

Mathematical Formulae

1. ALGEBRA

Quadratic Equation

For the equation $ax^2 + bx + c = 0$

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

Mensuration

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

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

2. TRIGONOMETRY

Formulae for $\triangle ABC$

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

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

$$\Delta = \frac{1}{2}ab \sin C$$

- 1 (i) Factorise $6x^2 - 5x - 4$. $(2x+1)(3x-4)$ [1]
 (ii) Hence, solve the equation $6x^2 - 5x - 4 = -2(3x - 4)^2$. $x = 4/3$ or $7/8$ [2]
- 2 Make x the subject of the formula $\frac{z^3}{\sqrt{3+x^2}} = \frac{y}{2} \sqrt{\frac{3-x^2}{16-x^4}}$ where $x \neq \pm 2$. [3]
 $x = \pm \sqrt[4]{(64Z^6 - 9Y^2)/(4Z^6 - Y^2)}$
- 3 (i) Factorise $8x^3 - 27$. $(2x-3)(4x^2+6x+9)$ [1]
 (ii) Hence, express $\frac{8x^3 - 27}{4x^2 - 12x + 9} \div \frac{x^2 - \frac{1}{2}x - 3}{4x^2 - 9}$ as a single fraction in its simplest form. [4]
 $\frac{2(4x^2+6x+9)}{(x-2)}$
- 4

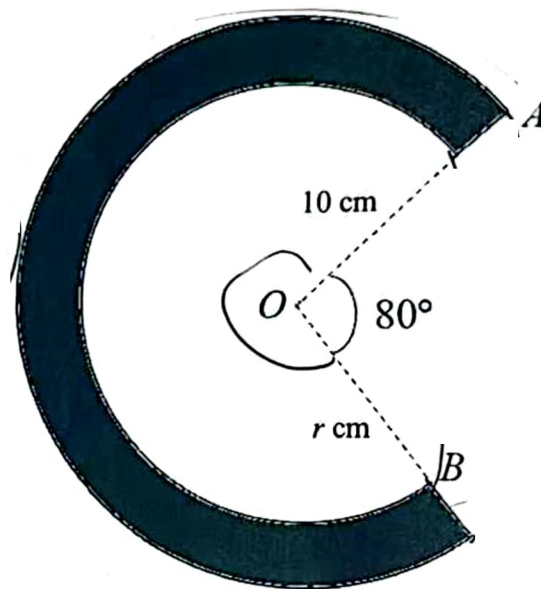


Diagram is not drawn to scale.

In the diagram, an air-conditioning company Celsius has designed a new logo in the shape of the letter "C".

91

The letter "C" is formed by two concentric arcs, with centre O .

The point A lies on the circumference of the outer circle with radius 10 cm.

The point B lies on the circumference of the inner circle with radius r cm, where $r < 10$.

The letter "C" is shown by the shaded area in the diagram.

- (i) Given that $\angle AOB = 80^\circ$ and the perimeter of the letter "C" is 91 cm. Find the value of r . $r = (639 - 140\pi)/(14\pi - 18) = 7.67$ [3]
- (ii) Hence, find the area of the shaded of the letter "C". $100.75 = 101(3sf)$ [2]

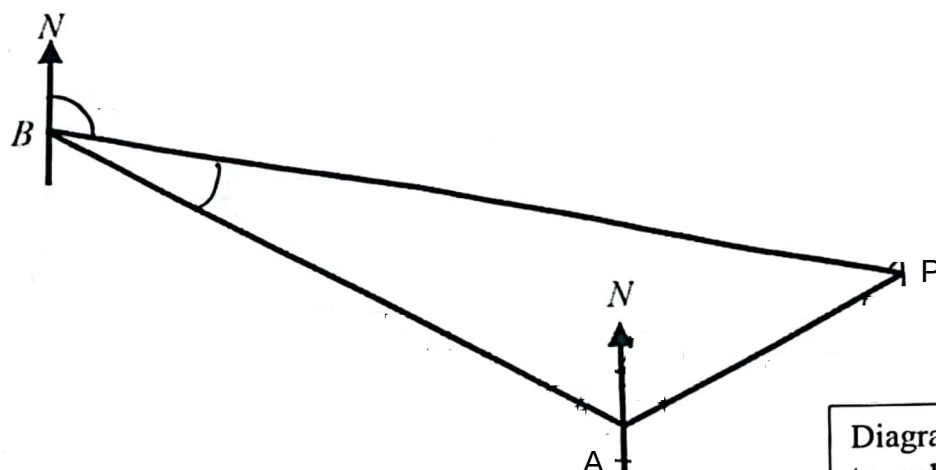


Diagram is not drawn to scale.

Lucky set out on a bicycle ride from her house at A to her friend Elly's house at B . Lucky rode at an average speed of 7.4 km/h for 15 minutes , travelling in a straight line on a bearing of 330° from her house at A .

After reaching B , Lucky and Elly rode 2.8 km towards Park P , on a bearing of 102° from B .

At the park, Lucky's bicycle suffered from a punctured tyre, so she decided to walk back to her house. She walked along a straight line from P back to A .

- (i) Find distance AB . 1.85KM [2]
- (ii) Show that angle $ABP = 48^\circ$. [1]
- (iii) Find the distance AP . 2.08KM [2]
- (iv) Hence, find the bearing that Lucky must take from the park to go home at A . [3]

240.6 deg

- 6 In the diagram, OAB is a sector of a circle with centre O and radius 16 cm. The area of sector OAB is 153.6 cm^2 . The midpoint of OA is C and the line through C parallel to OB meets the arc AB at D . The perpendicular from D to OB meets OB at E .

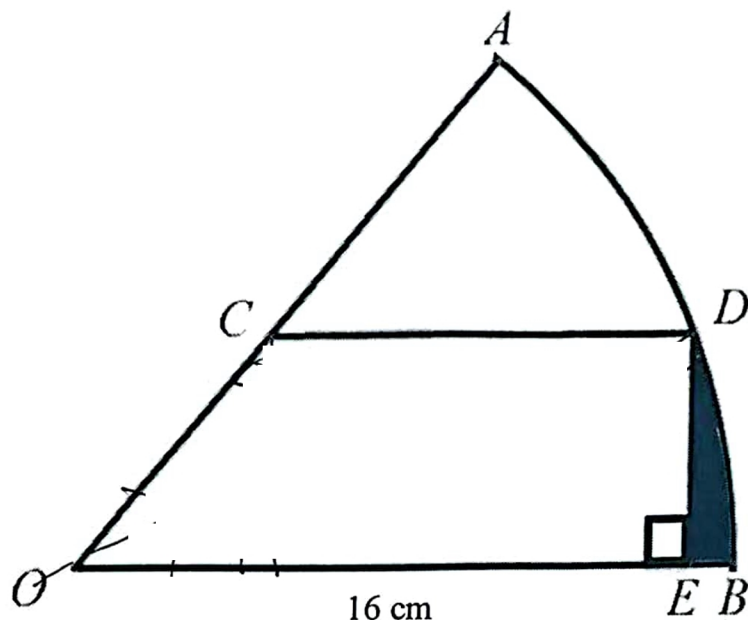


Diagram is not drawn to scale.

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|-------|--|---------|-----|
| (i) | Find angle AOB in radian. | 1.2 rad | [1] |
| (ii) | Show that $\angle DOE = 0.485$ radians (3 s.f.). | | [2] |
| (iii) | Find the perimeter of the shaded region. | 17.1cm | [3] |

End of Paper