Edexcel GCE

Core Mathematics C2

Advanced Subsidiary

Geometry

Materials required for examination
Mathematical Formulae (Pink or Green)

Items included with question papers
Nil

Advice to Candidates

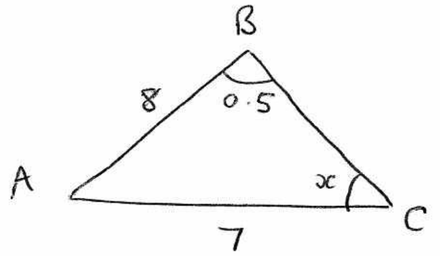
You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

1. In the triangle ABC, $AB = 8$ cm, $AC = 7$ cm, $\angle ABC = 0.5$ radians and $\angle ACB = x$ radians.

(*a*) Use the sine rule to find the value of $\sin x$, giving your answer to 3 decimal places. **(3)**

Given that there are two possible values of x,

(*b*) find these values of x, giving your answers to 2 decimal places. **(3)**



a)

$$\frac{\sin x}{8} = \frac{\sin 0.5}{7}$$

$$\sin x = \frac{8 \sin 0.5}{7}$$

$$\sin x = 0.548 \quad 3dp$$

b)

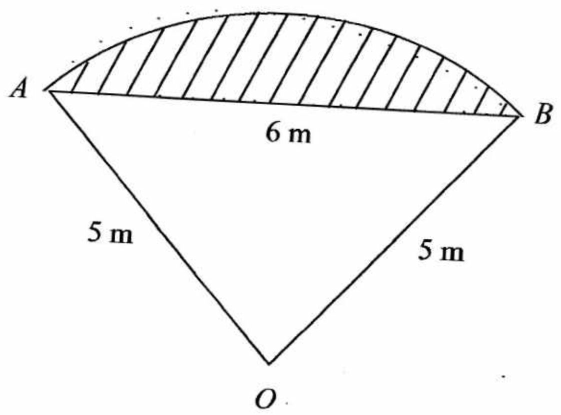
$$x = \sin^{-1}(0.548$$

$$= 0.58, \ \pi - 0.58$$

$$= \underline{0.58}, \ \underline{2.56}$$

2.

Figure 2



In Figure 2 OAB is

(*a*) Show that cos $AOB = \frac{7}{25}$

(*b*) Hence find the angle AOB in radians to 3dp ~~es.~~ **(2)**

(*c*) Calculate the area of the sector OAB. **(1)**

(*d*) Hence calculate the shaded area. **(2)**

(3)

a) $\cos A = \frac{b^2+c^2-a^2}{2bc}$

$= \frac{5^2+5^2-6^2}{2(5)(5)}$

$= \frac{14}{50} = \frac{7}{25}$

b) $\cos^{-1}\left(\frac{7}{25}\right) = \underline{1.287^c}$

c) $\frac{\theta}{2} \times r^2$

$\frac{1.287}{2} \times 5^2 = 16.09 \text{ m}^2$ (2dp)

d) Area of triangle $= \frac{1}{2}(5)(5)\sin(1.287)$

$= 12 \text{ m}^2$

Shaded area $= 16.09 - 12 = 4.09 \text{ m}^2$ (2dp)

3.

Figure 2

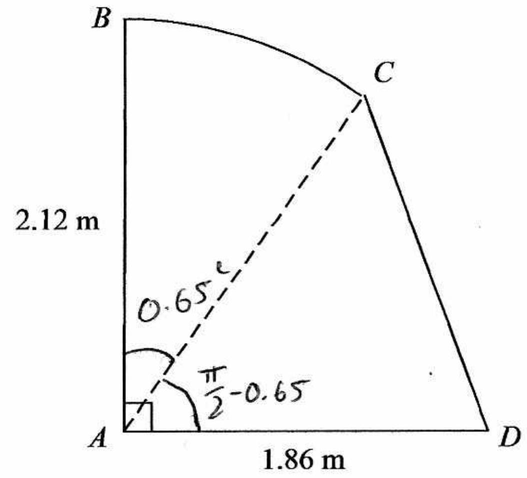


Figure 2 shows the cross-section *ABCD* of a small shed.

The straight line *AB* is vertical and has length 2.12 m.

