

Ex 2.5

Q1.

(i)

$$\begin{aligned}x^2 &= 5^2 + 8^2 - 2(5)(8) \cos 62 \\x^2 &= 89 - 37.55 \\x &= \sqrt{51.44} \\x &= 7.17 = 7.2 \text{ cm}\end{aligned}$$

(ii)

$$\begin{aligned}x^2 &= 11^2 + 14^2 - 2(11)(14) \cos 38 \\x^2 &= 317 - 242.707 \\x &= \sqrt{74.29} \\x &= 8.6 \text{ cm}\end{aligned}$$

(iii)

$$\begin{aligned}x^2 &= 5^2 + 6.8^2 - 2(5)(6.8) \cos 105 \\x^2 &= 71.24 - (-17.5997) \\x^2 &= 88.84 \\x &= \sqrt{88.84} \\x &= 9.4 \text{ cm}\end{aligned}$$

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

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

Q2 (i)

$$\cos A = \frac{7^2 + 8^2 - 12^2}{2(7)(8)}$$

$$\cos A = -0.2768$$

$$A = \cos^{-1}(-0.2768)$$

$$A = 106^\circ$$

(ii)

$$\cos B = \frac{20^2 + 18^2 - 14^2}{2(20)(18)}$$

$$\cos B = 0.73$$

$$B = \cos^{-1}(0.73)$$

$$B = 43^\circ$$

(iii)

$$\cos C = \frac{9^2 + 13^2 - 18^2}{2(9)(13)}$$

$$\cos C = -0.32$$

$$C = \cos^{-1}(-0.32)$$

$$C = 108^\circ$$

$$\cos C = -0.32$$

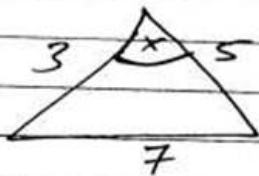
$$C = \cos^{-1}(-0.32)$$

$$C = 108^\circ$$

Q3

3 cm      5 cm      7 cm

Largest angle is between the 2 shorter sides  
or opposite largest side.



$$\cos X = \frac{5^2 + 3^2 - 7^2}{2(5)(3)}$$

$$\cos X = -0.5$$

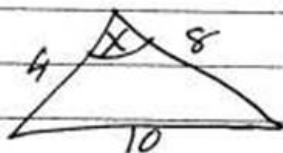
$$X = \cos^{-1}(-0.5)$$

$$X = 120^\circ$$

Q4

4, 8, 10

Need an angle to find area.



$$\cos X = \frac{4^2 + 8^2 - 10^2}{2(4)(8)}$$

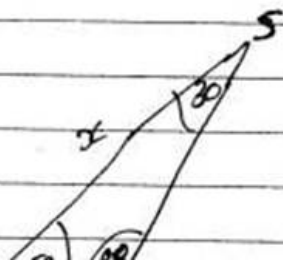
$$\cos X = -0.3125$$

$$X = \cos^{-1}(-0.3125)$$

$$X = 108^\circ$$

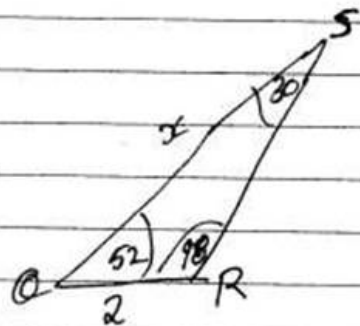
$$\begin{aligned} \text{Area} &= \frac{1}{2}(4)(8)\sin(108) \\ &= 15.2 \text{ sq units.} \end{aligned}$$

Q5



$$180 - 52 - 30 = 98^\circ$$

Q5



$$180 - 52 - 30 = 98^\circ$$

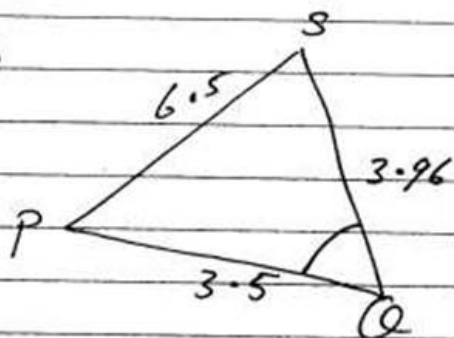
$$(i) \frac{x}{\sin 98} = \frac{2}{\sin 30}$$

$$x = \frac{2}{\sin 30} \times \sin 98$$

$$x = 3.96$$

$$x = 4.0$$

(ii)



