CIRCULAR MEASURE

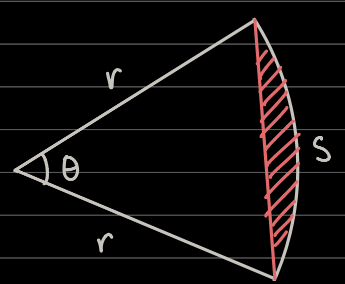
How to calculate Radians (from degrees)

General formula : $\dfrac{\pi}{180} = \dfrac{\text{Radians}}{\text{Degrees}}$.

A radian is defined as the angle at which the radius is equal to the arc length that the angle subtends.

Degrees	Radians
360	2π
180	π
90	$\pi/2$
45	$\pi/4$
60	$\pi/3$
30	$\pi/6$
120	$2\pi/3$
135	$3\pi/4$
270	$3\pi/2$

Important formulas to remember



1. Arc length

$$s = r\theta$$

2. Area

$$A = \frac{1}{2} r^2 \theta$$

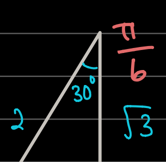
3. Area (Alternate formula)

$$A = \frac{1}{2} rs$$

4. Area of shaded region

$$A = \text{Area of sector} - \text{Area of triangle}$$
$$= \frac{1}{2} r^2 \theta - \frac{1}{2} r^2 \sin\theta$$

Patterns in trig.



$\sin \pi/3$

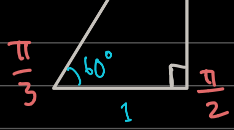
$\sin 60^\circ = \dfrac{\sqrt{3}}{2}$

$\cos \pi/3$

$\sin \pi/6$

$\sin 30^\circ = \dfrac{1}{2}$

$\cos \pi/6$



$\cos 60° = \frac{1}{2}$ $\qquad$ $\cos 30° = \frac{\sqrt{3}}{2}$

$\tan \pi/3$ $\qquad$ $\tan \pi/6$

$\tan 60 = \frac{\sqrt{3}}{1}$ $\qquad$ $\tan 30° = \frac{1}{\sqrt{3}}$ or $\frac{\sqrt{3}}{3}$

Note: $\boxed{\frac{1}{\sqrt{a}} = \frac{\sqrt{a}}{a}}$

$\sin\theta = \cos(90-\theta)$

Past Paper Practice Q1 – Q4 → Classwork } Oct 22nd
Q5 – Q10 → Homework

Q1 i) Area of shaded region = Area of triangle − Area of sector

A. of Δ : $\frac{1}{2}(r)(r\tan\theta)$ $\qquad$ A. of sector : $\frac{1}{2}r^2\theta$

A. shaded region $= \frac{1}{2}r^2\tan\theta - \frac{1}{2}r^2\theta$

$= \frac{1}{2}r^2(\tan\theta - \theta)$ → shown

ii) $\theta = 0.8$, $r = 15$

$P = r\tan\theta + \frac{r}{\cos\theta} + \underbrace{r\theta}_{\text{arc length}}$

$= (15)(\tan 0.8) + \frac{15}{\cos 0.8} + (15)(0.8)$

$= 0.209 + 15.001 + 12$

$= 27.21$

$= 27.2$ → perimeter of the shaded region

Q2.

i) $\theta = 1$

$A = \frac{1}{2}r^2\theta$

$= \frac{1}{2}(8)^2(1)$

$= 32\text{ cm}^2$ → Area of sector BOC

ii) $2r + r\theta = \frac{2r + r(\pi - \theta)}{2}$

$16 + 8\theta = \frac{16 + 8\pi - 8\theta}{2}$

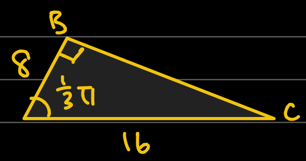
$32 + 16\theta = 16 + 8\pi - 8\theta$

$\frac{24\theta}{24} = \frac{8\pi - 16}{24}$

$\theta = 0.3805$

$\theta = 0.381$ radians.

iii) If $\theta = \frac{1}{3}\pi$, the $A\hat{B}O = B\hat{A}O = \frac{1}{3}\pi$ = thus, equilateral triangle



$P = 8 + 16 + BC$

$= 8 + 16 + 8\sqrt{3}$

$= 24 + 8\sqrt{3} \longrightarrow$ shown

$BC^2 + 8^2 = 16^2$

$BC = \sqrt{16^2 - 8^2}$

$BC = \sqrt{256 - 64}$

$BC = \sqrt{192}$

$= \sqrt{64 \times 3}$

$= 8\sqrt{3}$

Q3. i) $P = 2r + r\theta$

$20 = 2r + r\theta$

$\frac{20 - 2r}{r} = \theta$

$\frac{20}{r} - 2 = \theta \rightarrow$ shown

ii) $A = \frac{1}{2} r^2 \theta$

$= \frac{1}{2} r^2 \left(\frac{20}{r} - 2\right)$

$= \frac{1}{2} 20r - 2r^2$

$A = 10r - r^2 \rightarrow$ shown

iii) $r = 8$, $|PQ|$

$\theta = \frac{20}{r} - 2$

$= \frac{20}{8} - 2$

$= 0.5$ rad.

