GCSE Maths: Substituting into formulae (Foundation): answers

GCSE Maths - Substitution and Formulae - Foundation - Lesson 8.4

Answers. Final answers to the worksheet questions. Full step-by-step solutions for every question are free at **websink.site/gcse/maths/ch08-substitution-formulae/foundation/substituting-into-formulae/**

Exercise 8D Using formulae (non-calculator) Non-calculator

1 Use each formula to work out the answer.

(a) Area of a rectangle with length 12 cm and width 5 cm: $A = lw$

Answer: 60 cm^2

(b) Perimeter of the same rectangle: $P = 2l + 2w$

Answer: 34 cm

(c) Volume of a cuboid 6 cm by 4 cm by 3 cm: $V = lwh$

Answer: 72 cm^3

(d) Area of a triangle with base 10 cm and height 7 cm: $A = ½bh$

Answer: 35 cm^2

2 Work out each answer. Remember the units.

(a) A cyclist travels 240 km in 3 hours. Speed: $s = d/t$

Answer: 80 km/h

(b) A metal block has mass 540 g and volume 200 cm^3. Density: $D = m/V$

Answer: 2.7 g/cm^3

(c) A force of 600 N acts on an area of 20 m^2. Pressure: $P = F/A$

Answer: 30 N/m^2

(d) A mass of 12 kg has acceleration 4 m/s^2. Force: $F = ma$

Answer: 48 N

3 A car has starting speed u, acceleration a and time t. Its final speed is $v = u + at$. Work out v when

(a) $u = 5$, $a = 3$, $t = 4$

Answer: 17 m/s

(b) $u = 12$, $a = 2$, $t = 6$

Answer: 24 m/s

(c) $u = 0$, $a = 10$, $t = 3$

Answer: 30 m/s

4 The electrical formula $V = IR$ gives the potential difference V volts from the current I amps and the resistance R ohms. Work out V when

(a) $I = 3$ and $R = 8$

Answer: 24 V

(b) $I = 0.5$ and $R = 12$

Answer: 6 V

5 The time, T minutes, needed to cook a joint of meat is $T = 40m + 20$, where m is the mass of the joint in kg. Work out the cooking time for a joint of mass

(a) 1.5 kg

Answer: 80 minutes

(b) 2.5 kg

Answer: 120 minutes

(c) 3 kg

Answer: 140 minutes

6 A formula to change degrees Celsius (C) to degrees Fahrenheit (F) is $F = 1.8C + 32$. Work out F when

(a) $C = 20$

Answer: 68°F

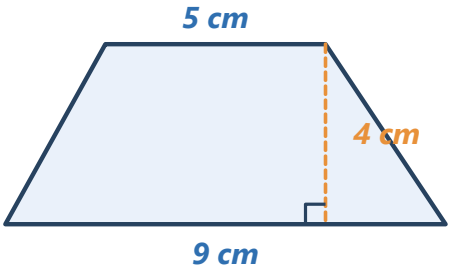
(b) $C = 100$

Answer: 212°F

(c) $C = -40$

Answer: −40°F

7 Work out the area of the trapezium using $A = \frac{1}{2}(a + b)h$.



Answer: 28 cm^2

8 Work out the kinetic energy $E = \frac{1}{2}mv^2$ (in joules) when

(a) $m = 2$ and $v = 6$

Answer: 36 J

(b) $m = 10$ and $v = 3$

Answer: 45 J

(c) $m = 0.5$ and $v = 8$

Answer: 16 J

9 Zoe uses $v = u + at$ with $u = 4$, $a = 3$ and $t = 2$. She writes $v = 7 \times 2 = 14$. Explain her mistake and work out the correct value of v.

Answer: v = 10

10 Car A travels 180 km in 2.5 hours. Car B travels 150 km in 2 hours. Use $s = d/t$.

(a) Work out the average speed of car A.

Answer: 72 km/h

(b) Work out the average speed of car B.

Answer: 75 km/h

(c) Which car has the greater average speed?

Answer: Car B

11 Block X has mass 840 g and volume 300 cm^3. Block Y has mass 620 g and volume 250 cm^3. Use $D = m/V$.

(a) Work out the density of block X.

Answer: 2.8 g/cm^3

(b) Work out the density of block Y.

Answer: 2.48 g/cm^3

(c) Which block is denser?

Answer: Block X

12 The final speed v m/s of an object is $v = \sqrt{(u^2 + 2as)}$. Work out v when

(a) $u = 4$, $a = 3$ and $s = 8$

Answer: 8 m/s

(b) $u = 6$, $a = 2$ and $s = 7$

Answer: 8 m/s

13 Use $P = F/A$ to show that a force of 500 N on an area of 25 m^2 gives the same pressure as a force of 100 N on an area of 5 m^2.

Answer: Both are 20 N/m^2

Exercise 8E Using formulae with a calculator

Calculator allowed

1 Use $A = \pi r^2$ to work out the area of each circle. Give your answers to 1 decimal place.

(a) radius 4.5 cm

Answer: 63.6 cm^2

(b) radius 12 cm

Answer: 452.4 cm^2

(c) radius 0.8 cm

Answer: 2.0 cm^2

2 Use $C = \pi d$ to work out the circumference of each circle. Give your answers to 1 decimal place.

(a) diameter 7.3 cm

Answer: 22.9 cm

(b) diameter 15.6 cm

Answer: 49.0 cm

3 The volume of a cylinder is $V = \pi r^2 h$. Work out the volume of each cylinder, to 1 decimal place.

(a) radius 3.5 cm, height 10 cm

Answer: 384.8 cm^3

(b) radius 2.4 cm, height 7.5 cm

Answer: 135.7 cm^3

4 Usain Bolt ran 100 m in 9.58 seconds. Use $s = d/t$ to work out his average speed in m/s, to 1 decimal place.

Answer: 10.4 m/s

5 A metal sample has mass 84.6 g and volume 12.5 cm^3. Use $D = m/V$ to work out its density. Give your answer to 3 significant figures.

Answer: 6.77 g/cm^3

6 A stone falls from a height of 12 m. Its speed on landing is $v = \sqrt{(2gh)}$, where $g = 9.8$ and h is the height in metres. Work out v to 1 decimal place.

Answer: 15.3 m/s

7 The time for a pendulum of length l metres to swing is $T = 2\pi\sqrt{(l/g)}$ seconds, where $g = 9.8$. Work out T when $l = 1.5$, to 2 decimal places.

Answer: 2.46 seconds

8 The volume of a sphere is $V = \frac{4}{3}\pi r^3$. Work out the volume of a sphere of radius 2.4 cm, to 1 decimal place.

Answer: 57.9 cm^3

9 A circular ring has outer radius $R = 8.5$ cm and inner radius $r = 6.2$ cm. Its area is $A = \pi(R^2 - r^2)$. Work out A to 1 decimal place.

Answer: 106.2 cm^2

10 A cylindrical tin has radius 4.2 cm and height 11.5 cm. Work out its volume, to the nearest cm^3.

Answer: 637 cm^3

11 Use $F = 1.8C + 32$ to change a body temperature of 36.6°C into degrees Fahrenheit. Give your answer to 1 decimal place.

Answer: 97.9°F

12 Sam works out the area of a circle with radius 5 cm by typing $(\pi \times 5)^2$ on his calculator. He gets 246.7. Explain his mistake and work out the correct area, to 1 decimal place.

Answer: 78.5 cm^2

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