The Bear Grylls ADVENTURE

FORCES AND MOTION

KS3 PHYSICS

www.beargrylladventure.com

An Introduction To Forces

Lead-in questions:

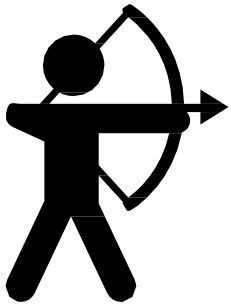
- What do we mean by the word 'forces' and 'motion'?
- Can you use the words 'forces' and 'motion' in a sentence?

Task 1:

- It's time to play 'Push, Pull or Twist'! Identify some of the different types of forces below.
- What is happening in the images? Are they showing pushes, pulls or twists?

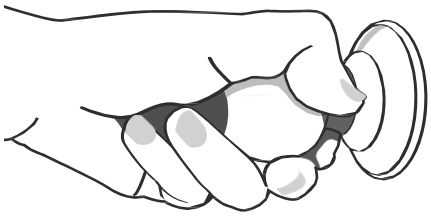
Push, Pull or Twist?:

A.....



B.....

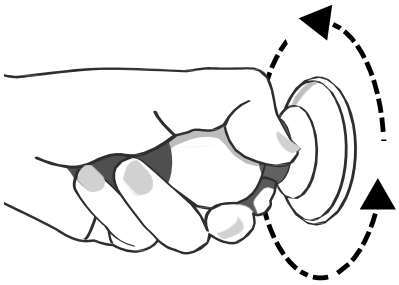
C.....



D.....

E.....

.



F.....

Answers: A Pull; B Pull; C Pull; D Push; E Twist; F Twist

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Task 2:

Add arrows to the diagrams on the previous page to show the direction of the forces in action.
Which of these forces do you think you could encounter at The Bear Grylls Adventure? When and where?

Task 3:

It's time to visit the Forces Investigation Stations! Look through the different station instructions across the next pages, and have a go at each of the tasks. Make note of what you find with each experiment!

Task 4:

Share the results of your experiments with the class. Use the sentence starters below to help you:

We looked at a force called
.....
.....

In our experiment we saw
.....
.....

I think this happened because
.....
.....

STATION ONE

Materials required: Two magnets with red and blue ends

MAGNETIC FORCE

Experiment with the magnets on the table.

What happens when you push together the two red ends?

What about a red and a blue end?

STATION TWO

Materials required: Block of ice, block of wood, desk

FRICTION

Push a block of ice along the desk.

Push the wooden block along the desk.

Which one is easier to push? Why?

