

Higher Check In - 6.02 Algebraic formulae

1. Find the values of $\sqrt{a^2 - 2bc}$ when $a = -1.3$, $b = \frac{1}{4}$ and $c = 2.4$.
2. Given that $V = \frac{1}{3}\pi r^2 h$, find r in terms of V and h .
3. A car travels at u mph for 1 hour and v mph for 2 hours. Write an expression for the average speed of the car.
4. For the following question you may use the formula $s = ut + \frac{1}{2}at^2$ where:
 t = time taken u = initial velocity
 a = acceleration s = distance travelled.

Find the acceleration of a car that travels from rest for 10 seconds, covering a distance of 250 m.

5. Rearrange $\frac{1}{5}m = \frac{3pw + 1}{p - w}$ to make w the subject.
6. The cost, C pence, of x oranges and y apples is given by the formula $C = 15x + 12y$. What does the '15' in this formula represent?
7. The length of a rectangle is l cm, and the diameter is d cm. If the width is w cm, show that $w = \sqrt{d^2 - l^2}$.
8. Show that the formula $2pq = 1 - p$ can be rearranged to $p = \frac{1}{2q + 1}$.
9. In triangle PQR , PQ is 5.2 cm, QR is 7.3 cm and angle PQR is 35° . Find the area of the triangle, giving your answer to 3 significant figures.
10. $DEFG$ is a parallelogram. DE is 8 cm, EF is 3.5 cm and the diagonal EG is 9.2 cm. Find the size of angle DEG to the nearest degree.

Extension

Given the formulae $s = ut + \frac{1}{2}at^2$ and $v = u + at$, show that $v^2 = u^2 + 2as$.



GCSE (9-1) MATHEMATICS

Answers

1. 0.7 and -0.7

2. $r = \sqrt{\frac{3V}{\pi h}}$

3. Total distance = $u + 2v$, total time = 3 hours, so average speed = $\frac{u + 2v}{3}$ mph.

4. Rearranging to make a the subject gives $a = \frac{2(s - ut)}{t^2}$. $a = \frac{2(250 - 0 \times 10)}{10^2} = 5 \text{ ms}^{-2}$

5. $w = \frac{mp - 5}{15p + m}$

6. The cost of an orange in pence.

7. Using Pythagoras' theorem: $d^2 = l^2 + w^2$; $w^2 = d^2 - l^2$; $w = \sqrt{d^2 - l^2}$.

8. $2pq = 1 - p$
 $2pq + p = 1$
 $p(2q + 1) = 1$
 $p = \frac{1}{2q + 1}$

9. $\frac{1}{2} \times 5.2 \times 7.3 \times \sin 35^\circ = 10.9 \text{ cm}^2$

10. 22°

Extension

$$v^2 = (u + at)^2 = u^2 + 2uat + a^2t^2$$

$$u^2 + 2as = u^2 + 2a\left(ut + \frac{1}{2}at^2\right) = u^2 + 2uat + a^2t^2$$

$$\text{So } v^2 = u^2 + 2as$$



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Assessment Objective	Qu.	Topic	R	A	G
AO1	1	Substitute positive and negative numbers into a complex formula			
AO1	2	Rearrange a formula to change the subject where a power of the subject appears			
AO1	3	Formulate an expression from a real-world context			
AO1	4	Use a kinematic formula to work out acceleration			
AO1	5	Rearrange a formula involving algebraic fractions			
AO2	6	Interpret a simple algebraic formula			
AO2	7	Recall and use Pythagoras' theorem			
AO2	8	Rearrange a formula to change the subject where the subject appears twice			
AO3	9	Recall and use the formula for area of a triangle			
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