Solutions

7 The Circle

1. Area of sector = $\frac{40}{360}\times\pi\times15^2$ = 78.5 cm^2 (3 sf)

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2. If they are to meet then this will be the angle in a semi-circle which should be 90°
Use converse of Pythagoras
4.1^2 = 16.81
$2.6^2 + 3.1^2$ = 16.37
Since $4.1^2 \neq 2.6^2 + 3.1^2$ then angle at top of bridge is NOT 90° (converse of Pythagoras).
So beams will NOT fit this archway.

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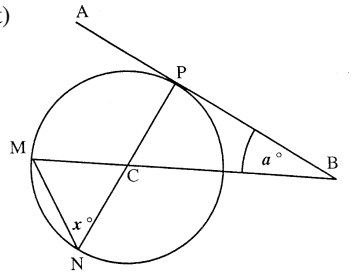
3. ∠ CPB = 90° (tangent)



∠ PCB = 180 - a
(angle sum triangle)
∠ MCN = ∠ PCB
= 180 - a
(vertically opposite)
∠CMN = x°
(isosceles triangle)

So, $x + x + 180 - a = 180$ (angle sum of triangle)
Re-arrange to give: $2x = a$ So, $x = ½\ a$

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4. Area of sector = $\frac{50}{360}\times\pi\times1.2^2$ = 0.63 m^2 (2 sf)

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5. Let angle of sector = θ So, $200 = \frac{\theta}{360}\times\pi\times15^2$

Re-arrange to get $\theta = \frac{200\times360}{\pi\times15^2} = \frac{320}{\pi}$

Length of arc: $\frac{\theta}{360}\times\pi\times30 = \frac{320}{\pi}\times\frac{\pi\times30}{360}$ = 26.7 m

Alternatively, $\frac{\text{arc length}}{\text{circumference}} = \frac{\text{area of sector}}{\text{area of circle}}$

So, $\frac{\text{arc length}}{\pi\times30} = \frac{200}{\pi\times15\times15}$, arc length $= \frac{200\times\pi\times30}{\pi\times15\times15}$

arc length = 26.7 m

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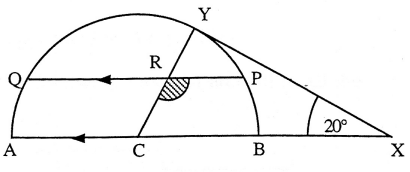
6. Area of sector = $\frac{105}{360}\times\pi\times40^2$ = 1466 cm^2 (4 sf)
Area of screen (trapezium) = ½ (120 + 80) × 60
= 6000 cm^2

Area not cleaned = 6000 – 1466 = 4534 cm^2

7.



∠CYX = 90° (tangent), so ∠ YCX = 70° (angle sum Δ)
∠YRP = 70° (corresponding angle)
So, shaded angle
∠CRP = 110° (supplementary angle – adds up to 180°)

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8. Find length of BD: OD = radius = 60 cm
BOD is a right angled triangle
Use Pythagoras: $BD^2 = 60^2 + 60^2$
BD = 84.852…. cm = 84.9 cm (1 dp)

Perimeter of circular part of table = $\frac{270}{360}\times\pi\times120$
= 282.7433.. cm = 282.7 cm (1 dp)

Perimeter of table = 84.9 + 282.7 = 367.6 cm

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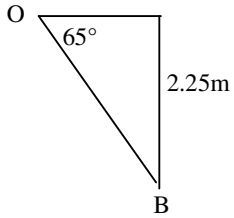
9. a) Use SOH-CAH-TOA



$\sin 65 = \frac{2.25}{OB}$

hence OB = 2.482.. = 2.48 m

b) Length of border = perimeter.

radius of curved edge = 2 x 2.48 = 4.96 m
Curved length = $\frac{130}{360}\times\pi\times4.96$ = 5.626.. m
Length of border = 8.3 + 8.3 + 4.5 + 5.6 = 26.7 m

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10. Arc length = $\frac{160}{360}\times\pi\times60$ = 83.8 cm (3 sf)

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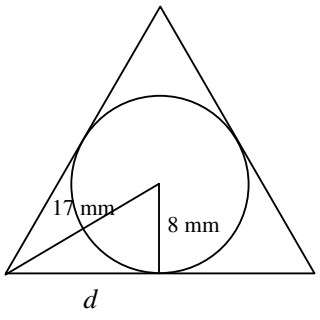
11. First draw the diagram
Mark on information given.



Find d.

$17^2 = d^2 + 8^2$

d = 15 cm

Hence each side of triangle = 30 cm

Since equilateral, perimeter = 3 x 30 = 90 cms.

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12. Let angle of arc = θ
Hence, $\frac{\theta}{360} = \frac{7}{\pi\times12}$, so θ = 66.8°

Angle through which the rod swings is 67°

Solutions

7 The Circle *(continued)*

13. Area of sector = $\frac{240}{360}\times\pi\times3^2$ = 18.8 m^2 (3 sf)

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14. Length of waist = $\frac{140}{360}\times\pi\times56$ = 68.4 cm (3 sf)

NB. the other dimension is not relevant to the question.

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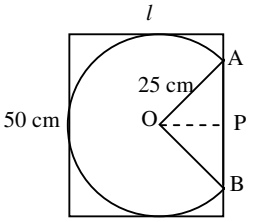
15. Area of sector = $\frac{280}{360}\times\pi\times50$ = 122.17.. = 122.2 cm^2



To find *l*, we need to find OP and then add to the radius of 25 cm

Angle AOB = 360 – 280 = 80°

Angle AOP = 40°

Using SOH-CAH-TOA

$\cos 40 = \frac{OP}{25}$ hence OP = 19.151.. = 19.2 cm

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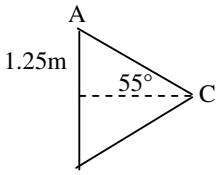
16. a) Draw triangle as shown



$\sin 55° = \frac{1.25}{AC}$

$AC = \frac{1.25}{\sin 55°} = 1.5259...$ hence AC = 1.53m (3 sf)

b) Find perimeter of table

radius of arc = 1.53m (diameter = 3.06m)

length of curved end = $\frac{110}{360}\times\pi\times3.06 = 2.94\,\text{m}$

length of straight section = 5m

Perimeter = 2.94 + 2.94 + 5 + 5 = 15.88m

= 1588 cm

No. of people = 1588 ÷ 75 = 21.17.. So **21 people**
