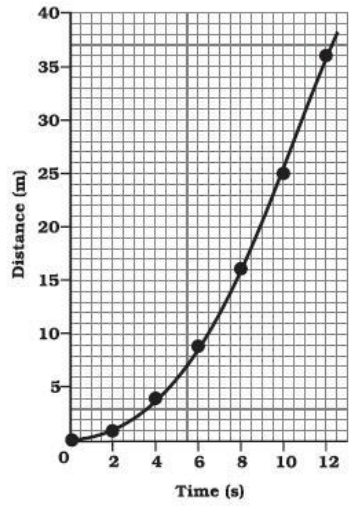
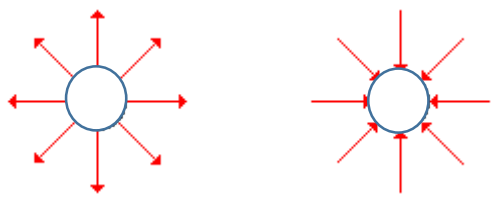
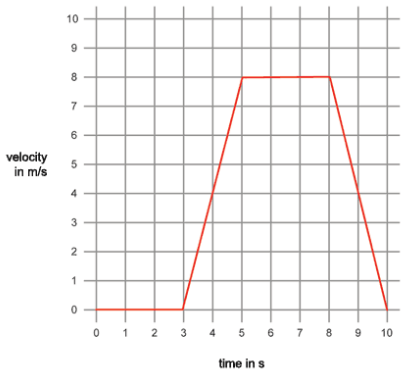
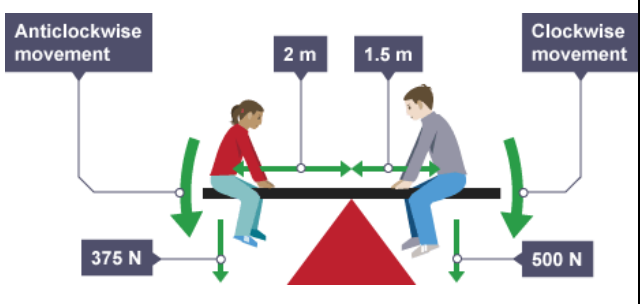
Physics Forces and Motion, Static and Space

%	I can…	Prove it!
70%	**3.7 Calculate average speed for non-uniform motion** **4.2 Draw tangents on a distance time graph to determine speed of an accelerating object (triple only)** **5.1 Apply the equation $v^2-u^2=2as$ (For moving and falling objects) [Newton's equations of motion]** **7.4 Explain how levers and gears transmit the rotational effects of levers and gears (triple only)** **8.3 Describe and explain the effect of electric fields (triple only)** **8.4 Draw an electric field pattern for an isolated charged sphere (triple only)** **8.5 Link the concept of electric fields to electrostatic phenomena (triple only)** **8.2 Explain why electrically charged objects attract or repel (triple only)** **9.5 Explain how planets and satellites maintain their circular orbits (triple only)** **9.6 Link gravity and velocity in circular orbits (triple only)** **9.7 Link radius and speed in stable orbits (triple only)** **9.9 Explain the effects of red-shift (triple only)** **9.10 Explain how red-shift provides evidence for the big bang theory (triple only)** **9.11 Explain how recent observations provide evidence for the expanding universe (triple only)** **2.3 Use vector diagrams to illustrate the resolution of forces and determine resultant forces (scale drawings)**	1. Use the distance-time graph to find the speed at 5sec. You must draw a tangent onto the curve to show how you found the answer.  2. An object accelerates from 2m/s to 6m/s over a distance of 8m. Use the equation $v^2 - u^2 = 2as$ to find the acceleration of the object. 3. A car mechanic wants to turn a tight nut in the engine of a car and she cannot decide whether or not to use a long handle spanner or a short handle spanner. Write three sentences explaining which one she should use and why. 4. Complete the diagram to show the electric field pattern for an isolated sphere by adding either a + or - sign to the centre of each sphere:  5. Complete the summary about electric fields using these words: **charge, closest, charged, weaker, positive** An electric field will exert a force on a _____ object. The electric field is strongest _____ to the charged object. Further away from the object the charge is _____. The direction of the field is towards the _____ charge. You can increase the strength of a field by adding more _____. 6. Use your knowledge about electric fields to explain why an ionic bond is formed. 7. Draw a labelled diagram to show how planets remain in orbit around our Sun. use these words in your annotations: **Earth, velocity, speed, constant, accelerates, Sun, direction, change, gravity** 8. Show that the orbital speed of Earth is **2.6 million km/day** using the following information: **orbital speed** = $\frac{2 \times \pi \times r}{T}$ **r = radius of Earth (150 million km)** **T = time taken to orbit the Sun once** 9. Explain what is meant by the term 'red-shift'. **You may use a diagram and the following words: light waves, moving, away, wavelength, longer, red, spectrum.** 10. Give three pieces of evidence for the red-shift. 11. Draw a vector diagram to show the forces and resultant force acting on a plane flying through the air at a constant speed.