The straight line *AD* is horizontal and has length 1.86 m.

The curve *BC* is an arc of a circle with centre *A*, and *CD* is a straight line.

Given that the size of $\angle BAC$ is 0.65 radians, find

(*a*) the length of the arc *BC*, in m, to 2 decimal places, **(2)**

(*b*) the area of the sector *BAC*, in m^2, to 2 decimal places, **(2)**

(*c*) the size of $\angle CAD$, in radians, to 2 decimal places, **(2)**

(*d*) the area of the cross-section *ABCD* of the shed, in m^2, to 2 decimal places. **(3)**

a) arclength $= \theta r$
$= 0.65 \times 2.12$
$= \underline{1.378} = \underline{1.38}$ m (2dp)

b) sector area $= \frac{\theta}{2} \times r^2$
$= \frac{0.65}{2} \times 2.12^2$
$= \underline{1.46 m^2}$ (2dp)

c) $\angle CAD = \pi/2 - 0.65$
$= \underline{0.92^c}$ (2dp)

d) Area of triangle $= \frac{1}{2}(1.86)(2.12)\sin(0.92)$
$= 1.569558817 \ m^2$

Triangle + Sector $= \underline{3.03 \ m^2}$ 2dp

4. **Figure 2**

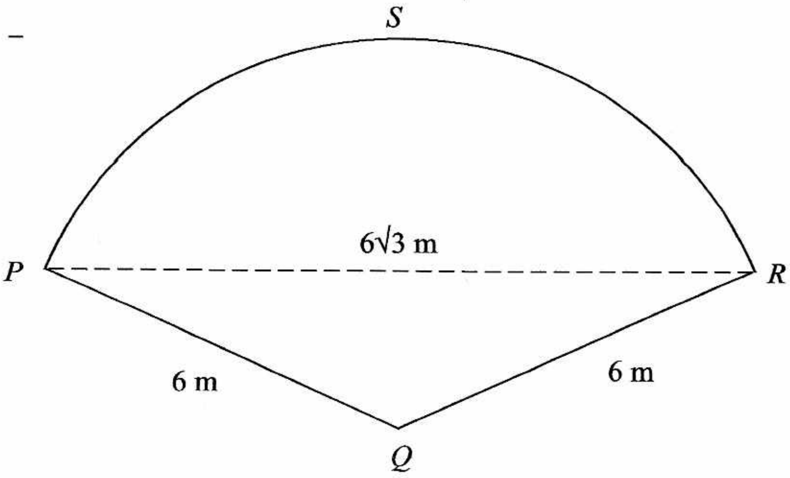


Figure 2 shows a plan h centre Q and radius 6 m.

Given that the le

(*a*) find the exact size or angle PQR in radians **(3)**

(*b*) Show that the exact area or the patio is 12π m^2 **(2)**

(*c*) Find the exact area of the triangle *PQR*. **(2)**

(*d*) Find, in m^2 to 1 decimal place, the area of the segment *PRS*. **(2)**

(*e*) Find, in m to 1 decimal place, the perimeter of the patio *PQRS*. **(2)**

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a) $\cos A = \dfrac{b^2+c^2-a^2}{2bc}$

$= \dfrac{6^2+6^2-(6\sqrt{3})^2}{2(6)(6)}$

$\cos A = -1/2$

$A = \frac{2}{3}\pi$

b) sector area $= \frac{\theta}{2} r^2$

$= \dfrac{2/3\pi}{2} \times 6^2$

$= 12\pi$ m^2

c) $1/2(6)(6)\sin\left(\frac{2}{3}\pi\right) = 9\sqrt{3}$ m^2

d) $12\pi - 9\sqrt{3} = \underline{22.1\ m^2}$ 1dp

e) Arc length $= \theta r$

$= \frac{2}{3}\pi \times 6$

$= 4\pi$

Perimeter $= 12 + 4\pi$

$= \underline{24.6\ m}$ 1dp

5.

