Mathematical Formulae

Compound interest

$$\text{Total amount} = P\left(1+\frac{r}{100}\right)^n$$

Mensuration

Curved surface area of a cone = πrl

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

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

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

$$\text{Area of triangle } ABC = \frac{1}{2}ab\sin C$$

Arc length = $r\theta$, where θ is in radians

$$\text{Sector area} = \frac{1}{2}r^2\theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

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

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

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

Answer **all** the questions.

1 Solve $4(x-5)=3x+2$.

Answer $x =$ …… [2]

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2 Factorise completely $8ab+10ay-12bx-15xy$.

Answer …….. [2]

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3 By writing each number correct to 1 significant figure, estimate the value of

$$\frac{34.5-6.3}{\sqrt{8.76}}.$$

Show your working.

Answer …….. [2]

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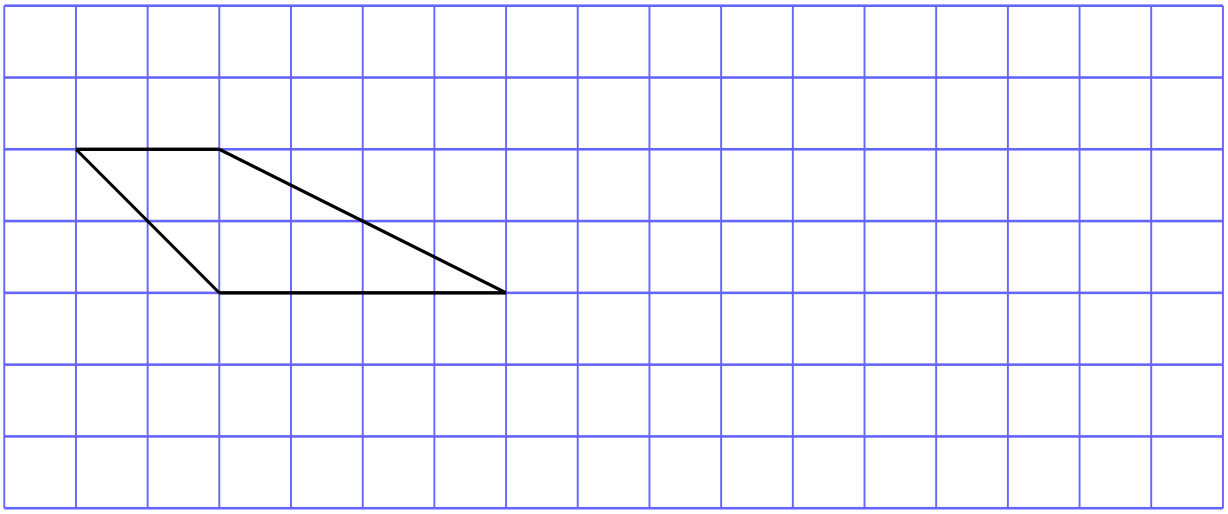
4 On the grid, draw an enlargement of this quadrilateral using the scale factor $\frac{3}{2}$.



[2]

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5 **(a)** Write $\frac{5^3 \times 5^4}{5^{-2}}$ as a single power of 5.

Answer …….. [1]

(b) Given that $9^{\frac{1}{3}} = 3^n$, find n.

Answer $n =$ …… [1]

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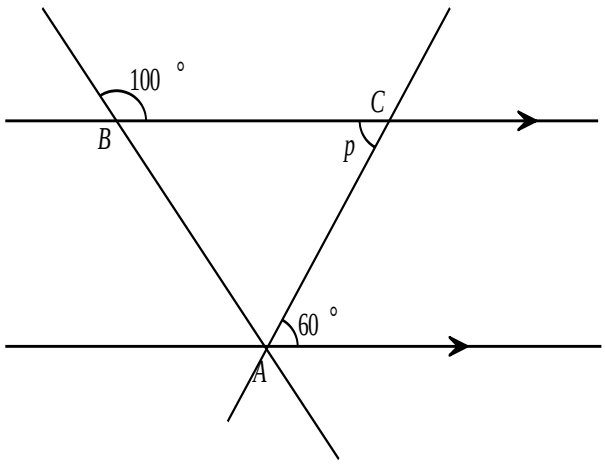
6 **(a)** Simplify $10x - 3(7 - 4x)$.

