

Topic 4: 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

Lesson No. and Title	Learning objectives - Knowledge	National Curriculum	Working Scientifically skills	Practical equipment
1. Types of forces	<p>ARE – To describe the main types of forces.</p> <p>AGD – To explain the effect forces can have on different objects.</p>	<ul style="list-style-type: none"> forces as pushes or pulls, arising from the interaction between 2 objects forces measured in newtons, measurements of stretch or compression as force is changed 	REPAIR	<p>PRAC: Forces circus (made up into trays)</p> <ol style="list-style-type: none"> 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	<p>ARE – To describe forces as either contact or non-contact.</p> <p>AGD – To explain the difference between contact and non-contact forces.</p>	non-contact forces	CONNECT	<p>PRAC: Contact and non-contact</p> <p>Balloons, Magnets, cupcake cases</p>
3. Balanced and unbalanced	<p>ARE – To calculate resultant forces from a force diagram.</p> <p>AGD – To explain the effects of balanced and unbalanced forces.</p>	<ul style="list-style-type: none"> using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces 	REHEARSE	REMEMBER
4. Free body diagrams	<p>ARE – To construct an accurate free body diagram.</p> <p>AGD – To justify the importance of drawing free body diagrams accurately.</p>	<ul style="list-style-type: none"> using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces 	APPLY	PERFORM

KS3 – Year 7

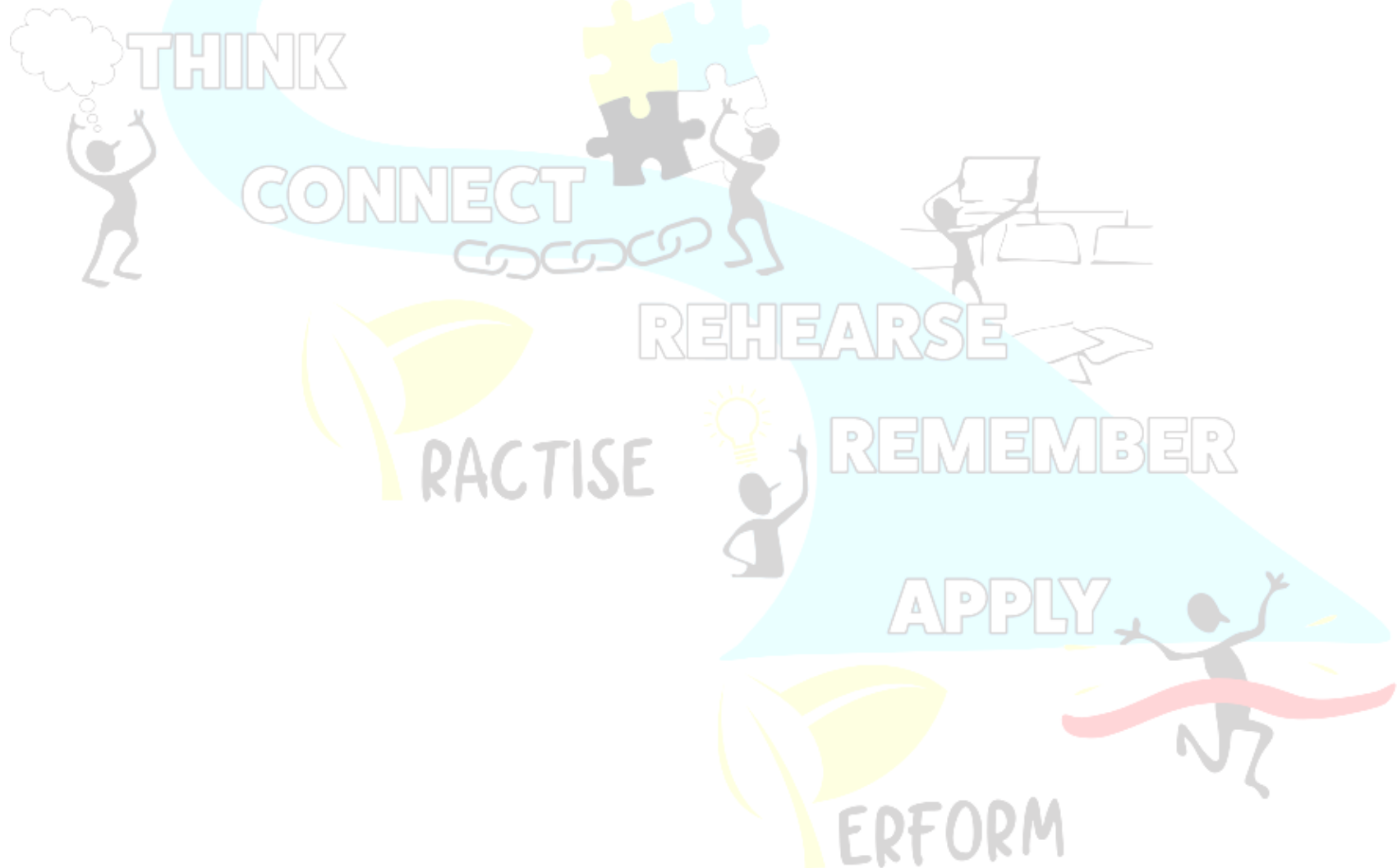
5. Interaction pairs	<p>ARE – To describe what is meant by an interaction pair.</p> <p>AGD – To identify and explain the interaction pair in given examples.</p>	<ul style="list-style-type: none"> forces as pushes or pulls, arising from the interaction between 2 objects using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces 		<p>PRAC: Interaction pairs</p> <p>Skateboard? Small pedal bikes, Newton meters</p>
Assessment 1: Forces				
6a. Helicopters - Plan	<p>ARE – To describe the different variables in an investigation.</p> <p>AGD – To evaluate a given method and state improvements.</p>		<p>WS8 – writing and evaluating a given method</p> <p>WS9 – Writing and identifying variables</p> <p>WS10 - Selecting and using equipment properly</p> <p>WS13 – Introduce construct own results table</p>	
6b. Helicopters - investigate	<p>ARE – To explain the results of an investigation.</p> <p>AGD – To analyse and present data from an investigation.</p>		<p>WS14 - drawing a line graph</p> <p>WS17 – Writing a conclusion using evidence</p>	<p>PRAC: Helicopters</p> <p>Templates, paperclips (lots), stop watches</p>
7. Friction	<p>ARE – To explain how friction happens.</p> <p>AGD – To explain the effect of friction in terms of forces.</p>	<ul style="list-style-type: none"> forces: with rubbing and friction between surfaces 		
8a. Friction - Plan	<p>ARE – To describe the different variables in an investigation.</p> <p>AGD – To evaluate a given method and state improvements.</p>	<ul style="list-style-type: none"> forces: with rubbing and friction between surfaces 	<p>WS8 – writing and evaluating a given method</p> <p>WS9 – Writing and identifying variables</p> <p>WS10 - Selecting and using equipment properly</p> <p>WS13 – Introduce how to construct own results table</p>	

