

Teacher's Guide for "Forces and Angles"

The context of this video is in Malaysia. However, you are welcome to adopt and adapt the activities according to your very own context or similar daily application. Please note that this video is to help students of age 15-16 to understand better about resolution of forces and learn how to draw a free body diagram. Students should have knowledge of trigonometry, so teacher needs to do some revision on simple trigonometry to enhance students' problem solving on resolution of forces.

Most of the materials required for the activities are very simple and can be easily made available. Teacher has to guide and encourage students to explore new ideas during group activities. Materials and apparatus required for:

No. Activity 1

- 1 a roll of string
- 2 uniform wooden block attached with hook
- 3 a spring scale.

No. Activity 2

- 1 a piece of plywood
- 2 uniform wooden block
- 3 a piece of plywood,
- 4 7-8 pieces of bricks

No. Activity 3

- 1 3 pieces of plywood/wooden plank of lengths 0.5, 1.0, 1.5 metres,
- 2 spring scale,
- 3 5 pieces of bricks
- 4 plastic bottle filled with sand
- 5 string / thread

No. Activity 4

- 1 2- wheel travelling bag

It is hoped that students will enjoy learning and construct new knowledge through this inquiry-discovery based learning approach.

ACTIVITY 1 (7 minutes)

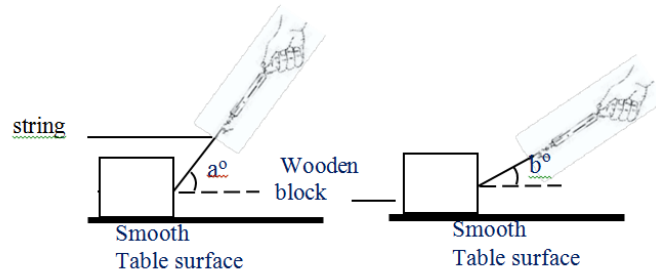
1. After watching the video in segment 1, the teacher will assign students to work in a group of four to carry out an activity to determine the force required to keep a wooden block moving along a smooth surface by pulling it at different fixed angles.
2. Each group will be given: a roll of string, a wooden block and a spring scale.

Procedure I : dragging at a chosen angle with respect to the ground

Procedure II : dragging at a different angle with respect to the ground

Procedure I

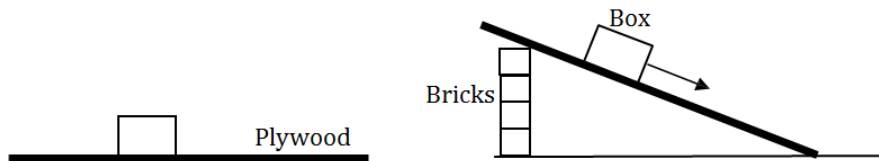
Procedure II



2. Students will discuss among themselves the outcomes of their findings and answer this question: At which angle did you find it easier to drag the wooden block?

ACTIVITY 2 (7 minutes)

1. Each group is given: a piece of plywood, a wooden block and 7-8 pieces of bricks
2. Students work together in a group of 4, plan and carry out an activity to investigate what would cause the wooden block to slide downwards along tilted plywood.



3. Students will discuss among themselves the following questions

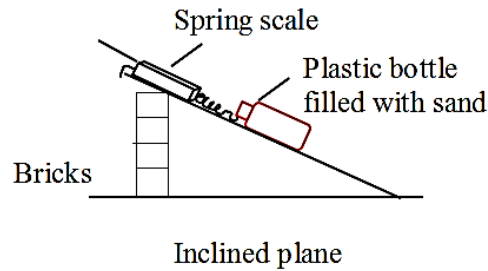
- Q1: How can you make the block accelerate at a greater rate down the slope?
- Q2: What causes the box to move when the plane is being tilted?
- Q3: How do you think this happens?

ACTIVITY3 (12 minutes) – Class experiment.

To find out the relationship between the degree of inclined plane and **the force exerted on the load.**

1. Each group is given : a few pieces of plywood/wooden plank of lengths 0.5, 1.0, 1.5 metres, spring scale, 5 pieces of bricks, plastic bottle filled with sand (to represent load), and string / thread,

2. Work in a group of four and conduct an experiment to find out the relationship between the angle of inclination of plank / plywood and the force exerted on the load.
3. Analyse the results and make a conclusion for the experiment.



4. Students are encouraged to discuss the conclusion and relate to the resolution of forces and angle of the plane.
 - Q1. What are the forces acting on the plastic bottle filled with sand when placed on the inclined plane?
 - Q2. What will happen to these forces when the angle of inclined plane is increased?

ACTIVITY4 (5 minutes)

1. Students are provided with a travelling bag with two wheels.
2. Working in a group of 4, the students are required to find out whether it is easier to push or pull a travelling bag on an uneven surface.

They are to discuss the following question:

- Q1. Based on what you have learned (resolution of forces), is it easier to pull or push a travelling bag on an uneven surface?