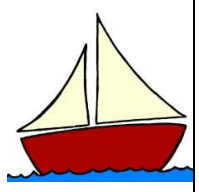
Physics Forces and Motion, Static and Space

%	I can…	Prove it!
60%	**1.7 Explain how to measure weight using a calibrated spring balance (i.e. a Newton meter)** **3.9 Describe circular motion (triple only)** **4.4 Estimate the magnitude of every day acceleration** **5.3 Explain the acceleration of objects through fluids (terminal velocity) – making reference to parachutes travelling through air** **6.2 Explain the concept of inertia (triple only)** **6.4 Define inertial mass (triple only)** **7.1 Describe examples in which forces cause rotation (triple only)** **7.3 Describe moments for a balanced object (triple only)** **8.1 Explain how insulating materials can become electrically charged (triple only)** **9.8 Explain what the big bang theory is (triple only)** **9.3 Explain the life cycle of a star making reference to our sun and stars more massive than our sun (triple only)** **9.4 Explain how elements are made in our solar system (triple only)**	1. Design an investigation to find out how to measure the weight of ten different objects using a Newton meter. Include your equipment list and a method. 2. Explain why the Earth stays in orbit around the Sun using what you know about circular motion. 3. Use the diagram (beside) to describe what is happening to the sky diver at each stage as the sky diver falls through the air. You must label the forces and describe what is happening to these forces at each arrow and how it is affecting the motion of the sky diver. 4. Complete the following explanation of inertia using these key words: **unbalanced, inactivity, motion, constant, rest, change** Inertia is the Latin word for _____. It means that an object will remain in its existing state of _____ (either at ____ or moving at a _____ speed) unless an _____ force acts on it. The inertial mass is how difficult it is to _____ its velocity. 5. If an object is balanced, the total clockwise moment about its pivot equals the what? Use your knowledge of moments to answer the question. 6. Explain how you could cause a polythene rod to become electrically charged using a dry rod and draw a diagram to help you. 7. Make a flow chart to show the stages in the Big Bang. 8. Draw a life cycle of a star and make sure you include stars of all sizes. As an extension challenge, explain what happens inside stars to make new elements.
50%	**1.6 Describe "the centre of mass"** **3.1 Explain the difference between distance and displacement** **4.3 Use and rearrange the equation a = Δv / t (calculating acceleration)** **4..6 Use velocity time graphs to calculate distance/displacement** **6.5 Estimate the forces involved in large accelerations for every day road transport using - correctly.** **7.2 Define moment and use and rearrange the equation M = F x d (triple only)**	1. Write a definition for 'centre of mass' and draw an 'x' on these objects to show where their centre of mass would be: 2. Write a definition for the following two words: distance and displacement. 3. Find the acceleration of a car which reaches 12.5m/s in only 5seconds. Include the correct units. 4. Use the velocity-time graph below to calculate the distance travelled. 5. Calculate the turning moment of each person in the diagram.