$PQ \Rightarrow c^2 = a^2 + b^2 - 2ab\cos C$

$c^2 = 8^2 + 8^2 - 2(8)(8)\cos(0.5)$

$c^2 = 128 - 2(64)\cos(0.5)$

$c = 3.958$

$c = 3.96$

Q4. i) A = A of triangle - A of sector $\rightarrow$ Incorrect, do again

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

$= \frac{1}{2}(100)\sin(0.8)$

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

$= \frac{1}{2} 6^2 \, 0.8$

$= 35.9\text{cm}^2$ $\qquad\qquad\qquad\qquad = 14.4\text{cm}^2$

$A = 35.9 - 14.4$

$= 21.5\text{cm}^2 \rightarrow$ A. of shaded region.

ii) $\dfrac{\sin 0.8}{x} = \dfrac{\sin\left(\frac{\pi - 0.8}{2}\right)}{10}$

$\dfrac{\sin 0.8}{x} = \dfrac{0.359}{10}$

$\dfrac{10 \sin 0.8}{0.359} = x$

$19.98 = x$

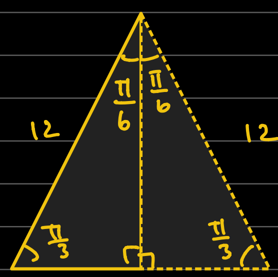
$20 = x$

$P = 20 + 8 + r\theta$

$= 28 + 6(0.8)$

$= 32.8\text{ cm} \rightarrow$ perimeter of shaded region.

Q5. A. shaded region = A of Δ − A of sector



↳ cut equilateral Δ in half.

$\sqrt{12^2 - 6^2} = c$

$\sqrt{144 - 36} = c$

$\sqrt{108} = c$

$\sqrt{3 \times 3 \times 3 \times 2 \times 2} = c$

$6\sqrt{3} = c$

A of Δ = $\dfrac{6 \times 6\sqrt{3}}{2}$

$= 18\sqrt{3}$

A of sector

$= \frac{1}{2} r^2 \theta$

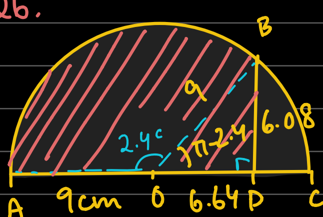
$= \frac{1}{2} 36\theta$

$= 18\frac{\pi}{3}$

$= 6\pi$

∴, A of shaded region $= 18\sqrt{3} + 6\pi$

Q6.



i) BD ⇒ $\sin(\pi - 2.4) = \dfrac{BD}{9}$

$9\sin(\pi - 2.4) = BD$

$6.079 = BD$

$6.08 = BD \rightarrow$ shown

ii) OD → $\cos(\pi - 2.4) = \dfrac{OD}{9}$

$9\cos(\pi - 2.4) = OD$

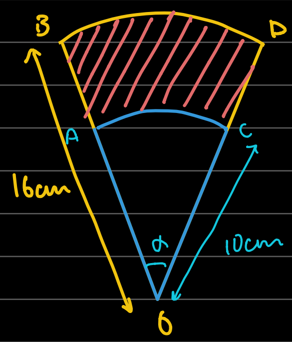
$6.64 = OD$

$s = r\theta$
$= 9(2.4)$
$= 21.6$

$P = 9 + 6.64 + 6.08 + 21.6$
$= 43.32$
$= 43.3\ cm \rightarrow$ perimeter

iii) $A = \frac{1}{2}r^2\theta + \frac{6.64 \times 6.08}{2}$
$= \frac{81(2.4)}{2} + \frac{40.37}{2}$
$= 117.385$
$= 117\ cm^2 \rightarrow$ Area of shaded region.

Q7.



i) $\alpha = 0.8$ rad.
A. shaded region = A. sector − A. sector
$= \frac{1}{2}r^2\theta - \frac{1}{2}r^2\theta$
$= \frac{1}{2}16^2\theta - \frac{1}{2}10^2\theta$
$= \frac{\theta}{2}(256 - 100)$
$= 0.4(156)$
$= 62.4\ cm^2 \rightarrow$ Area of shaded region

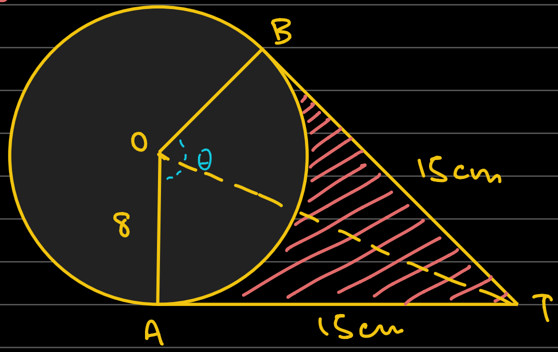
ii) $28.9cm - 12 = 16.9cm$

$r_1\theta + r_2\theta = 16.9$

$10\theta + 16\theta = 16.9$
$\frac{26\theta}{26} = \frac{16.9}{26}$
$\theta = 0.65$ rad.