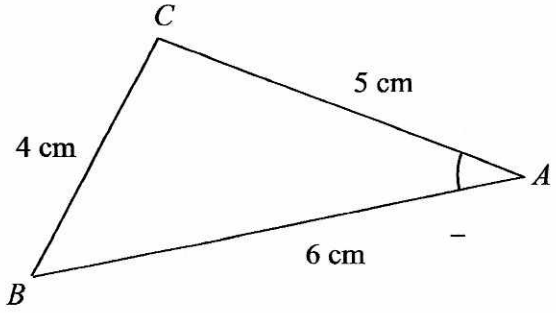


Figure 1

Figure 1 shows the triangle ABC, with $AB = 6$ cm, $BC = 4$ cm and $CA = 5$ cm.

(*a*) Show that $\cos A = \frac{3}{4}$.

(3)

(*b*) Hence, or otherwise, find the exact value of $\sin A$.

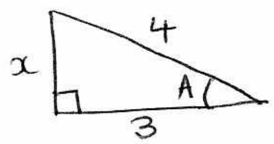
(2)

a) $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

$= \dfrac{5^2 + 6^2 - 4^2}{2(5)(6)}$

$= \dfrac{3}{4}$

b)



$4^2 = x^2 + 3^2$

$16 = x^2 + 9$

$7 = x^2$

$x = \sqrt{7}$

$\sin A = \dfrac{\sqrt{7}}{4}$

6. **Figure 1**

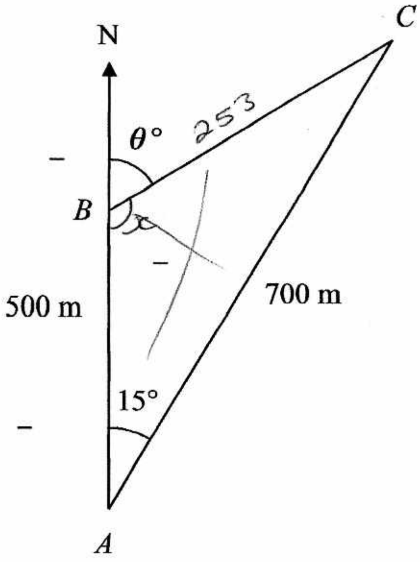


Figure 1 shows 3 yachts A, B and C which are assumed to be in the same horizontal plane. Yacht B is 500 m due north of yacht A and yacht C is 700 m from A. The bearing of C from A is 015°.

(*a*) Calculate the distance between yacht B and yacht C, in metres to 3 significant figures.

(3)

The bearing of yacht C from yacht B is θ°, as shown in Figure 1.

(*b*) Calculate the value of θ.

(4)

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

$= (500)^2 + (700)^2 - 2(500)(700)\cos(15)$

$= 63851.9216$

$a = 252.6893777$

$= 253$ m (3sf)

b) $\dfrac{\sin x}{700} = \dfrac{\sin 15}{253}$

$\sin x = 0.7169804019$

$x = 45.8°$ OR $134.2°$

$\theta = 180 - 45.8$

$= \cancel{134.2°}$ 1dp

$\cancel{(134°}$ 3sf)

$\theta = 180 - 134.2$

$= 45.8°$

7.

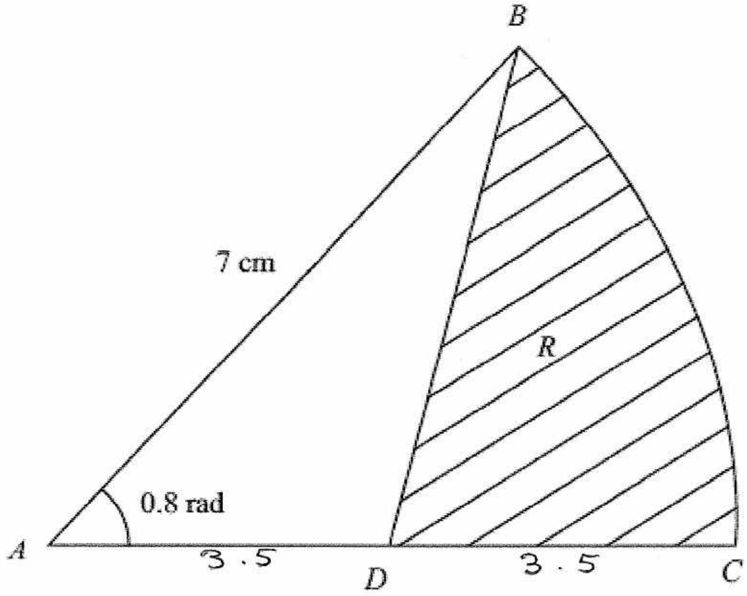


Figure 1

Figure 1 shows *ABC*, a sector of a circle with centre *A* and radius 7 cm.