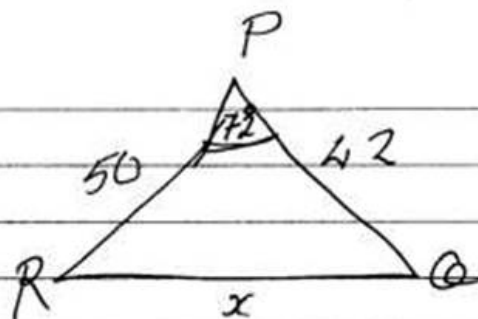
$$\cos \theta = \frac{(3.96)^2 + (3.5)^2 - (6.5)^2}{2(3.96)(3.5)}$$

$$\cos \theta = -0.517$$

$$\theta = \cos^{-1}(-0.517)$$

$$\theta = 121^\circ$$

i Q6



$$x^2 = 50^2 + 42^2 - 2(50)(42)\cos 72$$

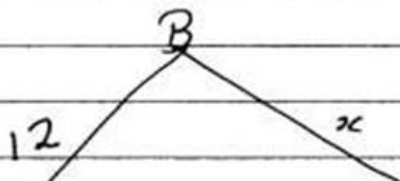
$$x^2 = 4264 - 1297.87$$

$$x = \sqrt{2966.13}$$

$$x = 54.46 = 54.5 \text{ m}$$

$$\begin{aligned} \text{Total length} &= 50 + 42 + 54.5 \\ &= 146.5 \text{ m.} \end{aligned}$$

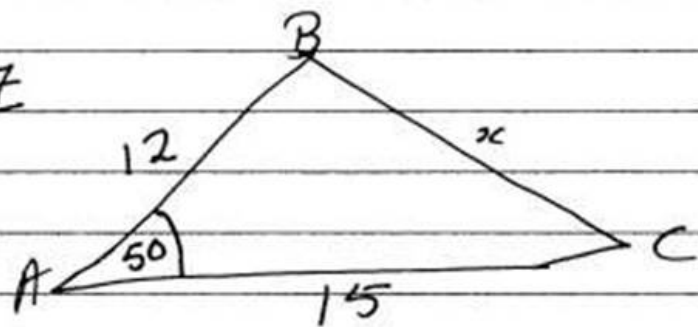
Q7



$$(1) \text{ Area} = \frac{1}{2} ab \sin C$$

$$65 = \frac{1}{2} (12)(15) \sin A$$

Q7



$$(1) \text{ Area} = \frac{1}{2} ab \sin C$$

$$65 = \frac{1}{2} (12)(15) \sin A$$

$$65 = 90 \sin A$$

$$\sin^{-1}\left(\frac{65}{90}\right) = A$$

$$46^\circ = A$$

(ii)

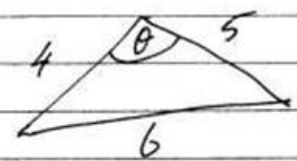
$$x^2 = 12^2 + 15^2 - 2(12)(15)\cos 46^\circ$$

$$x^2 = 369 - 250 \cdot 0.68$$

$$x = \sqrt{118.92}$$

$$x = 10.9 \text{ cm}$$

Q8

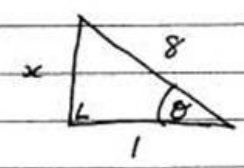


$$(i) \cos \theta = \frac{4^2 + 5^2 - 6^2}{2(4)(5)}$$

$$\cos \theta = \frac{1}{8}$$

$$(ii) \sin \theta = \frac{a\sqrt{7}}{b}$$

$$\cos \theta = \frac{1}{8} = \frac{A}{H}$$



Use Pythagoras to find opp

$$8^2 = x^2 + 1^2$$

$$64 - 1 = x^2$$

$$\sqrt{63} = x$$

$$3\sqrt{7} = x \text{ (opp side)}$$

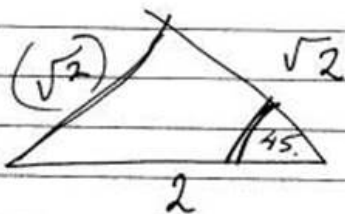
$$\sin \theta = \frac{O}{H}$$

$$\sin \theta = \frac{3\sqrt{7}}{8}$$

$\Rightarrow a = 3$  and  $b = 8$ .