$\therefore, \alpha = 0.65 \rightarrow$ Ans.

Q8.



i) $\frac{1}{2}\theta = \alpha$

$\tan(\alpha) = \frac{15}{8}$
$\alpha = \tan^{-1}\left(\frac{15}{8}\right)$
$\alpha = 1.08$ rad.

$\frac{1}{2}\theta = \alpha$

ii) $P = 30 + r\theta$
$= 30 + 8(2.16)$
$= 47.28\text{cm} \rightarrow$ perimeter of shaded region

$\theta = 2\alpha$
$\theta = 2(1.08)$
$\theta = 2.16 \text{ rad} \rightarrow$ shown

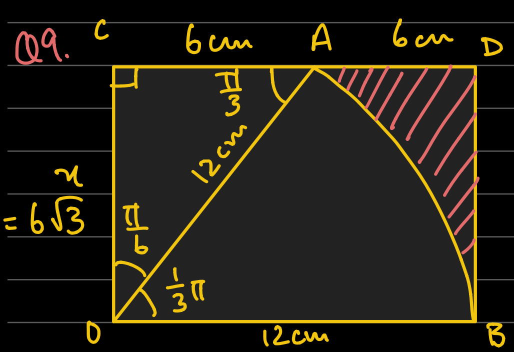
iii) $A = 2(A.\text{ triangle} - A \text{ sector})$

$A.\Delta : \frac{15 \times 8}{2}$
$= 60\text{cm}^2$

$A \text{ sector} = \frac{1}{2} r^2 \theta$
$= 32(1.08)$
$= 34.56 \text{ cm}^2$

$A = 2(60 - 34.56)$
$= 2(25.44)$
$= 50.88$
$\approx 50.9\text{cm}^2 \rightarrow$ area of shaded region

Q9.



$[a(\sqrt{3}) - b\pi]$ form

A. shaded region $= A \square - (A \text{ sector} + A\, \Delta)$

$\sqrt{12^2 - 6^2} = x$
$\sqrt{144 - 36} = x$
$\sqrt{108} = x$
$6\sqrt{3} = x$

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

$A \square = 12 \times 6\sqrt{3}$
$= 72\sqrt{3}$

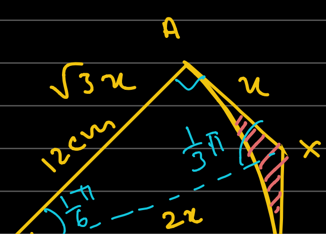
$A \text{ sector} = \frac{1}{2} r^2 \theta$
$= \frac{1}{2} 12^2 \left(\frac{\pi}{3}\right)$
$= \frac{72\pi}{3}$
$= 24\pi$

$A\, \Delta = \frac{6 \times 6\sqrt{3}}{2}$
$= 18\sqrt{3}$

A shaded region $= A \square - A \Delta - A \text{ sector}$
$= 72\sqrt{3} - 18\sqrt{3} - 24\pi$
$= 54\sqrt{3} - 24\pi$

$\therefore$, area $= 54\sqrt{3} - 24\pi$, $[a\sqrt{3} - b\pi]$, $a = 54$, $b = 24$

Q10.



i) in terms of $\sqrt{3}$

$x^2 + 2x^2 = 12^2$
$3x^2 = 144$
$x^2 = 48$

$x = \sqrt{48}$

$= \sqrt{2^4 \times 3}$

$= \sqrt{4^2 \times 3}$

$= 4\sqrt{3}$

$\therefore, AX = 4\sqrt{3}$

ii) in terms of π and $\sqrt{3}$

$A_{SR} = 2(A_\Delta - A_{sect.})$

$A_\Delta = \frac{4\sqrt{3} \times 12}{2}$

$= 24\sqrt{3}$

$A_{sect.} = \frac{1}{2} r^2 \theta$

$= \frac{144}{2} \times \frac{\pi}{6}$

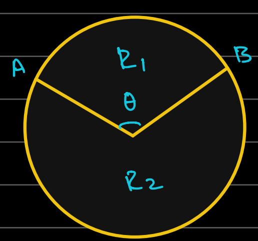
$= 12\pi$

$A_{SR} = 2(24\sqrt{3} - 12\pi)$

$A_{SR} = 48\sqrt{3} - 24\pi \longrightarrow$ Area of shaded region.