Given that the size of $\angle BAC$ is exactly 0.8 radians, find

(*a*) the length of the arc *BC*,

(2)

(*b*) the area of the sector *ABC*.

(2)

The point *D* is the mid-point of *AC*. The region *R*, shown shaded in Figure 1, is bounded by *CD*, *DB* and the arc *BC*.

Find

(*c*) the perimeter of *R*, giving your answer to 3 significant figures,

(4)

(*d*) the area of *R*, giving your answer to 3 significant figures.

(4)

a) Arc length $= \theta r$
$= 0.8 \times 7$
$= 5.6$ cm

b/ Sector Area $= \frac{\theta}{2} \times r^2$
$= \frac{0.8}{2} \times 7^2$
$= 19.6 \text{ cm}^2$

c/ $a^2 = b^2 + c^2 - 2bc \cos A$
$= 7^2 + 3.5^2 - 2(7)(3.5)\cos(0.8)$
$= 27.11137124$

$a = 5.206858097$

perimeter $= 5.21 + 5.6 + 3.5$
$= 14.3$ cm 3sf

d/ Area of triangle
$= \frac{1}{2}(3.5)(7)\sin 0.8$
$= 8.78761211 4$

Area of R
$19.6 - \text{ANS} = 10.8 \text{ cm}^2$ 3sf

8.

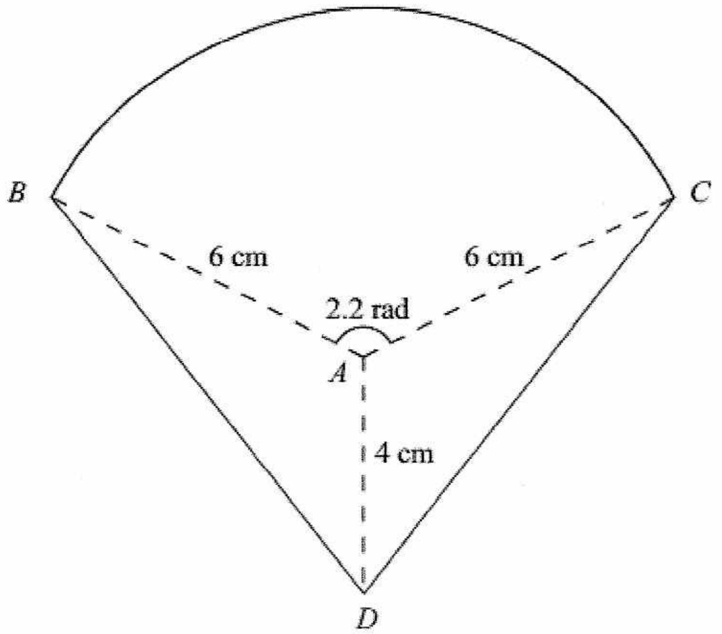


Figure 3

The shape *BCD* shown in Figure 3 is a design for a logo.

The straight lines *DB* and *DC* are equal in length. The curve *BC* is an arc of a circle with centre *A* and radius 6 cm. The size of $\angle BAC$ is 2.2 radians and $AD = 4$ cm.

Find

(*a*) the area of the sector *BAC*, in cm^2, **(2)**

(*b*) the size of $\angle DAC$, in radians to 3 significant figures, **(2)**

(*c*) the complete area of the logo design, to the nearest cm^2. **(4)**

a) sector area $= \frac{\theta}{2} \times r^2$
$= \frac{2.2}{2} \times 6^2$
$= 39.6 \text{cm}^2$

b/ $\frac{2\pi - 2.2}{2} = 2.04^c$ (3sf)

c/ Area of triangle $= \frac{1}{2}(4)(6)\sin(2.04)$
$= 10.69448832 \text{ cm}^2$

$2 \times \text{ANS} + 39.6 = 60.98897664 \text{ cm}^2$
$= \underline{\underline{61 \text{ cm}^2}}$ (nearest cm^2)