Answer …….. [1]

(b) Make m the subject of the formula $h = k - 2m$.

Answer m = …… [2]

7



(a) Find p, giving a reason for your answer.

p = ……. ° because ……... [2]

(b) Determine if triangle ABC is an equilateral triangle.

Answer ……..

……

…… [2]

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8 The stem-and-leaf diagram shows the age, in years, of 50 performers in the National Day parade.

0	8 9
1	0 2 2 5 6 7 7 7 9
2	3 5 5 6 6 6 7 8 8 8 8
3	1 1 2 4 4 7 8 9 9
4	2 3 3 4 5 6 7 8
5	0 0 3 3 5 5 9
6	1 4 6 7

Key 1 | 2 represents 12 years

(a) Find the modal age.

Answer ……. years [1]

(b) Find the median age.

Answer ……. years [1]

(c) One of the performers is selected at random.
Find the probability that the performer is younger than 30 years old.
Give your answer as a fraction in its lowest terms.

Answer …….. [1]

9 Solve these simultaneous equations.

$$x - 4y = 13$$
$$7x + y = 33$$

Show your working.

Answer $x =$ ……

$y =$ …… [3]

10 y is inversely proportional to the square of x.

(a) Given that $y = 45$ when $x = 3$, find a formula for y in terms of x.

Answer …….. [2]

(b) Find y when $x = 6$.

Answer $y =$ …… [1]

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11 The line l_1 has equation $y = 4x - 3$.

(a) Show that the point (2, 5) lies on the line l_1.

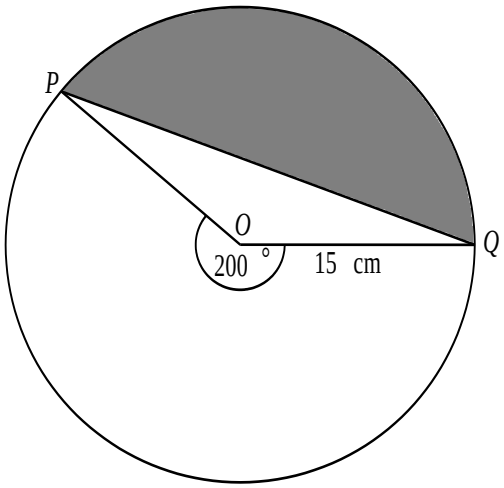
Answer

[1]

(b) Find the equation of the line l_2 with the same gradient as line l_1 and passing through the point (–1, 5).

Answer …….. [2]

12



P and *Q* are points on a circle with radius 15 cm and centre *O*.
Reflex angle *POQ* = 200°.
Calculate the area of the shaded segment.

Answer ……... cm^2 [3]

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13 Solve $2x = \frac{4}{x-5}$, giving your answers correct to 3 significant figures.
Show your working.

Answer x = …… or x = …… [4]

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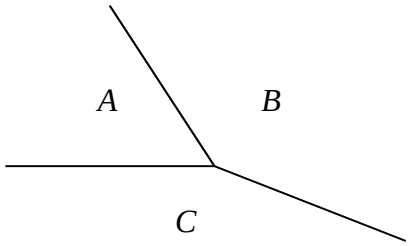
14 **(a)** Express $x^2+10x-9$ in the form $(x+a)^2+b$.

Answer …….. [2]

(b) Hence solve $x^2+10x-9=0$.
Give your answers correct to 2 decimal places.

Answer x = …… or x = …… [2]

15



The diagram shows how 3 regular polygons, *A*, *B* and *C*, are joined together.
Shape *A* has 3 sides and shape *B* has 10 sides.
How many sides does shape *C* have?
Show your working.

Answer ……. sides [4]

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16 A map is drawn to a scale of 1 : 50 000.

