BLOSSOMS VIDEO LESSON TRANSCRIPT

Forces and Angles

Hello, I'm Bahtiar
a physics teacher
from Kuching North Science Secondary School in Malaysia.
Through this video,
we are going to study some concepts
on Forces and Angles.
Let's watch this scene.

Adam seems to have difficulties
in dragging the rubbish bag.
Why do you think Ali is not having
Experiment with your friends
and see why
Adam is having difficulty
in dragging the bag
with these materials.
Now,
assume that the uniform wooden block
provided to you by your teacher
represents the rubbish bag.
Attach one end of the string
to a wooden block
and the other end to a spring scale.
Drag the wooden block
by along a smooth surface
by pulling the spring scale.
Try to keep the angle
of the string with respect to the ground
as constant as possible
and record the reading on the spring scale.
Then,
repeat the procedure
but with different angles
with respect to the ground.
At which angle did you find it easier
to drag the wooden block?
Please report your findings to the class
See you in a while.

Activity 1

Earlier,
you were asked to find out
why Adam is having difficulty
dragging the rubbish bag.

Through the experiment,
you were asked to drag a wooden block
at different angles
with respect to the ground.
What have you found out?
Yes,
you are right!
It is easier to drag the wooden block
with a smaller angle to the ground
Now,
let us observe
another scene
of a child
sitting on the flat area
of the playground slide
and then sliding down
along the inclined-plane of the slide.
Have you ever slide down a slide before?
Do you move downwards
when you are sitting stationary on the flat area
at the top of the slide?
What would happen to you
when you sit on the inclinedplane of the slide?
Now with reference to the slide,
when would a wooden block
start to slide downwards
if it is placed on tilted plywood?
Let us find out in the next activity.
You will be given:
a piece of plywood,
a wooden block
and seven to eight pieces of bricks.
Now, please work together in a group of four,
plan and carry out an activity
to investigate
what would cause the wooden block
to slide downwards along a tilted plywood.
You will also have to answer these questions
Questions 1
How can you make the wooden block accelerate at a greater down the slope?
What causes the wooden block to accelerate at a greater rate when the plane is being tilted?
How do you think this happens?

Activity 2

Back to the questions earlier
Question 1
How can you make the block

accelerate at a greater rate down the slope?
Yes,
the wooden block can be made to accelerate
at a greater rate by increasing
the angle of inclination of the plywood
Question 2What causes the wooden block
to move when the plane is being tilted?
There must be force acting on the object
that pushes it downwards
along the plane.
Question 3
How do you think this happens?
An object placed on a *tilted surface*
will often slide down the surface.
A tilted surface is called an
inclined plane.
The rate at which the object accelerates down the surface
is dependent upon how *tilted* the surface is;
the greater the *tilt* of the surface,
the greater the acceleration of the object down the slope.
Objects tend to accelerate
down inclined planes because
of an unbalanced force.
The normal force
always acts in the upwards direction,
opposite to the direction of the force of gravity.
This is true
when the objects are placed on horizontal surface.
On a flat plane,
the perpendicular component of force of gravity
is directed opposite the normal force
and as such balances the normal force.
But normal forces are not always acting upwards,
but rather
that they always directed
perpendicular to the surface
that the object is on.
On an inclined plane
assumed to be friction-free,
the normal force does not
act directly opposite to the direction of gravity.
Usually,
any force,
a vector quantity,
directed at an angle to the horizontal
can be resolved into 2 or more component forces.
Here,
the force can be broken down into **two** components,
the **horizontal** and **vertical** component.

The force of gravity here
is resolved into two component forces
one directed perpendicular to the inclined surface ($F_{\perp}$)
and the other directed parallel to the inclined surface (F_{II}).
On an inclined plane,
the force parallel to the inclined plane is FII,
which is the parallel component of the force of gravity.
This force is not balanced by any other force.
Thus,
the object will subsequently accelerate
down the inclined plane
due to the presence of an unbalanced force.
It is the parallel component of the force of gravity
that causes this acceleration.
The parallel component of the force of gravity
is the net force.
In the presence of friction
or other forces,
the situation is slightly more complicated.
The perpendicular component of force,
($F\perp$), still balances the normal force
since objects do not accelerate
perpendicular to the incline.
Yet the frictional force
must also be considered
when determining the net force.
As in all net force problems,
the net force is the vector sum of all the forces.
That is,
all the individual forces
are added together as vectors.
Now,
let us watch another scene
of a family moving into their new house
What can you suggest
to help the mover
unload the goods
easily from a fixed height?
Let's find out more in the next activity.
Now working groups of fours
and conduct an experiment to find out
the relationship between the angle of
inclination of plank
or plywood and the force
exerted on the load.
Each group is given
a few pieces of plywood or wooden plank
of lengths half a meter
1 meter