STATION THREE

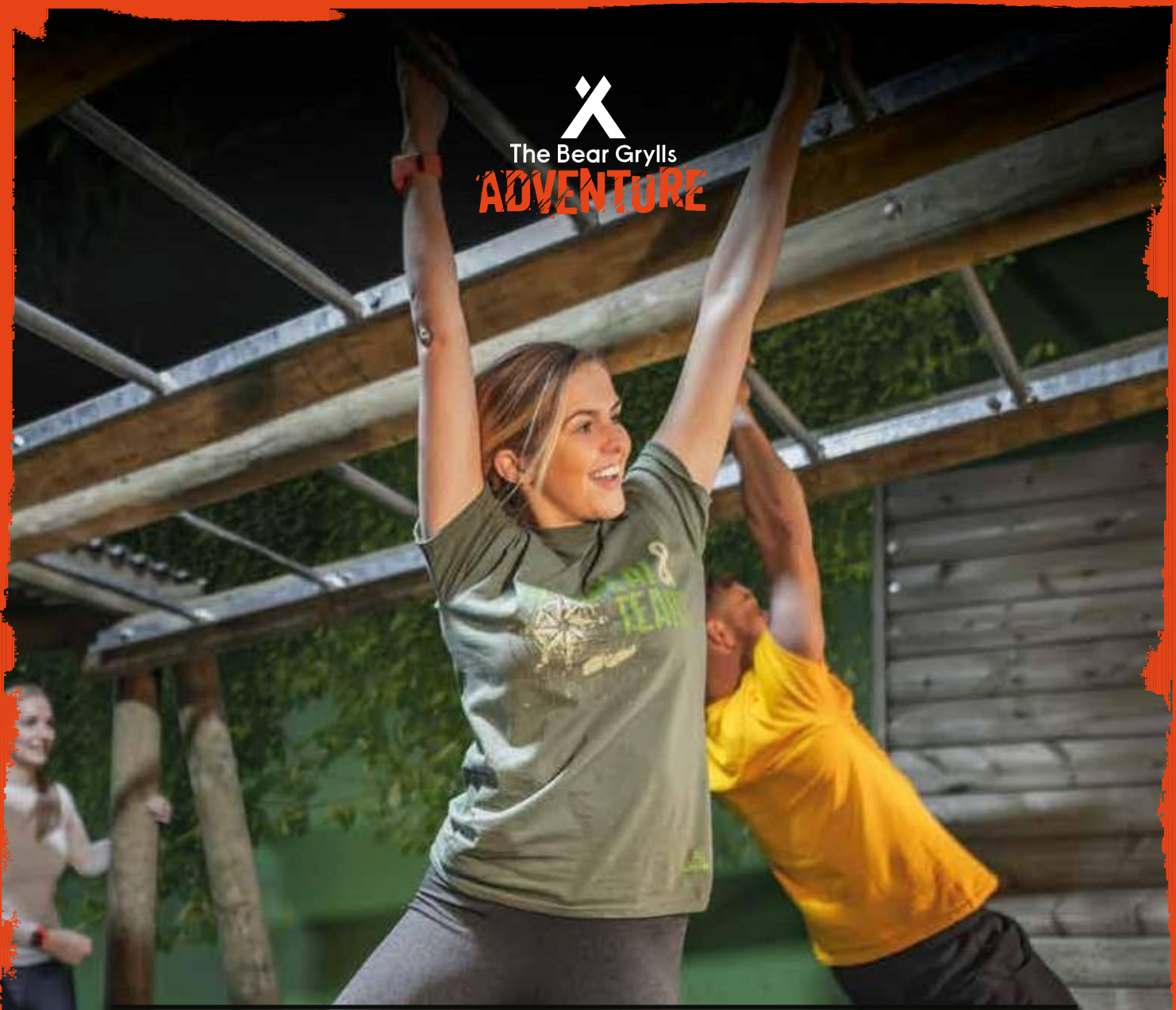
Materials required: Ping-pong ball, fan

AIR RESISTANCE

Push the ping-pong ball along the table. Now turn on the fan.

Why does the ping-pong ball travel faster?

See if you can push the ping-pong ball towards the fan when it is on.



STATION FOUR

Materials required: Ball, Scrunched-up piece of paper

GRAVITY: WEIGHT

Drop the ball and the scrunched-up paper at the same time, from the same height.

Does one hit the ground first? Why?

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STATION FIVE

Materials required: Balloon

STATIC ELECTRICITY

Rub the balloon against your clothes for a few seconds.

What happens now if you put the balloon next to somebody's hair?

Can you get the balloon to stick to the wall?

STATION SIX

Materials required: Ball of plasticine, disk of plasticine, container of water

WATER RESISTANCE

Drop the ball of plasticine & the flat disk of plasticine into the water.

Which one hits the bottom of the tank first? Why?

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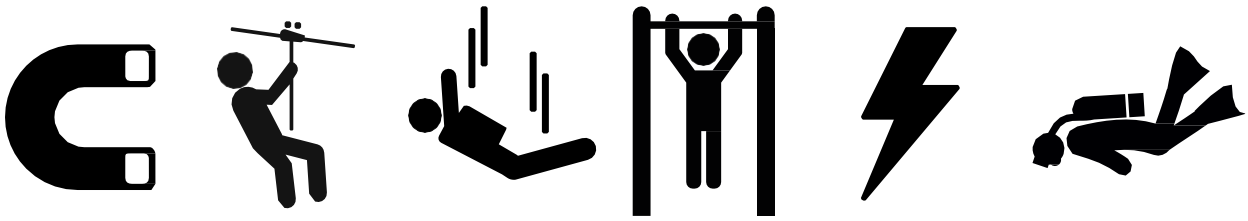
Recap questions:

- What different forces can you think of?
- What forces are in affect at The Bear Grylls Adventure?

