



Forces and Their Effects **Answers**

1. Name the force that is acting in each of the situations described below.

The force of the water acting on a boat that keeps it afloat.	upthrust
The force of the table acting on a cup that is resting on the table.	reaction
The force that keeps a car on the ground.	gravitational force
The force that holds up a decoration that is hanging from a string.	tension
The force that causes a paperclip to be attracted to a magnet.	magnetic force
The force of the air acting on a moving bus.	air resistance
The force that holds together sodium and chloride ions to make salt.	electrostatic force
The force of the doormat on your shoes when you wipe your feet.	friction

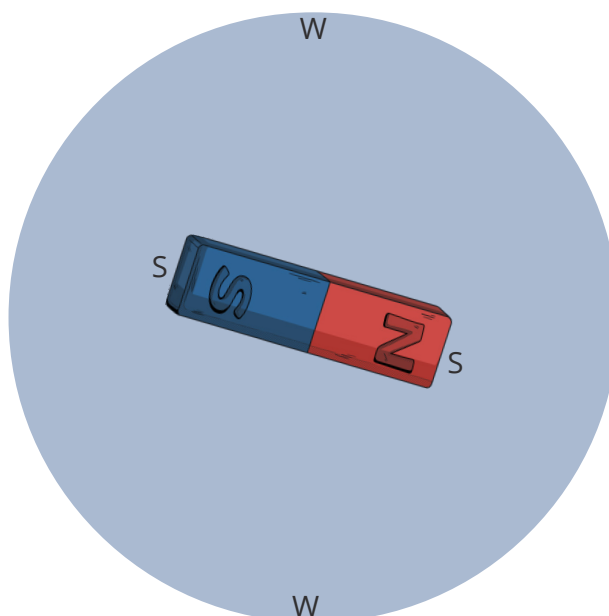
Contact and Non-Contact Forces **Answers**

1. Tick the correct box in the table below to identify the contact and non-contact forces. There are three non-contact forces.

Force	Contact	Non-Contact
upthrust	✓	
air resistance	✓	
electrostatic		✓
tension	✓	
magnetic		✓
reaction	✓	
water resistance	✓	
gravitational		✓
friction	✓	

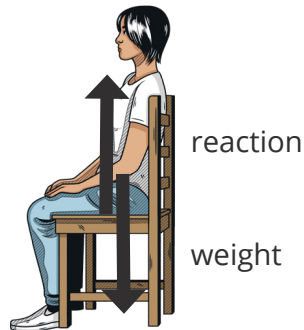
2. The diagram shows a magnet, surrounded by its magnetic field. Write a letter S where the magnetic force is the strongest and a letter W where the magnetic force is the weakest.

The S should be placed at a point closest to the magnet and the W should be placed around the edge of the circle.



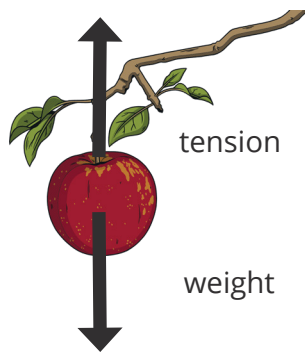
Force Diagrams **Answers**

Add force arrows to the diagrams below. Label the arrows with the force and add a description that says whether the forces are balanced or unbalanced.



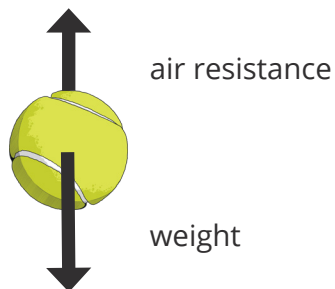
A person sitting on a chair.

The weight of the person and the reaction force of the chair are balanced.



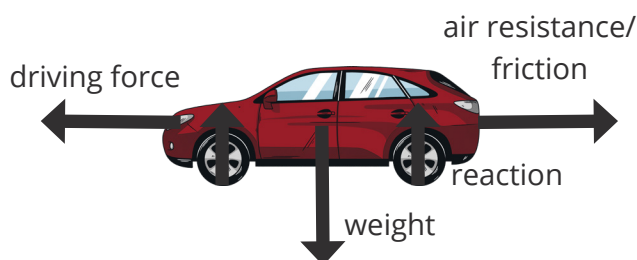
An apple hanging on a tree.

The weight of the apple and the tension of the branch are balanced.



A ball accelerating downwards.

The weight of the ball is larger than the air resistance on the ball so the forces are unbalanced.



