

GCSE Maths: Using formulae: problems and reasoning (Higher): answers

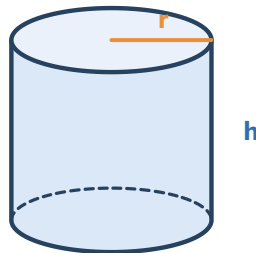
GCSE Maths - Substitution and Formulae - Higher - Lesson 8.9

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/higher/using-formulae-problems-and-reasoning/

Exercise 8J Using formulae: problems and reasoning

Non-calculator

- 1 The volume of a cylinder is $V = \pi r^2 h$.



- (a) Make h the subject.

Answer: $h = \frac{V}{\pi r^2}$

- (b) A cylinder has volume 157 cm^3 and radius 5 cm . Use $\pi = 3.14$ to work out its height.

Answer: 2 cm

- 2 A bicycle wheel has circumference 220 cm . Use $C = \pi d$ with $\pi = \frac{22}{7}$ to work out the diameter of the wheel.

Answer: 70 cm

- 3 A car travels 30 km at 60 km/h and then 60 km at 40 km/h . Use $t = d/s$ to find the time for each part, then work out the average speed for the whole journey.

Answer: 45 km/h

- 4 (a) Make C the subject of $F = \frac{9}{5}C + 32$. (b) Show that -40°C is the same temperature as -40°F .

- (a) Make C the subject

Answer: $C = \frac{5}{9}(F - 32)$

- (b) Show that $-40^\circ\text{C} = -40^\circ\text{F}$

Answer: -40

- 5 The area of a circle of radius r is $A = \pi r^2$. Show that doubling the radius makes the area four times as big.

Answer: New area $= 4\pi r^2 = 4 \times A$

- 6 A car of mass 1200 kg has kinetic energy $E = \frac{1}{2}mv^2$ joules when its speed is $v \text{ m/s}$.

- (a) Work out E when $v = 20$.

Answer: 240000 J

- (b) Work out E when $v = 40$.

Answer: 960000 J

- (c) How many times bigger is the energy when the speed is doubled?

Answer: 4 times

7 Density is $D = m/V$.

- (a) Make m the subject.

Answer: $m = VD$

- (b) Steel has density 7800 kg/m^3 . Work out the mass of 2.5 m^3 of steel.

Answer: 19500 kg

8 Show that the expression $3(x + 2) - 3x - 6$ is always equal to 0, whatever the value of x .

Answer: 0

9 A model for the stopping distance d metres of a car travelling at v metres per second is $d = 0.3v + \frac{v^2}{50}$.

- (a) Work out d when $v = 20$.

Answer: 14 m

- (b) Work out d when $v = 40$.

Answer: 44 m

- (c)

Tom says, "If the speed doubles, the stopping distance doubles." Use your answers to show that Tom is wrong.

Answer: 44 is more than $2 \times 14 = 28$

10 A car speeds up with constant acceleration. Its speeds and distance are linked by $v^2 = u^2 + 2as$.

- (a) Make s the subject.

Answer: $s = \frac{v^2 - u^2}{2a}$

- (b) Work out s when $v = 13$, $u = 5$ and $a = 6$.

Answer: 12 m

11 A rectangle has perimeter 20 cm. Its length is l cm and its width is w cm.

- (a) Show that $w = 10 - l$.

Answer: $w = 10 - l$

- (b)

Write the area A in terms of l only, then complete a table for $l = 1$ to 9 to find the largest whole number area.

Answer: 25 cm^2 when $l = 5$

- 12** Starting with $C = 2\pi r$ and $A = \pi r^2$, show that $A = \frac{C^2}{4\pi}$. Then use $\pi = 3.14$ to work out the area of a circle with circumference 62.8 cm.

(a) Show that $A = C^2/(4\pi)$

Answer: $A = C^2/(4\pi)$

(b) Area when $C = 62.8$ cm and $\pi = 3.14$

Answer: 314 cm²

- 13** The formula $y = 3x + 2$ is rearranged to give $x = \frac{y-2}{3}$. Show that putting this value of x back into $3x + 2$ gives y .

Answer: y