Past Paper Practice Q14, 15, 19, 20 $\rightarrow$ Classwork
All remaining q's till Q20 $\rightarrow$ homework } Oct 23rd

Q14.



i) $\frac{2r + r\theta}{r} = \frac{r(2\pi - \theta)}{r}$

$2 + \theta = 2\pi - \theta$

$2\theta = 2\pi - 2$

$\theta = \pi - 1 \rightarrow$ shown

ii) $30 = \frac{1}{2} r^2 \theta$

$60 = r^2 \theta$

$60 = r^2(\pi - 1)$

$\sqrt{\frac{60}{\pi - 1}} = \sqrt{r^2}$

$5.29 = r$

$30 = \frac{1}{2}(5.29)^2 \theta$

$\frac{30}{14} = \frac{14\theta}{14}$

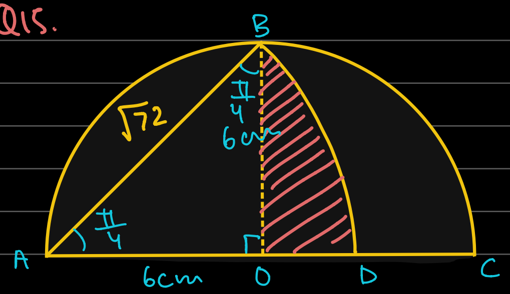
$2.14 = \theta$

$A = \frac{1}{2}(5.29)^2(4.14)$

$= 57.9\ cm^2$ ↳ Area of R2.

$2\pi - 2.14 = 4.14$

Q15.



i) $s = r\theta$

$= \sqrt{72}\left(\frac{\pi}{4}\right)$

$= 6.66\,cm \longrightarrow$ BD

ii) $A_{SR} = A_{sector} - A_{\Delta}$

$A_{sector} = \frac{1}{2}r^2\theta$ $\qquad A_{\Delta} = 18$

$= \frac{1}{2}(\sqrt{72})^2(\frac{\pi}{4})$

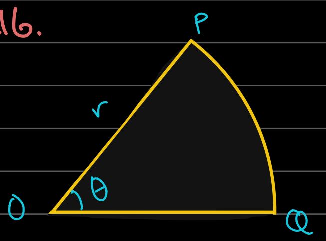
$= 36\frac{\pi}{4}$

$= 9\pi$

$A_{SR} = 9\pi - 18$

$= \underline{\underline{10.27cm^2}} \rightarrow$ Area of shaded region

Q16.



i) $50 = 2r + r\theta$

$\frac{50-2r}{r} = \frac{r\theta}{r}$

$\frac{50}{r} - 2 = \theta$

$A = \frac{1}{2}r^2\theta$

$= \frac{1}{2}r^2(\frac{50}{r} - 2)$

$= \frac{1}{2}(50r - 2r^2)$

$A = 25r - r^2$

$\rightarrow$ $\underline{\underline{\text{shown}}}$

ii) $A = 25r - r^2$

$-r^2 + 25r + 0 = 0$

$\frac{dA}{dr} = -2r + 25 \rightarrow$ gradient function

when gradient $= 0$, stationary point

$0 = 25 - 2r$

$2r = 25$

$r = 12.5 \rightarrow$ The value of r at stationary point

$A = 25r - r^2$

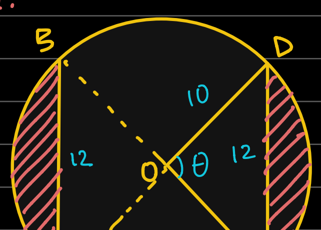
$A = 25(12.5) - (12.5)^2$

$A = 312.5 - 156.25$

$A = 156.25 \rightarrow$ Stationary value of area

Nature: Maximum value.

Q17.



i) $c^2 = a^2 + b^2 - 2ab\cos C$

$12^2 = 10^2 + 10^2 - 2(10)(10)\cos C$

$144 - 200 = -2(100)\cos C$

$-56 = -200\cos C$

$\cos^{-1}\left(\frac{56}{200}\right) = C$

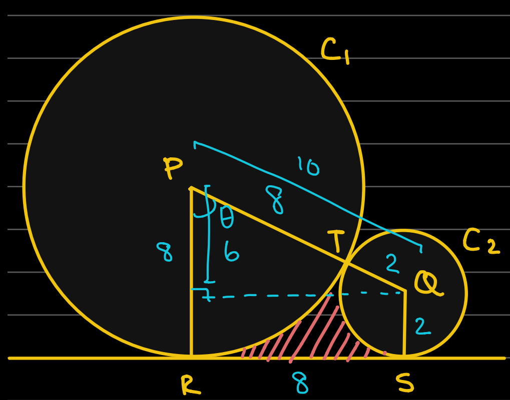
$1.287 = c \longrightarrow$ shown

ii) $\dfrac{2\pi - 2(1.287)}{2}$
$= \pi - 1.287$
$= 1.855$ rad.

