Motion & Force at Robin Hill

Describing force and motion at the park!

Student Introduction

- Balanced and unbalanced forces are at work all around you at Robin Hill
- Can you identify the forces you experience at the park and work out speeds using a formula?

TASK

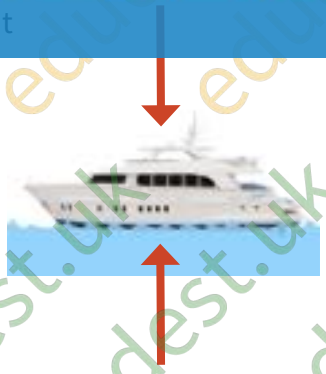
- ✓ You can work alone or in pairs.
- ✓ Enjoy the different activities at Robin Hill.
- ✓ Complete the tasks on the following pages.

Force Diagrams

Force diagrams help you to understand the forces acting on an object. The force arrows show the size of the force (the longer the arrow the larger the force) and the direction of the force.

This force diagram (right) shows the forces acting on a remote controlled boat

The boat is floating because the two forces acting on it are the same size, but acting in opposite directions.



The forces are balanced.

When forces acting on an object are balanced the object:

- » stays still

  OR

- » continues to move at the same speed in the same direction.

1 Add force arrows to the diagram below to show the boat is moving at the same speed in the same direction. Label your force arrows:

- » thrust from the engine
- » water resistance

2 Now add force arrows to the force diagram on the left to show a boat accelerating through the water. Use the same labels as above.

Add an arrow to show direction of movement.

TASK

- Add force arrows to the following force diagrams.
- Add an arrow to each diagram to show direction of movement.

Hill Billy Slide

Force arrows: Friction, air resistance, gravity

Cows Express Children's Train Ride

Force arrows: Thrust from engine, air resistance, friction

Falcon Diving

Force arrows: Gravity, air resistance

Force arrows: Gravity, air resistance

- **Draw a force diagram for the activities below.**
- **Add labelled force arrow and direction of movement arrows.**

Cheetah Zip Wire

Pitch and Putt

SPEED CALCULATIONS
Speeding Down the Toboggan Run!

Can you calculate the speed of different people sliding down the Toboggan Run?

Background

- The speed of an object depends upon the distance moved and the time taken.
- To calculate speed you use the formula:

Speed (m/s) = distance (metres) ÷ time (seconds)

Step 1

Practise your calculations!

- ✓ The length of the toboggan run is approximately 400m.
- ✓ Kerry travelled down the toboggan run in 35 seconds.

Q. What was her average speed?

Speed = distance ÷ time

Speed = 400 ÷ 35

Speed = 11 m/s

TASK

It took Tom 40 seconds to travel down the toboggan run.

Calculate his average speed.

Step 2

Time yourself (if travelling in pairs) or your friends as they travel down the toboggan run.

- Then use the formula **speed = distance ÷ time** to calculate your speed.

Remember:

- The distance of the toboggan run is 400m
- The time needs to be measured in seconds
- The unit for speed is m/s

If you are unable to time yourself or your friends here are some times we recorded for you.

Name	Time (s)	Calculation: speed = distance / time	Speed
Jason	30		
Emma	25		
Terry	28		
Alison	33		

Step 3

- You can change the formula around to find different values:

Distance = speed x time & **time = distance ÷ speed**

- The toboggan is designed to travel at a maximum speed of 20 m/s.

TASK What would be the time taken to travel down the toboggan run at the maximum speed? Show your working out. Don't forget to include the units.

DISTANCE-TIME GRAPH

The complete journey of the toboggan run can be represented by this distance-time graph.

TASK Add these labels to the distance-time graph above:

1. *Moving up the hill at a steady speed.*
2. *Stationary at the top of the hill for a few seconds.*
3. *Moving down the hill at a faster speed.*