(a) This scale can be written as 1 cm to n km.
Find n.

Answer n = …… [1]

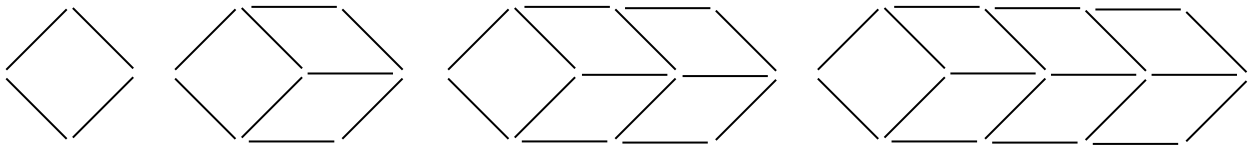
(b) Island A is 10 km away from Island B.
Find the distance, in cm, between these two islands on the map.

Answer …… cm [1]

(c) Island A has an area of 20 cm^2 on the map.
Find the actual area, in km^2, of Island A.

Answer ……... km^2 [2]

17 The diagram shows some patterns made from straight lines.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

(a) Complete the table.

Pattern number	1	2	3	4	5	6
Number of lines	4	9	14	19		

[1]

(b) Find an expression, in terms of n, for the number of lines in Pattern n.

Answer …….. [1]

(c) How many lines would there be in Pattern 15.

Answer ……. lines [1]

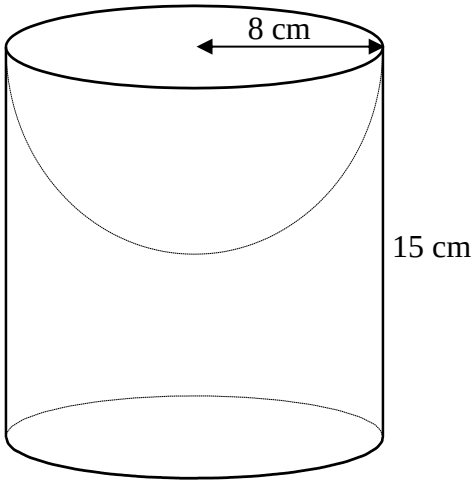
(d) Simon says he can make a pattern using 100 lines.
Is he able to do so? Explain your answer.

Answer ……..

……

…… [1]

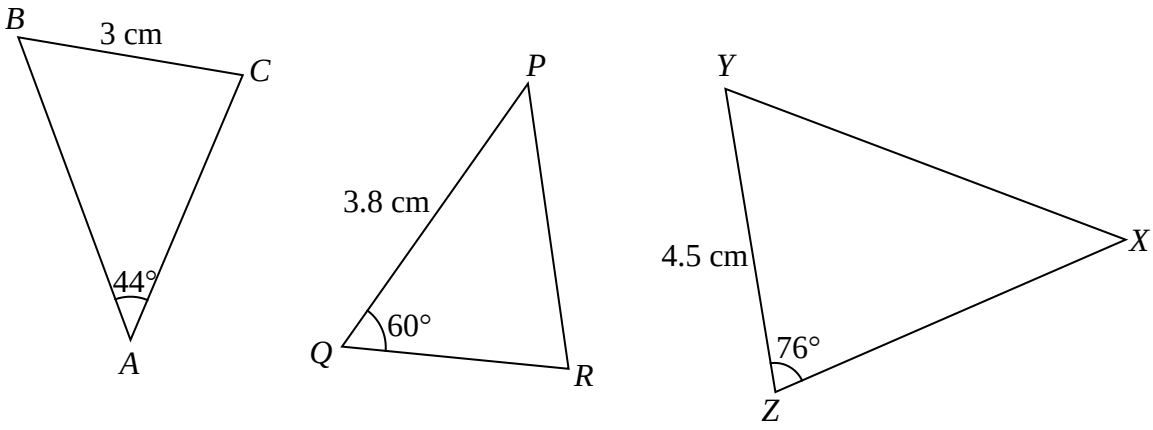
18 The diagram shows a solid formed by removing a hemisphere from a cylinder.