$P = 2(r\theta) + 2(12)$
$= 2(10 \times 1.855) + 24$
$= 2(18.55) + 24$
$= 37.1 + 24$
$= 61.1$ cm $\longrightarrow$ perimeter of ABDE

iii) $A = 2(\frac{1}{2} r^2 \theta) + 2(50)$
$= 2(\frac{1}{2} 10^2 1.855) + 100$
$= 2(50 \times 1.855) + 100$
$= 2(92.75) + 100$
$= 185.5 + 100$
$= 285.5 \longrightarrow$ Area of ABDE

Q18.



i) $10^2 - 6^2 = c^2$
$100 - 36 = c^2$
$\sqrt{64} = \sqrt{c^2}$
$8\text{cm} = c \longrightarrow$ shown

ii) $\cos\theta = \dfrac{6}{10}$
$\theta = \cos^{-1}\left(\dfrac{6}{10}\right)$
$\theta = 0.927$ radians.
$\hookrightarrow R\hat{P}Q$

iii) Ase = A trapezium − A two sectors

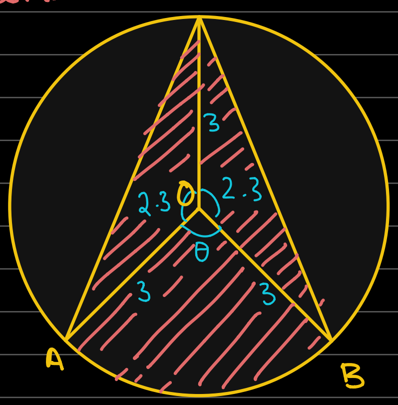
$\frac{\pi}{2} - 0.644 + \frac{\pi}{2}$
$= 2.21$ rad.

A trapezium : $\dfrac{(b_1 + b_2)h}{2}$
$= \dfrac{(8+2)(8)}{2}$
$= \dfrac{10 \times 8}{2}$
$= 40$ cm^2

A two sectors
$= \frac{1}{2} r^2\theta + \frac{1}{2} r^2\theta$
$= \frac{1}{2} 8^2 0.927 + \frac{1}{2} 2^2 2.21$
$= \dfrac{(64 \times 0.927) + (4 \times 2.21)}{2}$
$= \dfrac{59.328 + 8.84}{2}$
$= \dfrac{68.168}{2}$
$= 34.084$

Ase $= 40 - 34.084$
$= 5.916$
$= 5.92 \longrightarrow$ Area of shaded region

Q19.



i) $A\hat{O}B = 2\pi - 2(2.3)$
$= 2\pi - 4.6$
$= 1.683$ radians $\longrightarrow \underline{\underline{A\hat{O}B}}$

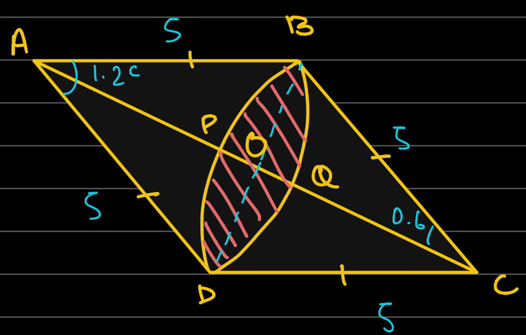
ii) $A_{SR} = 2(A_\Delta) + A_{sector}$

$A_\Delta = \frac{1}{2} ab\sin C$
$= \frac{1}{2}(3)(3)\sin(2.3)$
$= 3.356 \text{ cm}^2$

$A_{sector} = \frac{1}{2} r^2 \theta$
$= \frac{1}{2} 3^2 1.683$
$= 7.574 \text{ cm}^2$

$A_{SR} = 2(A_\Delta) + 7.574$
$= 2(3.356) + 7.574$
$= 6.712 + 7.574$
$= 14.286$
$= 14.3 \text{ cm}^2 \longrightarrow$ Area of shaded region

Q20.



i) $A_{SR} = 2(A_{sector} - A_\Delta)$

$A_{sector} = \frac{1}{2} r^2 \theta$
$= \frac{1}{2} 5^2 (1.2)$
$= 15 \text{cm}^2$

$A_\Delta = \frac{1}{2} ab\sin C$
$= \frac{1}{2}(5)(5)\sin 1.2$
$= \frac{25\sin 1.2}{2}$
$= 11.65 \text{ cm}^2$

$A_{SR} = 2(15 - 11.65)$
$= 2(3.35)$
$= 6.7 \text{cm}^2 \longrightarrow$ Area of shaded region

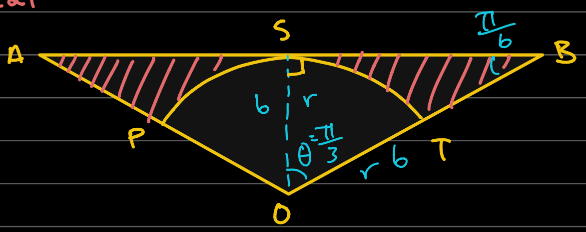
ii) $PQ = 2(r - CO)$

$CO \Rightarrow \quad \cos 0.6 = \frac{x}{5}$
$5\cos 0.6 = x$
$4.127 = x$

$PQ = 2(5 - 4.127)$
$= 2(0.873)$
$= 1.746$
$= 1.75 \text{ cm} \longrightarrow \underline{\underline{PQ}}$