Task 1:

To re-cap everything you know already; match the different forces to the correct image using the Forces Match-Up sheet below!

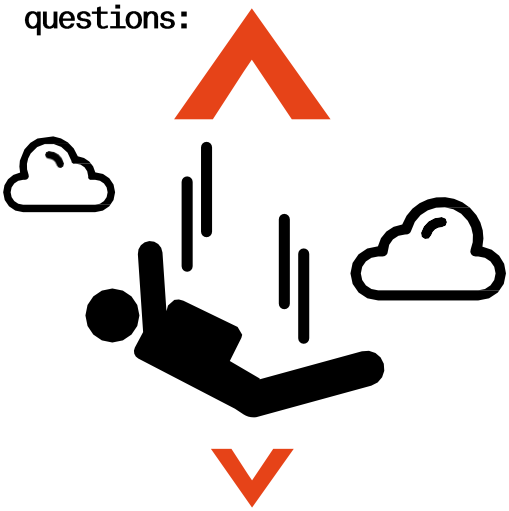


Gravity | **Water Resistance** | **Friction** | **Static Electricity** | **Air Resistsance** | **Magnetic Force**

Task 2:

Scientists use arrows to show the size and direction of forces. A force diagram or 'free-body diagram' uses labelled arrows to show all the forces acting on the object.

Look at the example of the free-body diagram for a skydive and answer the questions:



1. What force does the arrow pointing upwards represent?
2. What force does the arrow pointing downwards represent?
3. What does the difference in sizes of the two arrows suggest about the motion of the person?
4. Are the forces balanced or unbalanced here?

Answers: 1. Air resistance; 2. Weight owing to gravity; 3. The person is accelerating downwards; 4. The forces are unbalanced because the force due to gravity is greater than the force of the air resistance.

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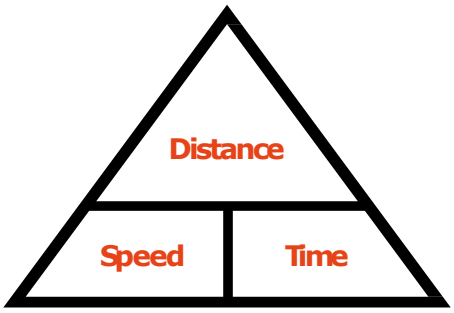
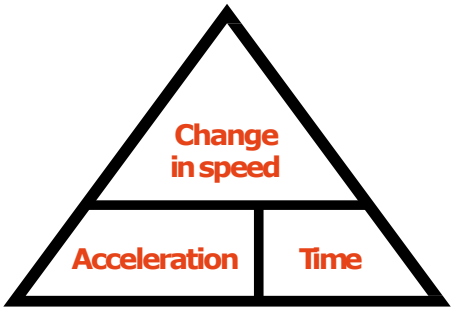
TOP TIPS AND FORMULAS

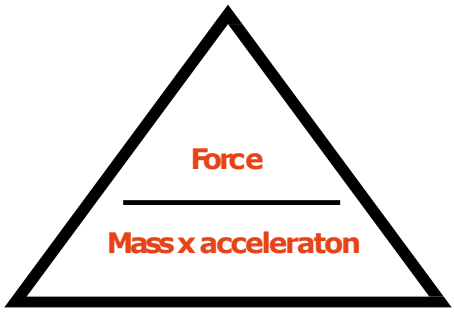


Calculate the speed of an object down the zip wire using the formula: speed = distance ÷ time.



Calculate the acceleration of an object down the zip wire using the formula: acceleration = (final velocity – initial velocity) ÷ time.

E.G. if an object accelerates down the zip wire from 0 m/s to 12 m/s in 10 seconds, its acceleration rate is 12m/s ÷ 10s = 1.2m/s².



Calculate the force required to move an object down a zip wire using the formula:

force = mass x acceleration (f=ma).