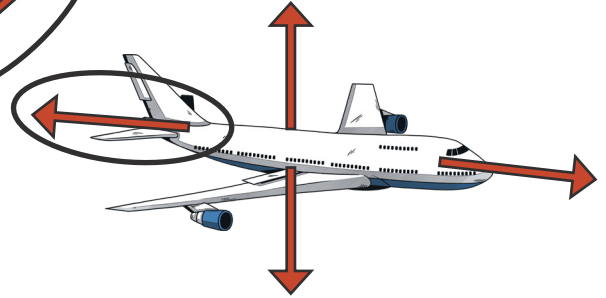
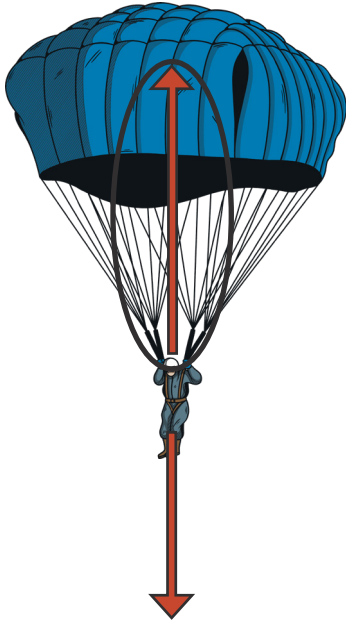
A car travelling at a constant speed.

The weight of the car and the reaction force of the ground are balanced.

The driving force of the engine and the resistive forces (air resistance and friction) are balanced.

Resistive Forces **Answers**

1. On each force diagram below, circle the resistive force(s).



2. Explain why carpet will slow down a toy car faster than tiles

Carpet is a rougher surface than tiles, which means it has more grip on the toy car. This increases the force of friction, which slows down the car faster.



Calculating the Mean **Answers**

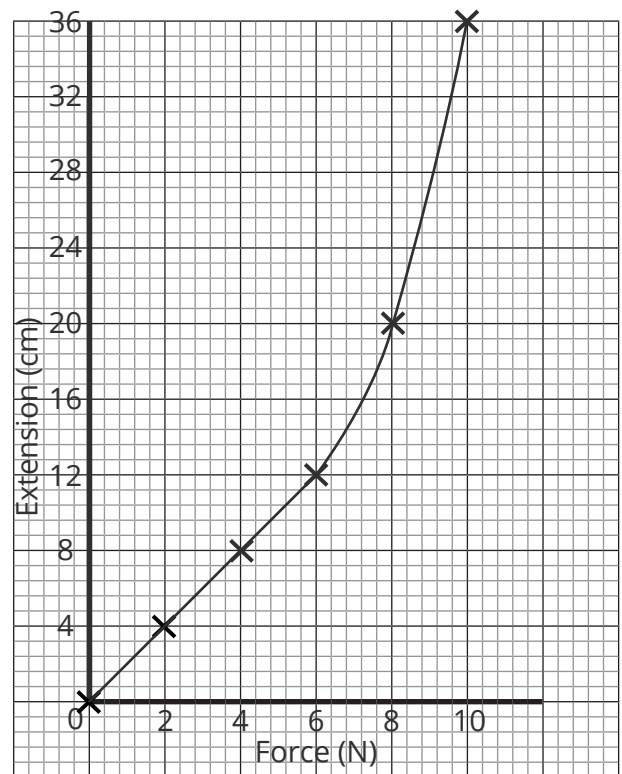
Calculate the mean distance the ball travelled for the other surfaces in the table below.

Surface	Distance Travelled (cm)			
	Repeat 1	Repeat 2	Repeat 3	Mean
grass	120	113	118	117
concrete	310	307	301	306
wooden decking	280	290	282	284
carpet	180	184	183	182

Using Data to Draw a Graph **Answers**

1. Plot the points on this graph. The first two points have been plotted for you.

Force (N)	Extension (cm)
0	0
2	4
4	8
6	12
8	20
10	36



The line of best fit is the most reasonable continuous line determined by the points; it helps to visualise the relationship between variables by averaging out any errors. The line may not pass through every point and may not be a straight line.

2. Add a line of best fit to the graph you plotted above.

3. Use your graph to predict the extension when a force of 3N is added to the spring

6cm



Planning an Investigation **Answers**

Two students wanted to investigate how the material of a parachute affects the time it takes for an object to fall.

The students have four types of material available: bin bags, felt, paper and cotton.

They have a wooden block with a hook, string, sticky tape and a timer.

Plan the investigation. Make sure you state the independent variable, the dependent variable and the control variables. Use the information on the front of the sheet to help you structure your plan.

Marking points:

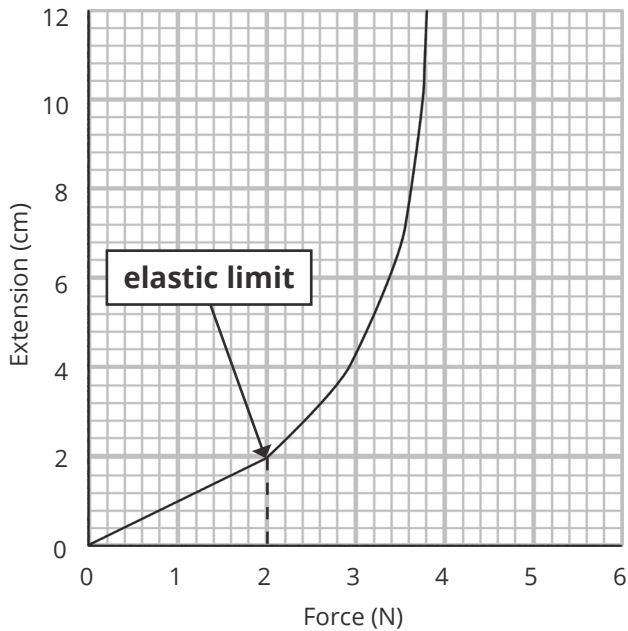
- The independent variable is the material used to make the parachute.
- The four materials have been listed.
- The dependent variable is the time taken for the parachute to fall.
- The time taken for the parachute to fall is measured using the timer.
- The control variables are: the size of the parachute, the height the parachute is dropped from, the length of the string used to attach the block.
- The investigation is repeated three times for each material.
- The mean time taken for the parachute to fall is calculated for each material.