Homework : Q20 – Q40 — Oct 26th, 2020

Q21



i) $A_{SR} = 2(A_\Delta - A\,sector)$

A_Δ :

$\tan\theta = \frac{SB}{r}$

$r\tan\theta = SB$

$A_\Delta = r \times r\tan\theta / 2$

$= \frac{r^2\tan\theta}{2}$

$A\,sector$:

$= \frac{1}{2}r^2\theta$

$= \frac{r^2\theta}{2}$

$A_{SR} = 2\left(\frac{r^2\tan\theta - r^2\theta}{2}\right)$

$= r^2\tan\theta - r^2\theta$

$= r^2(\tan\theta - \theta)$

↳ Area of shaded region

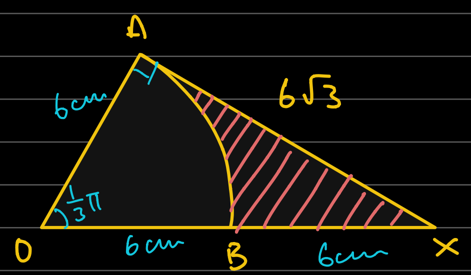
ii) $\theta = \frac{\pi}{3}$, $r = 6$

$P = 2(6(\frac{\pi}{3}) + 6 + 6\sqrt{3})$

$= 2(2\pi + 6 + 6\sqrt{3})$

$= 4\pi + 12 + 12\sqrt{3}$ → Ans.

Q22.



i) $\tan\theta = \frac{AX}{6}$

$\tan(\frac{\pi}{3}) = \frac{AX}{6}$

$\sqrt{3} = \frac{AX}{6}$

$6\sqrt{3} = AX$ → shown

ii) $A_{SR} = A_\Delta - A\,sector$

$A_\Delta = \frac{6 \times 6\sqrt{3}}{2}$

$= \frac{36\sqrt{3}}{2}$

$= 18\sqrt{3}$

$A\,sector$:

$= \frac{1}{2}r^2\theta$

$= \frac{1}{2}6^2(\frac{\pi}{3})$

$= \frac{18\pi}{3}$

$= 6\pi$

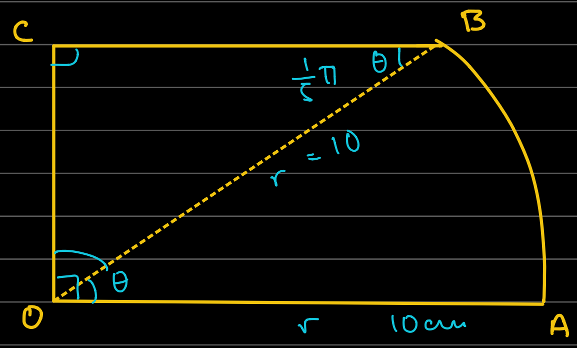
$A_{SR} = 18\sqrt{3} - 6\pi$ → Ans.

ii) $P = r\theta + 6\sqrt{3} + 6$

$= \frac{6\pi}{3} + 6\sqrt{3} + 6$

$= 2\pi + 6\sqrt{3} + 6 \rightarrow$ Ans.

Q23.



i) $r\sin\theta = CO$

$r\cos\theta = BC$

$P = r\sin\theta + r\cos\theta + r + r\theta$

$= r(\sin\theta + \cos\theta + 1 + \theta) \rightarrow$ Ans.

ii) $r = 10$, $\theta = \frac{1}{5}\pi$

$CO \Rightarrow \sin\left(\frac{\pi}{5}\right) = \frac{CO}{10}$

$10\sin(\pi/5) = CO$

$5.88 = CO$

$CB \Rightarrow \cos(\pi/5) = \frac{CB}{10}$

$10\cos(\pi/5) = CB$

$8.09 = CB$

$AD = \frac{5.88 \times 8.09}{2}$

$= 23.8\ cm^2$

Asector:

$\frac{1}{2}r^2\theta$

$= \frac{1}{2}10^2\left(\frac{\pi}{5}\right)$

$= \frac{50\pi}{5}$

$= 10\pi$

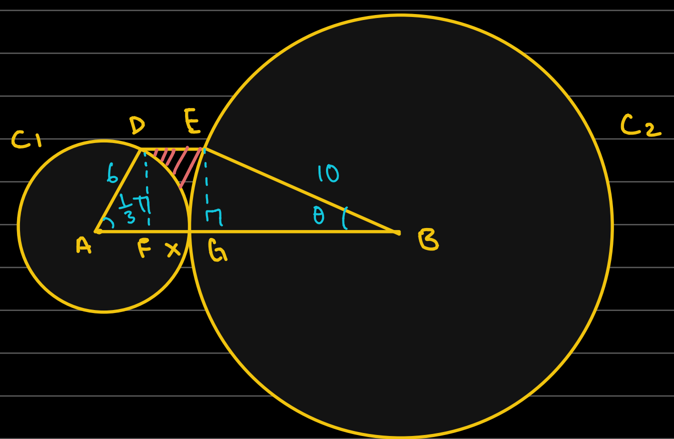
$= 31.42$

$A = 23.8 + 31.42$

$= 55.2\ cm^2$

$\therefore$, Area of plate $= 55.2\ cm^2$

Q24



i) DAF is a 30 60 triangle so

$DF = 3\sqrt{3}$ cm

so

$EG = 3\sqrt{3}$ cm

$\sin\theta = \frac{EG}{10}$

$\sin\theta = \frac{3\sqrt{3}}{10}$

$\theta = 0.55$

$\theta = \sin^{-1}\left(\frac{3\sqrt{3}}{10}\right) \rightarrow$ shown

ii) $P = r\theta + r\theta + DE$

$DE \Rightarrow 16 - AF - BG$

$AF \Rightarrow 6\cos(\pi/3) = AF$
$3 = AF$

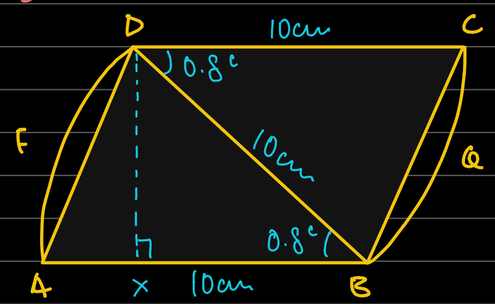
$BG \Rightarrow 10\cos\theta = BG$
$10\cos\left(\sin^{-1}\left(\frac{3\sqrt{3}}{10}\right)\right) = BG$
$8.54 = BG$

$16 - 8.54 - 3$
$= 4.46\text{cm}$

$P = 6(\pi/3) + 10(0.55) + 4.46$
$= 2\pi + 5.5 + 4.46$
$= 16.2\text{ m}$

∴, the perimeter of the shaded region = 16.24 cm.

Q25.



i) $DX \Rightarrow \sin 0.8 = \frac{DX}{10}$
$10\sin 0.8 = DX$
$7.174\text{ cm} = DX$

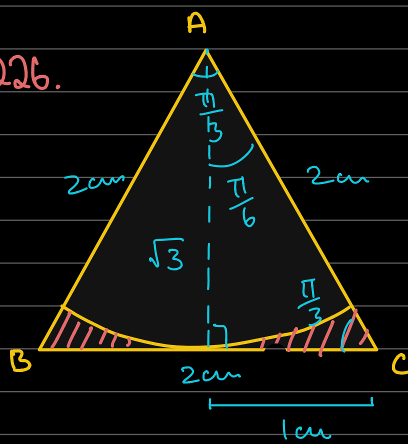
$A_{\text{parallelogram}} = b \times h$
$= 10 \times 7.174$
$= 71.74$
$= 71.7\text{cm}^2$

∴, the area of the parallelogram ABCD is 71.7cm^2.

ii) $A = \frac{1}{2}r^2\theta + \frac{1}{2}r^2\theta$
$= 2\left(\frac{1}{2}r^2\theta\right)$
$= 2\left(\frac{1}{2}10^2\,0.8\right)$
$= 10^2\,0.8$
Area of whole shape $= 80\text{ cm}^2 \rightarrow$ Answer

iii) $P = 2r\theta + 2r$
$= 2(10)(0.8) + 2(10)$
$= 16 + 20$
$= 36\text{ cm} \rightarrow$ Perimeter of whole shape

Q26.

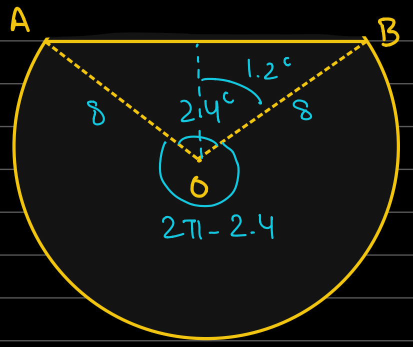


$A_{\Delta} = 2\left(\frac{bh}{2}\right)$
$= b \times h$
$= 1 \times \sqrt{3}$
$= \sqrt{3}\text{ cm}^2$

$A_{SR} = \sqrt{3} - \frac{\pi}{2} \rightarrow$ Ans.

