Forces answers

Pages 36–37 Balanced and unbalanced forces

1 a FALSE

b TRUE

c TRUE

d FALSE

e TRUE

2 The chair is pushing up on the person sitting in it with an equal force acting in the opposite direction

3 a A

b B

4 a B

b Because it has the greatest surface area *(1)* so that the force of the persons weight will be spread over the greatest possible area so will reduce the pressure *(1)* and reduce the risk of sinking into the ground

Pages 38–39 Friction

1 a Box A *(1)* Box C *(1)*

b Box A would move to the left *(1)* Box C would move to the right *(1)*

c For the box to move, the push force needs to be greater than the friction force

2 a Suitable friction from picture such as brakes, wheels on ground, etc.

b Suitable friction from picture such a where wheels meet axle, etc.

3 To reduce the friction between the moving parts *(1)* To prevent wear and tear *(1)* To reduce heating *(1)* *(Any 2, 1 mark each)*

4 Wear suitable clothing *(1)* Maintain streamlined position *(1)* Design of sleigh *(1)* *or* any sensible suggestions *(1)* *(Any 3, 1 mark each)*

(1) = 1 mark

Pages 40–41 Streamlining and air resistance

1 Air resistance gets greater as you go faster

2 **a** To move quickly and easily through water as it is harder to move through water than through air

b Increases the top speed *(1)* which means that at any speed the force needed from the engine is less, so less fuel is used *(1)*

3 **a** In all 3 diagrams, the downward arrow representing acceleration due to gravity should be the same

A The upward arrow is quite small as there is little air resistance.

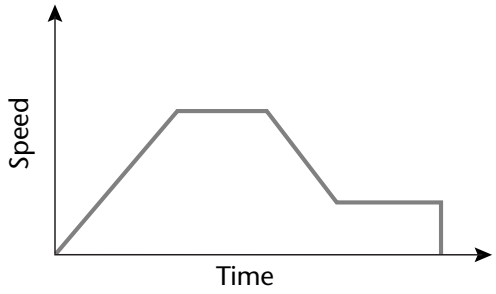
B Upward arrow is greater, almost as large as the downward force arrow as she nears terminal velocity

C Upward arrow increases a lot when the parachute is opened

(1 mark for each correct set of arrows)

b It increases

c

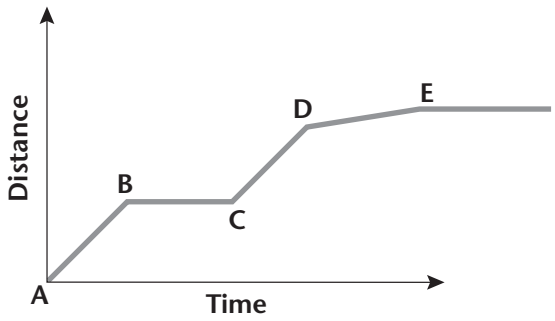


4 Terminal velocity

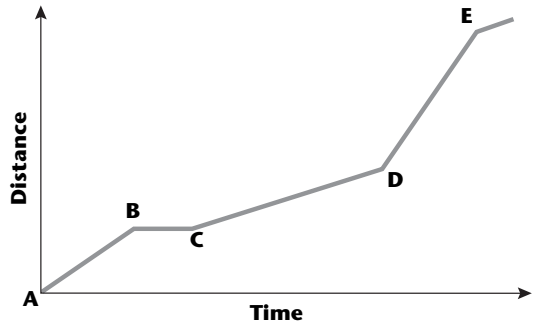
Pages 42–43 Speed and motion

1 **a** B and C

b



2



(5 marks in total, 1 for each section of the graph)

3

Speed (m/s)	Distance (m)	Time (s)
100	200	2
75	**150**	2
150	450	**3**
250	2500	10
250	1000	**4**

(1 for each correct calculation)

4 **a** 20 miles in 40 minutes is 30 miles per hour (mph) *or* 0.5 miles per minute (miles/min)

b A further 30 miles *or* 50 miles in total

c 50 miles at 45 miles per hour would take 60 ÷ 45 × 50 = 66.66 minutes

Pages 44–45 Speed and stopping distance

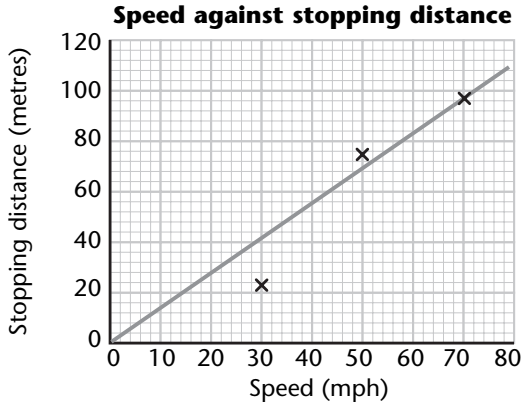
1 A Moving at a steady speed

B Stationary

C Steadily accelerating

D Moving at a steady speed

2



Title *(1)* Axes correctly labelled with appropriate scale *(2)* Line of best fit *(1)*
40 mph stopping distance is approx 60 m
60 mph stopping distance is 80–85 m *(Correct values for graph as drawn)*