1.5 meters
a spring scale,
5 pieces of bricks,
a plastic bottle filled with sand
Please answer these questions
Question 1
What are the forces
acting on the plastic bottle
filled with sand when placed
on the inclined plane?
Question 2
What will happen to these forces
when the angle of inclined plane is increased?

Activity 3

So what are the forces acting on the plastic bottle
filled with sand
on an inclined plane?
The forces acting on the
plastic bottle are
the horizontal component of the force of
gravity on the plastic bottle
and the tension in the spring
So question 2
What will happen to these forces
when the angle of inclined
plane is increased?
These forces will increase accordingly.
So this experiment
shows that by increasing the
angle of the plank,
the home mover
can slide the object down easily.
The variation in the angle of inclination
of an inclined plane
can affect the force exerted on the object
placed on the plane.
As the angle of the inclined plane is increased,
the force on the object along the plane is increased.
As the angle increases,
the component of force
parallel to the inclined plane increases
and the component of force perpendicular
to the inclined plane decreases.
It is the parallel component of the weight vector
that causes the movement along the plane.
Thus,
the force on the object

is greater at greater angles of inclination.
Based on what you have learned
on resolution of forces
what can you suggest to help Joe
move the travelling bag with ease?
Let's find out in the next activity.
You are provided with a travelling bag
with two wheels.
Work in a group of 4
Collaboratively,
find out whether it is easier to push
or pull a travelling bag
on an uneven surface.
Perform the experiment,
discuss and present your answer to the class.

Activity 4

Now,
have you found out whether it is easier
to pull or to push
a two wheeled travelling bag?
Yes, it is easier to pull
rather than to push
a two wheeled travelling bag
along an uneven surface.
Well,
in this lesson,
we have seen that the resolution of forces
on objects is a common and widely applied concept.
We have identified the forces acting on objects
and its resolution of forces
related to our daily activities
like when objects are pulled at different angles,
or when they are moving down along planes of varying angles.
You can also relate the concept of forces
resolution in daily activities around you,
for example,
the forces acting on the handle
of a garden lawn mower
when mowing the lawn
and a snow skier moving down a slope.
The force on the handle of a garden lawn mower
when mowing the lawn
When a lawn mower is pushed
it does not move in the direction it is pushed.
It moves in the direction
parallel to the surface of the ground.
The force that acts along the handle

at an angle to the surface of the ground
is resolved into two components.
One component acts horizontally
and moves the mower along the ground.
The other component acts vertically
and tends to push the mower into the ground.
The force exerted on a snow skier
moving down a slope:
Here, the force of gravity
(weight) of the skier will be resolved
into two components forces
one directed perpendicular to the slope
(W1)
and the other directed parallel to the slope (WII).
If the parallel component of the weight of the skier
is balanced by the frictional force on the ground,
the skier stays stationary.
But if the frictional force is
less than the parallel component
of the weight (or if the skier
pushes himself forward with the ski),
then the resultant force will
subsequently cause the skier
to accelerate down the slope.
It is the parallel component of the force of gravity
that causes this acceleration.
The parallel component of the force of gravity
is the net force.
We hope that
after following our lesson,
you have understood some concept
of forces and angles
and relate it to familiar activities around you.
We wish you all the best
and thank you for using
BLOSSOMS video lessons.

Teacher's Guide

Hi, there!
The context of this video
is in Malaysia.
However,
you are welcome to adapt
and adopt
the activities according
to your context or similar
daily application.
Please note that

this video is to help students
of ages 15-16
understand better about the resolution of forces
and learn how to draw free body diagrams.
Students should have knowledge of trigonometry,
so you need to do some revision on
simple trigonometry to enhance
students problem solving on
resolution of forces.
Most of the materials required
and can be easily made available.
You have to guide and encourage students
Materials and apparatus required for:
It is hoped that
students will enjoy learning and constructing
new knowledge through this
inquiry based learning approach.