Hooke's Law **Answers**

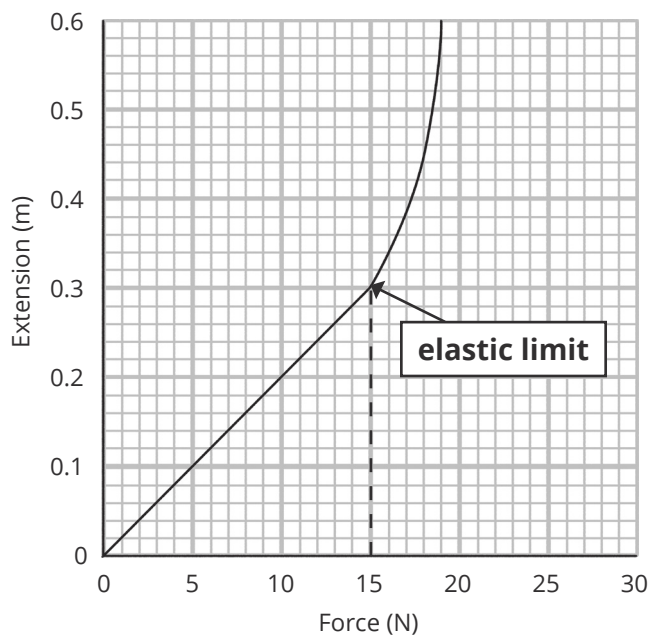
Draw the example graphs below on a sheet of paper. Label the elastic limit in each of the example graphs and write down the maximum force that could be applied to the spring to ensure it can return to its original size underneath each graph.

1.



maximum force = **2N**

2.



maximum force = **15N**



Mass and Weight **Answers**

1. Of the planets in our Solar System, Mercury has the smallest mass and Jupiter has the largest mass.

Explain how the mass and weight of an object would be different on Jupiter compared to on Mercury.

The weight will increase because Jupiter has a larger mass and therefore a larger gravitational field strength. The mass would stay the same because it is not affected by the mass of the planet.

To calculate weight, we use the equation:

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

An object on Earth has a mass of 5kg. The gravitational field strength on Earth is 10N/kg.

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

$$\text{weight} = 5\text{kg} \times 10\text{N/kg}$$

$$\text{weight} = 50\text{N}$$

2. An object on the Moon has a mass of 0.6kg. The gravitational field strength on the Moon is 1.6N/kg.

Calculate the weight of the object.

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

$$\text{weight} = 0.6\text{kg} \times 1.6\text{N/kg}$$

$$\text{weight} = 0.96\text{N}$$

$$\text{weight} = \mathbf{0.96\text{N}}$$

3. An object on Jupiter has a mass of 3.4kg. The gravitational field strength on Jupiter is 25N/kg. Calculate the weight of the object.

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

$$\text{weight} = 3.4\text{kg} \times 25\text{N/kg}$$

$$\text{weight} = 85\text{N}$$

$$\text{weight} = \mathbf{85\text{N}}$$



Rearranging Equations **Answers**

1. Use the rearranged equation to calculate the mass of a 4N object on Earth. Earth has a gravitational field strength of 10N/kg.

$$\frac{\text{weight}}{\text{gravitational field strength}} = \text{mass}$$

$$\frac{4\text{N}}{10\text{N/Kg}} = 0.4\text{Kg}$$

$$\text{mass} = \mathbf{0.4\text{kg}}$$

The extension of some elastic objects can be described by Hooke's law.

$$\text{force} = \text{spring constant} \times \text{extension}$$

2. Rearrange the equation to make the spring constant the subject. Use the steps above to help you.

$$\frac{\text{force}}{\text{extension}} = \frac{\text{spring constant} \times \text{extension}}{\text{extension}}$$

$$\frac{\text{force}}{\text{extension}} = \text{spring constant}$$

3. Use the rearranged equation to calculate the spring constant of a spring that has an extension of 0.2m when a force of 5N is applied.

Include the unit.

$$\frac{\text{force}}{\text{extension}} = \text{spring constant}$$

$$\frac{5}{0.2} = 25$$

$$\text{spring constant} = \mathbf{25\text{N/m}}$$