The cylinder and the hemisphere have a common radius of 8 cm.
The height of the cylinder is 15 cm.
Calculate the surface area of the solid.

Answer ……... cm^2 [4]

19



Triangle *ABC* and triangle *PQR* are congruent.
Triangle *XYZ* is similar to triangles *ABC* and *PQR*.
BC = 3 cm, *PQ* = 3.8 cm and *YZ* = 4.5 cm.
Angle *BAC* = 44°, angle *PQR* = 60° and angle *XZY* = 76°.

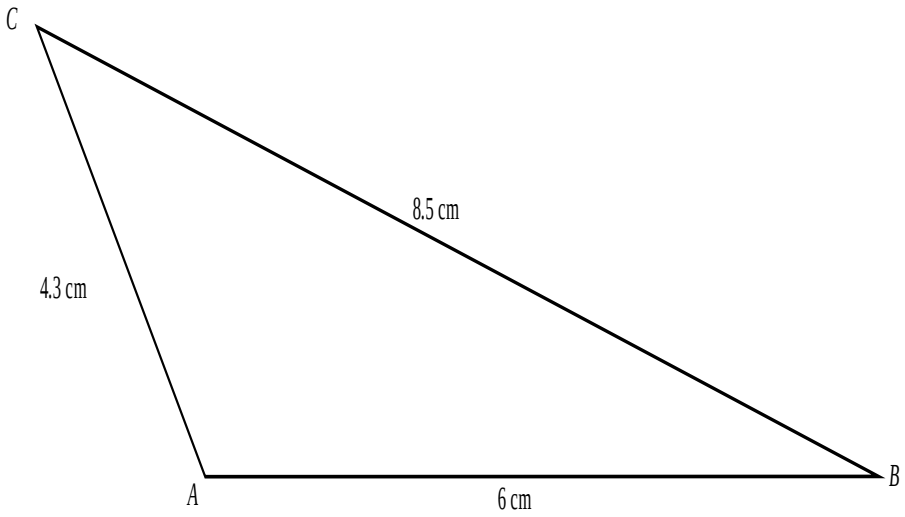
(a) Find the area of triangle *PQR*.

Answer ……... cm^2 [2]

(b) Find the length of *XY*.

Answer *XY* = …….. cm [2]

20



The diagram shows a triangle *ABC*.
AB = 6 cm, *BC* = 8.5 cm and *AC* = 4.3 cm.

(a) Construct a full-sized accurate drawing of triangle *ABC*.

Answer

[2]

(b) Measure angle *BAC*.

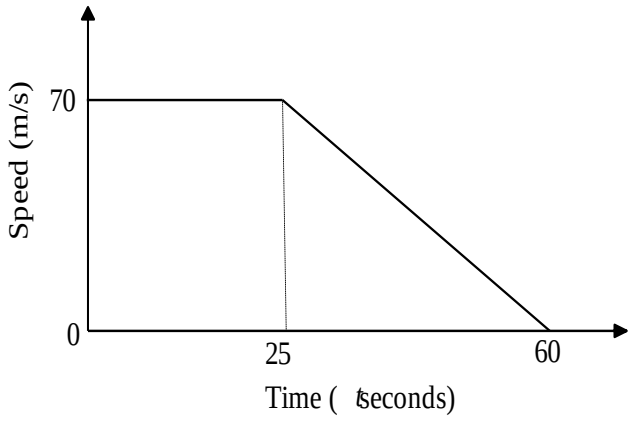
Answer Angle *BAC* = …… ° [1]

(c) Construct the bisector of angle *BAC*. [1]

(d) *M* is the point where the bisector of angle *BAC* crosses *BC*.
Measure *BM*.

Answer *BM* = …….. cm [1]

21



The diagram shows the speed-time graph for the motion of a particle.

(a) Describe what is happening between $t = 0$ and $t = 25$.

Answer …….. [1]

(b) Calculate the retardation.

Answer …….. m/s^2 [1]

(c) Calculate the average speed.

Answer …….. m/s [3]

End of Paper