

M8 PAPER A

ANSWERS

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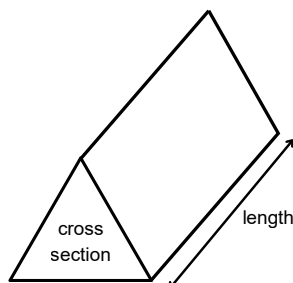
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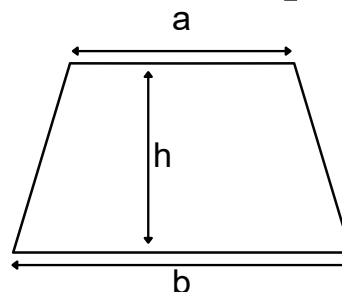


Formula Sheet

Volume of prism = area of cross section $\times$ length

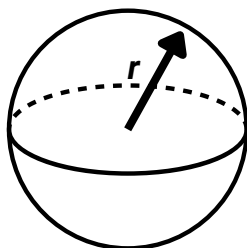


Area of a trapezium = $\frac{1}{2}(a + b)h$



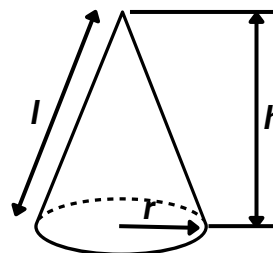
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

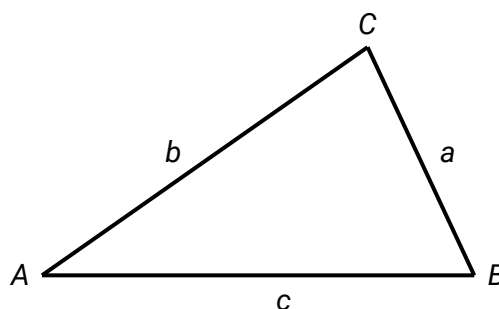


Quadratic Equation

The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

In any triangle ABC



Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule: $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle: $\frac{1}{2}ab \sin C$



1 a) Circle the irrational number



$\sqrt{16}$

$\frac{5}{6}$

$\frac{\pi}{2}$

0.345345

44

[1]

b) Write the recurring decimal $0.454545\dots$ as a fraction in its simplest form.



You must show all your working

$$\begin{aligned} x &= 0.454545 \\ 100x &= 45.4545 \\ 100x - x &= 45 \\ 99x &= 45 \\ x &= \frac{45}{99} = \frac{5}{11} \end{aligned}$$

Answer $\frac{5}{11}$ [3]

2 a) Work out: $64^{-\frac{2}{3}}$

$$\left(\frac{\sqrt[3]{1}}{\sqrt[3]{64}} \right)^2 = \frac{1^2}{4^2} = \frac{1}{16}$$



Answer $\frac{1}{16}$ [2]

b) Work out $\left(\frac{8}{125} \right)^{-\frac{1}{3}}$



$$\frac{\sqrt[3]{125}}{\sqrt[3]{8}} = \frac{5}{2}$$

Answer $\frac{5}{2}$ [2]



- 3 a) A radioactive material decays at a rate of 6% per month. !

There are currently 180 atoms in the sample.

How many atoms will there be after 2 years?

$$180 \times 0.94^{24} = 40.77$$
$$= 40$$

Answer 40 [2]

- 4 A circle has centre (0,0)

The equation of the tangent to the circle at the point P is

$$y = -2x + 15$$

- a) Find the equation of the radius OP.

$$-2 \rightarrow \frac{1}{2}$$

Answer $y = \frac{1}{2}x$ [2]

- b) Find the coordinates of the point P.

$$y = \frac{1}{2}x \quad y = -2x + 15$$

$$\frac{1}{2}x = -2x + 15$$

$$\frac{5}{2}x = 15$$

$$x = 6$$

$$y = \frac{1}{2}(6) = 3$$

Answer (6,3) [4]

- c) Hence find the equation of the circle.

$$r^2 = 6^2 + 3^2$$
$$= 45$$

$$x^2 + y^2 = 45$$

Answer $x^2 + y^2 = 45$ [1]