3 **a** Smooth tarmac

b 4 m

c 4 m

Pages 46–47 Pressure and moments

1 Area of wardrobe base = 1.5 × 0.75 = 1.125 m^2 *(1)*

Pressure = force ÷ area
= 450 N ÷ 1.125 m^2 *(1)*
= 506.25 N/m^2 *(1)*

2 Moment due to weight of barrier = 30 N × 2 m = 60 Nm *(1)*
Moment to lift barrier will need to be greater than this
For the same moment the weight needed would give a force of:
60 = force × 1.5
Force = 60 ÷ 1.5 = 40 N *(1)*
The force applied to lift the barrier must be greater than 40 N *(1)*
(Allow marks for any specific figure greater than 40 N provided reasoning is sound)

3 **a** Clockwise moment shown by arrow upwards from handle *(1)*
Anticlockwise moment downwards from barrow *(1)*

b Surface area in contact with ground = 80 + 20 + 20 = 120 cm^2

c Force = 300 N + 150 N = 450 N *(1)*
Pressure = force ÷ area
Pressure = 450 N ÷ 120 cm^2 *(1)*
= 3.75 *(1)* N/cm^2 *(1)*

Pages 48–49 Gravity

1 10 newtons (10 N)

2 Towards the centre of the Earth (NOT downwards)

3

	On Earth	In deep space	On the Moon
Mass	**90 kg**	**90 kg**	90 kg
Weight	**900 N**	**0 N**	**150 N**

(1 mark for each correct entry)

4 a It would increase

b A larger planet has a larger gravitational force and as weight depends on mass and gravitational force *(1)* although his mass would stay the same, his weight would increase *(1)*

5 C

6 a Air resistance

b On the moon, there is no atmosphere so there is no air resistance

Pages 50–51 The Earth and beyond

1 The Moon orbits the Earth approximately once every **28 days**. The moon is a **non-luminous** object which we can see because it reflects the light from the Sun which is a **luminous** object.

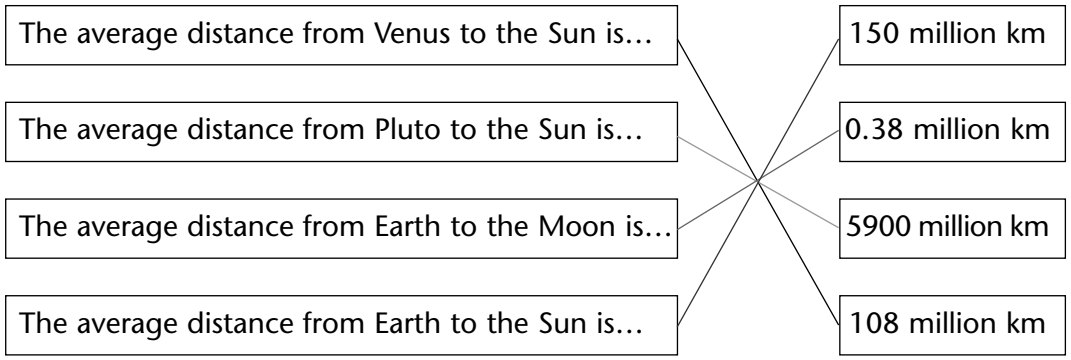
The Earth orbits the Sun approximately once every **365 days**. This length of time gives us our **year**. The Earth is tilted on its axis so different parts of the Earth's surface face towards it at different times in its orbit around the Sun. This is what gives us **summer and winter**. The Earth also rotates on its own axis once every **24 hours** and this is what gives us **day and night**. *(1 mark for each correct choice)*

2 a We can only see the part of the Moon that is facing towards the Sun *(1)* This changes as it orbits around the Earth *(1)*

b The Sun is much bigger than the Moon *(1)* but it is much much further away *(1)*

3 Gravity

4 a



(1 mark for each correct line)

b Pluto

c A sensible suggestion showing that the relative distances from the Sun have been taken into account, i.e. any figure greater than 40

5 The Sun

Pages 52–53 Magnetic forces

1 The suspended magnet will move away from one end of the piece of iron when it is brought close to it *(1)* because a magnet can attract an ordinary iron bar but it can only repel another magnet *(1)*

2 a In an electromagnet, the magnetic field can be switched on and off, in a bar magnet it cannot be controlled in this way

b Because when steel is magnetised it stays magnetised *(1)* so it would not stop being a magnet when the current was turned off *(1)*

3 a When the switch is pushed it completes the circuit and magnetises the iron core *(1)* This magnet attracts the iron bar in the door lock towards it so it moves to the left *(1)*

b When the switch is released, the core is no longer a magnet so the iron bar moves back to the right

c No

d The door lock only works because the electromagnet can attract the iron bar when the circuit is switched on *(1)* If the bolt was made of aluminium, which is not magnetic, this would not happen *(1)*

e Increase the number of turns on the coil *(1)* Increase the current in the wire *(1)*