Physics Forces and Motion, Static and Space

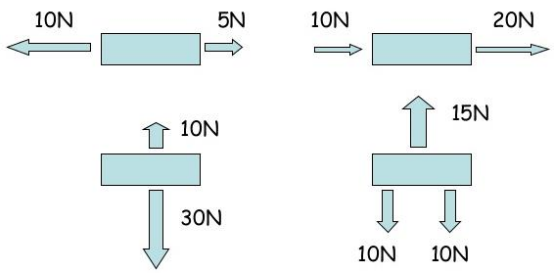
%	I can…	Prove it!
40%	**1.2 Use arrows to represent vector quantities** **1.4 Define weight and gravity** **1.5 Use W=m x g** **3.6 Use and rearrange s = v t (speed = d/t equation!)** **4.1 Draw and interpret distance time graphs and use these to determine speed** **4.5 Draw and interpret velocity time graphs in order to calculate acceleration** **5.4 Draw and interpret velocity time graphs for objects that reach terminal velocity** **6.1 Describe and explain Newton's first law** **6.3 Describe and explain Newton's second law using F = m a** **6.7 Describe and explain Newton's third law** **9.1 Describe the main parts of the solar system (triple only)** **9.2 Describe similarities and differences between planets, moons and artificial satellites (triple only)**	1. Add arrows to this diagram to show the magnitude and direction of the forces and label the name of each force:  2. Write a definition for each of the following key words: weight and gravity. 3. An astronaut with a mass of 80kg stands on the moon. The moon has a gravitational field strength of 1.6N/kg. What is his weight? 4. a. Draw a distance-time graph from this data table: b. Use your graph to determine the average speed of the object at 2.5 seconds. 5. a. Draw a velocity-time graph using the data in the table: b. Use the graph to calculate the acceleration of the object between 0s and 3s. 6. Sketch a velocity-time graph to show the motion of a skydiver who reaches terminal velocity. 7. Write a paragraph explaining what Newton's first law of motion is. 8. If a car has a mass of 1200kg and a resultant forward force of 500N, calculate its acceleration using F=ma. 9. What did Newton mean when he said 'For every action there is an equal and opposite reaction'? You could draw a force diagram to help explain this. 10. Draw a labelled diagram of the Solar System. 11. Complete this table to show the similarities and differences between objects in our Solar System:

Time (s)	Position (m)
0	0
1	6
2	12
3	18
4	24

Time (s)	Velocity (m/s)
0	0
1	5
2	10
3	15
4	15
5	15
6	15
7	10
8	5
9	0

Object	Description	Similarities	Differences
planets			
moons			
artificial satellites			

Physics Forces and Motion, Static and Space

%	I can…	Prove it!
30%	**1.1 Define scalar and vector quantities** **1.3 Define contact and non-contact forces giving examples of each** **2.1 Calculate and define resultant forces** **2.2 Use free body diagrams to show forces** **3.2 Define 'speed' and explain factors that affect the speed a person walks, runs or cycles at (including average speeds for these activities)** **3.3 Recall typical speeds for different types of transportation (TBC – bus, train, car, aeroplane!) using ~ correctly.** **3.4 Recall the speed of sound in air** **3.5 State that most moving objects have varying speed including sound, wind, travelling people** **3.8 Define 'velocity'** **5.2 Recall the value for acceleration due to gravity**	1. Write a definition for the terms vector and scalar. 2. Decide if each of these is a vector or scalar quantity: number of apples, velocity, height, speed, drag, acceleration. 3. Calculate the resultant forces in these diagrams and give their directions:  4. Decide which person will have the fastest speed on their journey: a. A 60 year old man who has to walk uphill to get to his bus stop. b. A 20 year old woman who has to walk downhill to get to her bus stop. 5. Complete the table to show what speed each activity or object is approximately (~) equal to: **Activity** / **~ speed (m/s)** walking running cycling aeroplane bus train car 6. Give the speed of sound in air. 7. Write a definition for the word 'velocity'. 8. What is the acceleration due to gravity on Earth? _____ m/s^2

Key Terms

Acceleration Braking distance Centre of gravity Deceleration Elastic Electrostatic force Equilibrium Extension Force Free fall Friction Gradient Gravitational field strength Mass Moment Pivot or fulcrum Resultant force Speed Terminal velocity Thinking distance Velocity Weight Satellite Galaxy Universe Balanced Force Unbalanced Force Conservation of Momentum Momentum Vector Scalar Gravity Resultant Force Displacement Static electricity Red Shift The Big Bang Nebula Red Giant Supernova