$A_{\text{sector}} = \frac{1}{2}r^2\theta$
$= \frac{1}{2}(\sqrt{3})^2(\pi/3)$
$= \frac{1}{2} \times 3 \times \frac{\pi}{3}$
$= \frac{3\pi}{6}$
$= \frac{\pi}{2}$

Q27.



i) $\sin 1.2 = \frac{x}{8}$

$8\sin 1.2 = x$

$7.46\text{cm} = x$

$\times 2$

$14.9\text{cm} = AB \rightarrow$ Ans

ii) $P = 14.9 + r\theta$

$= 14.9 + 8(2\pi - 2.4)$

$= 14.9 + 31.1$

$= 46\text{cm} \longrightarrow$ Perimeter of the plate

iii) $A = A_\Delta + A$ sector

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

$= \frac{1}{2}(8)^2 \sin(2.4)$

$= 32\sin 2.4$

$= 21.6\text{cm}^2$

A sector

$= \frac{1}{2}r^2\theta$

$= 32(2\pi - 2.4)$

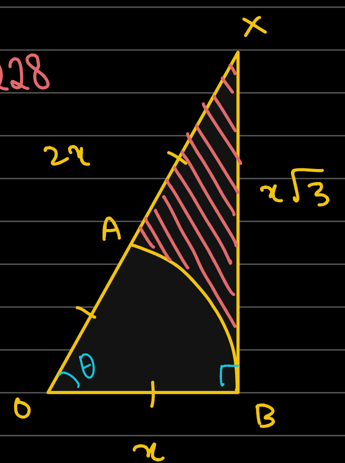
$= 124.3$

$A = 21.6 + 124.3$

$= 145.9\text{cm}^2 \longrightarrow$ Area of the plate

$= 146\text{cm}^2$

Q28



i) Sin OX = 2OB and $X\hat{B}O = 90°$, this is a 30, 60 triangle

$\cos\theta = \frac{r}{2r}$

$\theta = \cos^{-1}\left(\frac{1}{2}\right)$

$\theta = \frac{1}{3}\pi$

ii) $AB \Rightarrow r\theta$

$= r\frac{\pi}{3}$

$AX = r$

$XB = r\sqrt{3}$

$P_{SR} = r + r\sqrt{3} + \frac{r\pi}{3}$

$= r\left(1 + \sqrt{3} + \frac{\pi}{3}\right)$

↳ Perimeter of shaded region.

iii) $A_{SR} = A_\Delta - A$ sector

$A_\Delta = \frac{r \times r\sqrt{3}}{2}$

$= \frac{r^2\sqrt{3}}{2}$

A sector $= \frac{1}{2}r^2\theta$

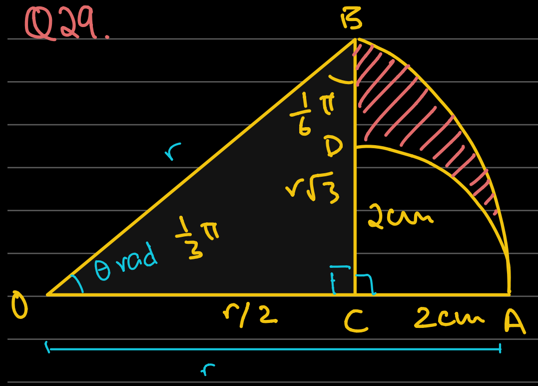
$= \frac{1}{2}r^2\,\pi/3$

$= \frac{r^2\pi}{6}$

$$ASR = \frac{r^2\sqrt{3}}{2} - \frac{r^2\pi}{6}$$

$$= r^2\left(\frac{\sqrt{3}}{2} - \frac{\pi}{6}\right) \rightarrow \text{Area of the shaded region}$$

Q29.



$BC = 2\sqrt{3}$

$2\sqrt{3} - 2 = BD$

$$BA \Rightarrow r\theta$$
$$= 4\frac{\pi}{3}$$
$$= \frac{4}{3}\pi$$

i) $OC \Rightarrow r\cos\theta$

$$AC = r - r\cos\theta$$
$$= r(1 - \cos\theta) \rightarrow \underline{\underline{\text{Ans.}}}$$

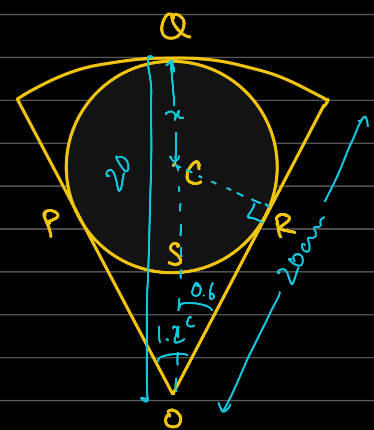
ii) $\theta = \frac{1}{3}\pi$, $r = 4$

$$AC \Rightarrow 4(1 - \cos(\pi/3))$$
$$= 4(0.5)$$
$$= 2$$

$$AD \Rightarrow r\theta$$
$$= 2\,\pi/2$$
$$= \pi$$

$$P = \pi + \frac{4}{3}\pi + 2\sqrt{3} - 2$$
$$= \frac{7}{3}\pi + 2\sqrt{3} - 2 \rightarrow \underline{\underline{\text{Ans.}}}$$

Q30.



i) $CO = 20 - x$
$CR = x$

$$\sin 0.6 = \frac{x}{20 - x}$$

$$20\sin 0.6 = x + x(\sin 0.6)$$
$$\frac{11.2928}{1.5646} = \frac{1.5646x}{1.5646}$$
$$7.2176 = x$$
$$7.218 = x \rightarrow \underline{\underline{\text{shown}}}$$