

Forces and Motion

Types of force, resultant forces, speed, weight, pressure and moments.

Name _____ Date _____ Class _____

Learning objective: I can describe forces and use equations for speed, weight, pressure and moments.

✓ I can identify forces ✓ I can find resultant forces ✓ I can calculate speed and weight

1 Contact or non-contact? Complete the table.

Force	Contact or non-contact?	Example
friction		brakes slowing a bike
gravity (weight)		
air resistance		
magnetism		
upthrust		

2 Resultant forces Work out the size and direction of the resultant force.

1 20 N right and 20 N left

2 50 N right and 30 N left

3 15 N up and 40 N down

3 Balanced or unbalanced? Circle the correct answer.

1 A car travels at a steady 30 mph in a straight line. The forces on it are...

(A) balanced (B) unbalanced

2 A football is kicked and speeds up. The forces on it are...

(A) balanced (B) unbalanced

3 When the forces on an object are balanced, it...

(A) must be still (B) stays still or keeps moving at a steady speed (C) always slows down

Forces and Motion

speed = distance ÷ time · **weight** = mass × gravitational field strength (use $g = 10 \text{ N/kg}$) · **pressure** = force ÷ area · **moment** = force × distance from pivot

4 Speed Find the speed.

1 100 m in 20 s

2 240 m in 30 s

3 1500 m in 300 s

5 Weight on Earth Find the weight.

1 mass 5 kg

2 mass 60 kg

3 mass 0.2 kg

6 Year 9 challenge Show your working.

1 A box weighing 600 N rests on an area of 2 m^2 . What pressure does it exert?

2 A 20 N force is applied 0.5 m from a pivot. What is the moment?

3 A spring stretches 2 cm for every 1 N added. How far will it stretch with 5 N (if it obeys Hooke's law)?

7 Explain it

1 Explain why mass and weight are not the same thing. [2 marks]

2 Explain why a skydiver reaches a steady (terminal) speed. [2 marks]

3 Explain why a sharp knife cuts more easily than a blunt one. [2 marks]

Answer Key

Forces and Motion

Question	Answers
1 Contact or non-contact?	friction – Contact or non-contact?: contact gravity (weight) – Contact or non-contact?: non-contact , Example: an apple falling from a tree air resistance – Contact or non-contact?: contact , Example: a parachute slowing a skydiver magnetism – Contact or non-contact?: non-contact , Example: a magnet picking up paper clips upthrust – Contact or non-contact?: contact , Example: a boat floating on water
2 Resultant forces	1 0 N (balanced); 2 20 N to the right; 3 25 N down
3 Balanced or unbalanced?	1 A (balanced); 2 B (unbalanced); 3 B (stays still or keeps moving at a steady speed)
4 Speed	1 $100 \div 20 = 5 \text{ m/s}$; 2 $240 \div 30 = 8 \text{ m/s}$; 3 $1500 \div 300 = 5 \text{ m/s}$
5 Weight on Earth	1 $5 \times 10 = 50 \text{ N}$; 2 $60 \times 10 = 600 \text{ N}$; 3 $0.2 \times 10 = 2 \text{ N}$
6 Year 9 challenge	1. $600 \div 2 = 300 \text{ N/m}^2 \text{ (Pa)}$ 2. $20 \times 0.5 = 10 \text{ N m}$ 3. 10 cm
7 Explain it	1. Mass is the amount of matter (kg) and is the same everywhere; weight is the force of gravity on that mass (N) and changes with gravitational field strength, e.g. on the Moon. 2. As speed increases, air resistance increases until it equals weight; the forces are balanced, so the speed stays constant. 3. The sharp edge has a much smaller area, so the same force produces a greater pressure.

Teaching note: $g = 10 \text{ N/kg}$ is used for simplicity (more precisely 9.8 N/kg on Earth). Accept other correct examples in the table.