

## Forces 1

### What's the science story?

Force is a useful idea because it is the key to explaining changes in the motion of an object or in its shape. The motion of an object can be explained or predicted if you know the sizes and directions of all the forces that act on it. Understanding forces helps us to predict and control the physical world around us.

### Previous knowledge:

KS2:

Year 5 – Forces (air/water resistance, friction. gears, pulleys, levers)

### Next steps...

**KS3**

Year 8 – Speed and Pressure

Year 9 – Forces 2

**KS4**

P5 – Forces



### Keywords

Force  
Push  
Pull  
Twist  
Interact  
Newton  
Contact  
Non-contact  
Interaction

Balanced  
Unbalanced  
Resultant  
Newtons  
Free body  
Pairs  
Drag  
Friction  
Opposite

Drag  
Water resistance  
Air resistance  
Particles  
Terminal velocity  
Collide  
Streamlined  
Resistance  
Exert  
Upthrust

Density  
Volume  
Width  
Mass  
Floating  
Sinking  
Lever  
Pivot  
Moment

Variable  
Method  
Risk  
Analysis  
Interpret  
Conclusion

### Working scientifically skills:

WS8 – writing and evaluating a given method  
WS9 – Writing and identifying variables  
WS10 - Selecting and using equipment properly  
WS11 – Identifying hazards, risks and precautions  
WS13 – Introduce construct own results table  
WS14 - drawing a line graph  
WS15 – Calculating an average  
WS16 – Use a given equation including rearrangement (density, volume and moments)  
WS17 – Writing a conclusion using evidence

### Assessments:

Exit tickets x 2/3 (formative)

- **Details of each exit ticket**
- ET Naming forces**
- ET Resultant force**
- ET Friction**

**KS3 – Year 7**

Lesson No. and Title	Learning objectives	National Curriculum/Working Scientifically skill	Practical equipment
1. Types of forces	ARE – To describe the main types of forces. AGD – To explain the effect forces can have on different objects.	<ul style="list-style-type: none"> <li>forces as pushes or pulls, arising from the interaction between 2 objects</li> <li>forces measured in newtons, measurements of stretch or compression as force is changed</li> </ul>	PRAC: Forces circus (made up into trays) 1. Magnets x 10 2. Ice cubes, wooden blocks 3. ping pong balls and fan 4. Pieces of paper 5. Balloons 6. Tank of water, plasticine (lots)
2. Contact and non-contact	ARE – To describe forces as either contact or non-contact. AGD – To explain the difference between contact and non-contact forces.	non-contact forces	PRAC: Contact and non-contact Balloons, Magnets, cupcake cases
3. Balanced and unbalanced	ARE – To calculate resultant forces from a force diagram. AGD – To explain the effects of balanced and unbalanced forces.	<ul style="list-style-type: none"> <li>using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces</li> </ul>	
4. Free body diagrams	ARE – To construct an accurate free body diagram. AGD – To justify the importance of drawing free body diagrams accurately.	<ul style="list-style-type: none"> <li>using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces</li> </ul>	
5. Interaction pairs	ARE – To describe what is meant by an interaction pair. AGD – To identify and explain the interaction pair in given examples.	<ul style="list-style-type: none"> <li>forces as pushes or pulls, arising from the interaction between 2 objects</li> <li>using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces</li> </ul>	PRAC: Interaction pairs Skateboard? Small pedal bikes, Newton meters

**KS3 – Year 7**

6a. Helicopters - Plan	ARE – To describe the different variables in an investigation. AGD – To evaluate a given method and state improvements.	WS8 – writing and evaluating a given method WS9 – Writing and identifying variables WS10 - Selecting and using equipment properly WS13 – Introduce construct own results table	
6b. Helicopters - investigate	ARE – To explain the results of an investigation. AGD – To analyse and present data from an investigation.	WS14 - drawing a line graph WS17 – Writing a conclusion using evidence	PRAC: Helicopters Templates, paperclips (lots), stop watches
7. Friction	ARE – To explain how friction happens. AGD – To explain the effect of friction in terms of forces.	<ul style="list-style-type: none"> <li>forces: with rubbing and friction between surfaces</li> </ul>	
8a. Friction - Plan	ARE – To describe the different variables in an investigation. AGD – To evaluate a given method and state improvements.	<ul style="list-style-type: none"> <li>forces: with rubbing and friction between surfaces</li> </ul> WS8 – writing and evaluating a given method WS9 – Writing and identifying variables WS10 - Selecting and using equipment properly WS13 – Introduce how to construct own results table	
8b. Friction - Investigate	ARE – To explain the results of an investigation. AGD – To analyse and present data from an investigation.	<ul style="list-style-type: none"> <li>forces: with rubbing and friction between surfaces</li> </ul> WS11 – Identifying hazards, risks and precautions WS14 - drawing a line graph WS15 – Calculating an average WS17 – Writing a conclusion using evidence	PRAC: Friction Different ramps each covered with different materials (sandpaper, plastic, foam, bubble wrap etc), toy cars, stop watches
9a. Water/air resistance - Plan	ARE – To explain what causes water and air resistance. AGD – To explain the effect of drag on sky divers.	<ul style="list-style-type: none"> <li>Forces: with pushing things out of the way; resistance to motion of air and water</li> </ul>	DEMO: Water/air resistance Trough of water, paper

**KS3 – Year 7**

9b. Water/air resistance - Investigate	ARE – To explain the results of an investigation. AGD – To analyse and present data from an investigation.	<ul style="list-style-type: none"> <li>using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces</li> </ul> WS9 – Writing and identifying variables WS11 – Identifying hazards, risks and precautions WS14 - drawing a line graph WS17 – Writing a conclusion using evidence	PRAC: Parachutes Lots of plastic bags/bin bags, string, 10g masses, metre sticks, stop watches
10. Streamlining	ARE – To describe the term streamlined using examples. AGD – To explain how streamlining can affect the speed of an object.	<ul style="list-style-type: none"> <li>using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces</li> </ul> WS8 – evaluating a given method WS9 – Writing and identifying variables WS15 – Calculating an average WS17 – Writing a conclusion using evidence	PRAC: Streamlining 100ml measuring cylinders, plasticine, stop watch, wallpaper paste, small tubs to collect any spills
11. Floating	ARE – To explain why some objects sink and some float. AGD – To analyse data to explain if upthrust depends on the liquid.	<ul style="list-style-type: none"> <li>forces measured in newtons, measurements of stretch or compression as force is changed</li> <li>upthrust effects, floating and sinking</li> </ul> WS9 – Writing and identifying variables WS17 – Writing a conclusion using evidence	DEMO: Floating 400ml beaker, polystyrene, rock PRAC: Floating and different liquids 250ml beakers, 4 difference liquids; water, wallpaper paste, syrup/oil) Newton meters, 10g masses
12. Density	ARE – To explain density. AGD – To calculate density and apply to whether an object will sink or float.	<ul style="list-style-type: none"> <li>forces: with pushing things out of the way; resistance to motion of air and water</li> <li>upthrust effects, floating and sinking</li> </ul> WS10 – using measuring equipment correctly WS16 – Use a given equation (density and volume)	PRAC: Density Blocks of different shapes and sizes, balances, tubs for water. rulers
13. Moments	ARE – To describe the term moment. AGD – To calculate the moment of a range of examples.	<ul style="list-style-type: none"> <li>moment as the turning effect of a force</li> </ul> WS16 – Use a given equation with rearrangement (moments)	DEMO: Range of levers? PRAC: Moments See saws and masses, balances