KS3 – Year 7

8b. Friction - Investigate	<p>ARE – To explain the results of an investigation.</p> <p>AGD – To analyse and present data from an investigation.</p>	<ul style="list-style-type: none"> forces: with rubbing and friction between surfaces 	<p>WS11 – Identifying hazards, risks and precautions</p> <p>WS14 - drawing a line graph</p> <p>WS15 – Calculating an average</p> <p>WS17 – Writing a conclusion using evidence</p>	<p>PRAC: Friction</p> <p>Different ramps each covered with different materials (sandpaper, plastic, foam, bubble wrap etc), toy cars, stop watches</p>
9a. Water/air resistance - Plan	<p>ARE – To explain what causes water and air resistance.</p> <p>AGD – To explain the effect of drag on sky divers.</p>	<ul style="list-style-type: none"> Forces: with pushing things out of the way; resistance to motion of air and water 		<p>DEMO: Water/air resistance</p> <p>Trough of water, paper</p>
9b. Water/air resistance - Investigate	<p>ARE – To explain the results of an investigation.</p> <p>AGD – To analyse and present data from an investigation.</p>	<ul style="list-style-type: none"> using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces 	<p>WS9 – Writing and identifying variables</p> <p>WS11 – Identifying hazards, risks and precautions</p> <p>WS14 - drawing a line graph</p> <p>WS17 – Writing a conclusion using evidence</p>	<p>PRAC: Parachutes</p> <p>Lots of plastic bags/bin bags, string, 10g masses, metre sticks, stop watches</p>
10. Streamlining	<p>ARE – To describe the term streamlined using examples.</p> <p>AGD – To explain how streamlining can affect the speed of an object.</p>	<ul style="list-style-type: none"> using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces 	<p>WS8 – evaluating a given method</p> <p>WS9 – Writing and identifying variables</p> <p>WS15 – Calculating an average</p> <p>WS17 – Writing a conclusion using evidence</p>	<p>PRAC: Streamlining</p> <p>100ml measuring cylinders, plasticine, stop watch, wallpaper paste, small tubs to collect any spills</p>
11. Floating	<p>ARE – To explain why some objects sink and some float.</p> <p>AGD – To analyse data to explain if upthrust depends on the liquid.</p>	<ul style="list-style-type: none"> forces measured in newtons, measurements of stretch or compression as force is changed upthrust effects, floating and sinking 	<p>WS9 – Writing and identifying variables</p> <p>WS17 – Writing a conclusion using evidence</p>	<p>DEMO: Floating</p> <p>400ml beaker, polystyrene, rock</p> <p>PRAC: Floating and different liquids</p> <p>250ml beakers, 4 difference liquids; water, wallpaper paste, syrup/oil)</p> <p>Newton meters, 10g masses</p>
12. Density	<p>ARE – To explain density.</p> <p>AGD – To calculate density and apply to whether an object will sink or float.</p>	<ul style="list-style-type: none"> forces: with pushing things out of the way; resistance to motion of air and water upthrust effects, floating and sinking 	<p>WS10 – using measuring equipment correctly</p> <p>WS16 – Use a given equation (density and volume)</p>	<p>PRAC: Density</p> <p>Blocks of different shapes and sizes, balances, tubs for water. rulers</p>

Assessment 2: Floating

13. Moments	<p>ARE – To describe the term moment.</p> <p>AGD – To calculate the moment of a range of examples.</p>	<ul style="list-style-type: none"> moment as the turning effect of a force 	<p>WS16 – Use a given equation with rearrangement (moments)</p>	<p>DEMO: Range of levers?</p> <p>PRAC: Moments</p> <p>See saws and masses, balances</p>
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Assessment Criteria

Assessment No. & Title	Working Towards	Age Related Expectations	At Greater Depth
1. Forces	Identify some forces acting on objects in everyday situations	Describe what is meant by an interaction pair	Explain the difference between contact and non-contact forces
	Identify an interaction pair		
n/a	State an example of a force deforming an object.	Describe how forces deform objects	Explain how solid surfaces provide a support forces.
	Recognise a support force		
n/a	Identify examples of drag forces and friction	Explain why drag forces and friction arise	Explain the effect of drag forces and friction in terms of forces
2. Floating	Describe characteristics of some objects that float and some that sink	Explain why some things float and some things sink, using force diagrams	Explain why an object will float or sink in terms of force or density