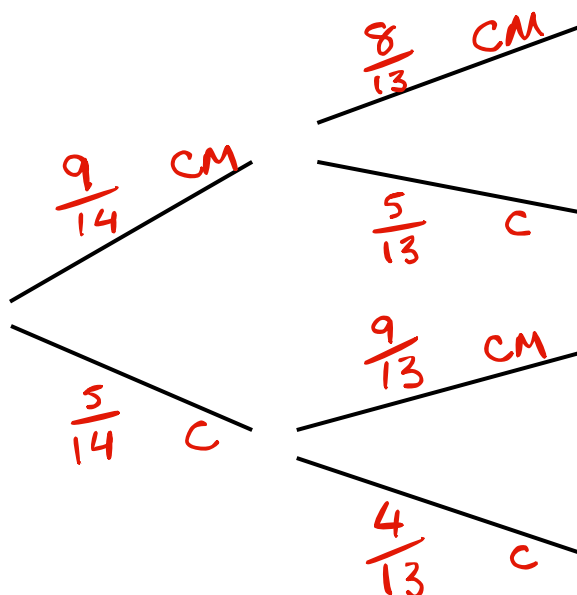
5 At a charity bake sale, a box contains:

- 9 chocolate muffins
- 5 cookies

Sarah chooses one item from the box and eats it.

Rory then chooses one item from the same box.

a) Complete the tree diagram showing the probabilities for Sarah's choice and Rory's choice.



[2]

b) Find the probability that both Sarah and Rory choose chocolate muffins.

$$\frac{9}{14} \times \frac{8}{13} = \frac{72}{182} = \frac{36}{91}$$

Answer $\frac{36}{91}$ [2]

c) Find the probability that Sarah and Rory choose different items.

$$\frac{9}{14} \times \frac{5}{13} + \frac{5}{14} \times \frac{9}{13}$$
$$\frac{45}{182} + \frac{45}{182} = \frac{90}{182} = \frac{45}{91}$$

Answer $\frac{45}{91}$ [2]



6 Express $\frac{3}{\sqrt{5}-2}$

in the form $p + \sqrt{q}$

where p and q are integers.

Show your working clearly.

$$\frac{3}{\sqrt{5}-2} \times \frac{\sqrt{5}+2}{\sqrt{5}+2}$$

$$= \frac{3(\sqrt{5}+2)}{(\sqrt{5}-2)(\sqrt{5}+2)} = \frac{3\sqrt{5}+6}{1}$$



$$\begin{array}{r|rr} \times & \sqrt{5} & -2 \\ \hline \sqrt{5} & 5 & -2\sqrt{5} \\ +2 & 2\sqrt{5} & -4 \\ \hline & & \end{array}$$

$= 1$

$$\begin{array}{l} 3\sqrt{5} + 6 \\ \uparrow \\ \sqrt{9}\sqrt{5} + 6 \\ \sqrt{45} + 6 \\ 6 + \sqrt{45} \\ p + \sqrt{q} \end{array}$$

Answer $6 + \sqrt{45}$ [4]



- 7 M is inversely proportional to the square root of N .

$M = 12$ when $N = 25$

- a) Work out an equation connecting M and N .

$$M \propto \frac{1}{\sqrt{N}}$$

$$12 = \frac{k}{5}$$

$$M = \frac{k}{\sqrt{N}}$$

$$160 = k$$

$$12 = \frac{k}{\sqrt{25}}$$

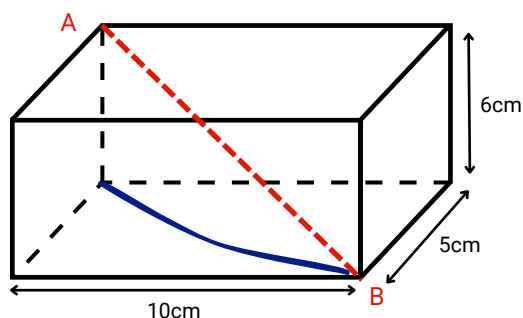
Answer $M = \frac{60}{\sqrt{N}}$ [3]

- b) Work out the value of M when $N = 400$

$$M = \frac{60}{\sqrt{400}} = \frac{60}{20} = 3$$

Answer 3 [2]

- 8 Calculate the length of the line AB .



