Shell the Canopy

Select the “Shell” tool

Set the shell thickness to 0.10"

(notice how this hollows out the canopy)
**Glass Canopy**

Flip the car back around using “Isometric”

Make the car body visible again by right-clicking “Edit the Appearance” to make it more realistic
Other things to try...

Try modifying the original rectangle for the car body to make it better match the Automoblox cars.

What happens when you change the dimension for the “ground clearance” construction line?

Try adding a spoiler or other detail.

Make axles and corresponding holes for the wheels.
Create new parts from existing bodies

Expand the “Solid Bodies” folder
Right click on the “canopy” body
Choose “Insert into New Part…”
SolidWorks
and
Part Finishing

oh my!

Take blade boxes!