1.

Figure 1
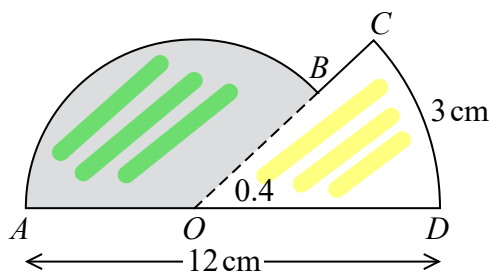
The shape *ABCDOA*, as shown in Figure 1, consists of a sector *COD* of a circle centre *O* joined to a sector *AOB* of a different circle, also centre *O*.

Given that arc length *CD* = 3 cm, ∠*COD* = 0.4 radians and *AOD* is a straight line of length 12 cm,

(a) find the length of *OD*,

(2)

(b) find the area of the shaded sector *AOB*.

(3)

a)

OD = radius

$S = r\theta$ S = arc length = 3cm

r = radius , ?

θ = 0.4 radians

Figure 1

$3 = r \times 0.4$ ⓘ =) $r = 3/0.4 = 7.5$cm

=) OD = 7.5cm ⓘ
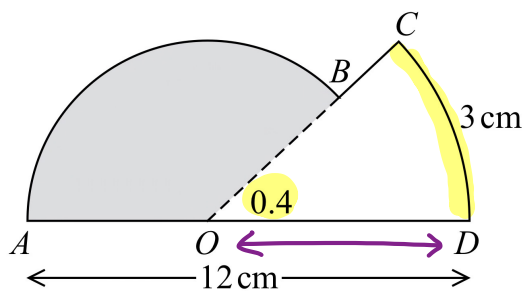
b) Area of Sector : $A = \frac{1}{2}r^2\theta$

=) $r = AO = 12 - 7.5 = 4.5$cm

$\pi = \theta + 0.4$ =) $\theta = \pi - 0.4$ ⓘ

=) $A = \frac{1}{2}(4.5)^2 \times (\pi - 0.4)$ ⓘ

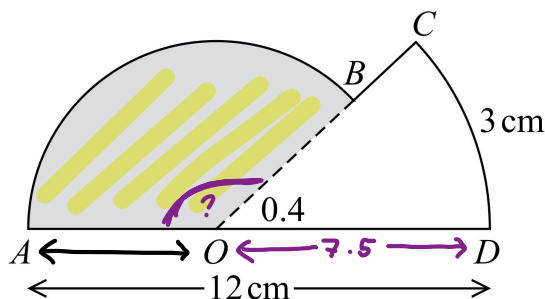=) $A = 27.8$cm^2 ⓘ

Figure 1

(Total for Question   is 5 marks)
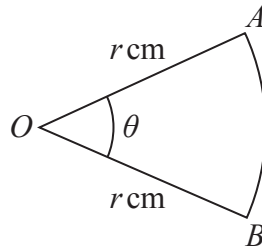
2.

Figure 1

Figure 1 shows a sector AOB of a circle with centre O and radius r cm.

The angle AOB is θ radians.
The area of the sector AOB is 11 cm²

Given that the perimeter of the sector is 4 times the length of the arc AB, find the exact value of r.

(4)

area of Sector : $\frac{1}{2} r^2 \theta$ perimeter : $r\theta + 2r$

$\frac{1}{2} r^2 \theta = 11$ ✓ $r\theta + 2r = 4r\theta$ ✓
                                    $2r = 3r\theta$
                                    $2 = 3\theta$
                          $\therefore \theta = \frac{2}{3}$

$\frac{1}{2} r^2 \left(\frac{2}{3} \right) = 11$ ✓

$\frac{1}{3} r^2 = 11$

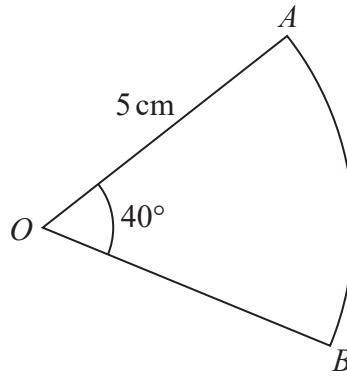$r^2 = 33 \Rightarrow r = \sqrt{33}$ ✓

3.

Figure 1

Figure 1 shows a sector AOB of a circle with centre O, radius 5 cm and angle $AOB = 40°$

The attempt of a student to find the area of the sector is shown below.

$$\text{Area of sector} = \frac{1}{2}r^2\theta$$

$$= \frac{1}{2} \times 5^2 \times 40$$

$$= 500 \text{ cm}^2$$

(a) Explain the error made by this student.

(1)

(b) Write out a correct solution.

(2)

a) $A = \frac{1}{2}r^2\theta$ is valid for radians, only, so therefore the student uses it incorrectly, since our angle is in degrees (and the student doesn't convert it to radians). ①

Correct Formula: $A = \dfrac{\text{Angle } \pi r^2}{360}$

b)

Area of the sector $= \dfrac{\text{angle}}{360} \pi r^2$ \qquad angle $= 40°$, $r = 5$cm

$= \dfrac{40}{360} \times \pi \times 5^2$ ① $\Rightarrow$ Area of sector $= \dfrac{25\pi}{9} \approx 8.73 \text{ cm}^2$ ①