5

$$\sqrt{10^2 + 5^2} = 5\sqrt{5}$$

10

6

$$\sqrt{6^2 + (5\sqrt{5})^2}$$
$$\sqrt{161} =$$

5√5

Answer 12.7cm [4]



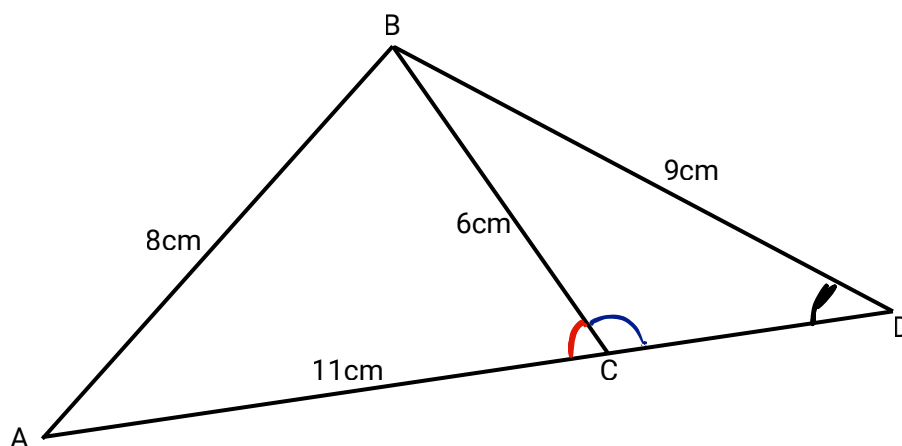
- 9 The triangle ABC in the diagram shown has sides 6cm, 8cm, 11cm.

BD has length 9cm.

A, C and D are points on a straight line.

Calculate the size of angle BDC.

Give your answer correct to 1 decimal place.



$$\begin{aligned}8^2 &= 11^2 + 6^2 - 2(11)(6)\cos C \\64 &= 157 - 132\cos C \\132\cos C &= 93 \\\cos C &= \frac{93}{132} \\C &= 45.2^\circ\end{aligned}$$

$$\angle BCD = 180 - 45.2 = 134.8$$

$$\frac{\sin D}{6} = \frac{\sin 134.8}{9}$$

Answer 28.2 [5]

$$D = 28.2^\circ$$



10

L is the straight line with equation

$$y = x + 1$$

C is the curve with equation

$$y = x^2 - 5$$

Using algebra, find the coordinates of the points of intersection of L and C.

You must show all your working.

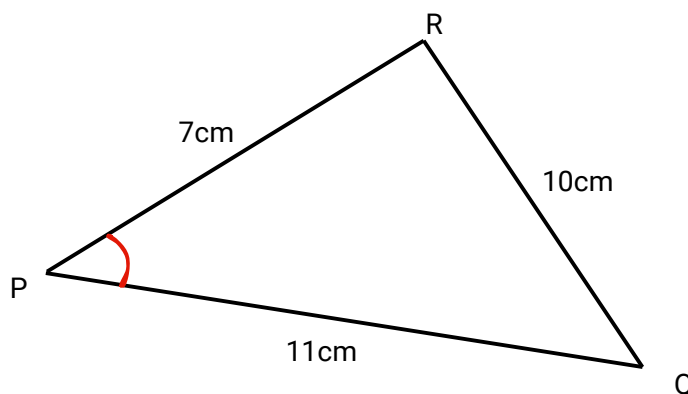
$$\begin{aligned}x + 1 &= x^2 - 5 \\x^2 - x - 6 &= 0 \\(x - 3)(x + 2) &= 0 \\x = 3 \text{ or } x = -2 \\y = 3 + 1 & \quad y = -2 + 1 \\y = 4 & \quad = -1 \\(3, 4) & \quad (-2, -1)\end{aligned}$$

Answer (3, 4) (-2, -1) [5]



11 Calculate the area of triangle PQR.

Give your answer correct to 1 decimal place.



$$\begin{aligned}10^2 &= 7^2 + 11^2 - 2(7)(11)\cos P \\100 &= 49 + 121 - 154\cos P \\100 &= 170 - 154\cos P \\ \cos P &= \frac{70}{154}\end{aligned}$$

$$P = 62.9^\circ$$

$$\begin{aligned}A &= \frac{1}{2}ab\sin C \\&= \frac{1}{2}(7)(11)\sin 62.9^\circ \\&= 34.3 \text{ cm}^2\end{aligned}$$

Answer 34.3 cm² [4]