Q9



Find Angle given Area

$$\text{Area} = \frac{1}{2} ab \sin C$$

$$1 = \frac{1}{2} (2)(\sqrt{2}) \sin C$$

$$1 = \sqrt{2} \sin C$$

$$\sin^{-1}\left(\frac{1}{\sqrt{2}}\right) = C$$

$$45^\circ = C$$

Find 3<sup>rd</sup> Side.

$$x^2 = (\sqrt{2})^2 + (2)^2 - 2(\sqrt{2})(2) \cos 45$$

$$x^2 = 6 - 4$$

$$x = \sqrt{2}$$

2 sides are  $\sqrt{2} \Rightarrow$  isosceles.

2 common Angles are  $45^\circ \Rightarrow$  3<sup>rd</sup> Angle is  $90^\circ \Rightarrow$  a right angled  $\Delta$ .

Q10 Find Angle B: Area formula

$$\frac{1}{2} ab \sin C = 10$$

$$\frac{1}{2} (3.2)(8.4) \sin B = 10$$

$$13.44 \sin B = 10$$

$$\sin B = \frac{10}{13.44}$$

$$\sin B = 0.744$$

$$B = \sin^{-1} 0.744$$

$$B = 48^\circ$$

Find 3rd Side: Cosine Rule

$$x^2 = (3.2)^2 + (8.4)^2 - 2(3.2)(8.4)\cos(48)$$

$$x^2 = 80.8 - 35.97$$

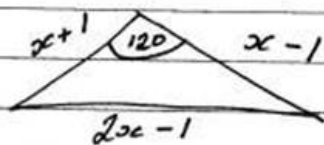
$$x^2 = 44.83$$

$$x = \sqrt{44.83}$$

$$x = 6.7 \text{ cm correct to one dec place}$$

$$\Rightarrow \text{Perimeter} = 3.2 + 8.4 + 6.7 = 18.3 \text{ cm}$$

Q11  
(i)



$$(2x-1)^2 = (x+1)^2 + (x-1)^2 - 2(x+1)(x-1)\cos(120)$$

$$4x^2 - 4x + 1 = (x^2 + 2x + 1 + x^2 - 2x + 1) - (2x+2)(x-1)\left(-\frac{1}{2}\right) - (2x^2 - 2x + 2x - 2)\left(-\frac{1}{2}\right)$$

$$4x^2 - 4x + 1 = 2x^2 + 2 + x^2 - 1$$

$$2x^2 - 4x + 1 = 3x^2 + 1$$

$$x^2 - 4x = 0$$

$$x(x-4) = 0$$

$$x = 0$$

$$x - 4 = 0$$

$$x = 4$$

Ans  $x = 4$

$$x(x-4) = 0$$

$$x = 0$$

$$x - 4 = 0$$

$$x = 4$$

Ans  $x = 4$ .

(ii)

$$\text{Area} = \frac{1}{2} ab \sin C$$

$$\text{Area} = \frac{1}{2} (x+1)(x-1) \sin 120 \quad x = 4$$

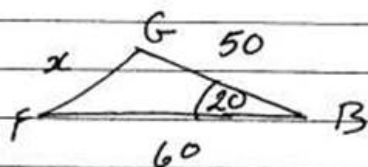
$$\Rightarrow \frac{1}{2} (x^2 - x^2 + x - 1) \left(\frac{\sqrt{3}}{2}\right)$$

$$\text{Area} = \frac{1}{2} (5)(3) \sin 120.$$

$$= \frac{15}{2} \left(\frac{\sqrt{3}}{2}\right)$$

$$= \frac{15\sqrt{3}}{4} \text{ sq units.}$$

i Q12

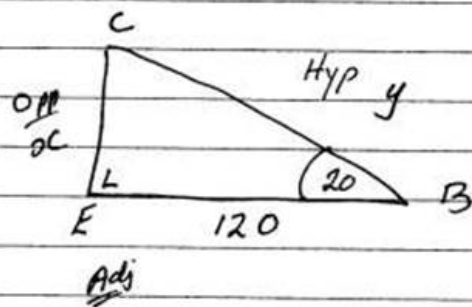


$$x^2 = (50)^2 + (60)^2 - 2(50)(60)\cos 20$$

$$x^2 = 6100 - 5638.156$$

$$x^2 = 461.844$$

$$x = 21.5 \text{ to one dec place}$$



$$\tan 20 = \frac{x}{120}$$

$$\tan(20) \times 120 = x$$

$$43.68 = x$$

$$\cos 20 = \frac{120}{y}$$

$$y = \frac{120}{\cos 20}$$

$$y = 127.7$$

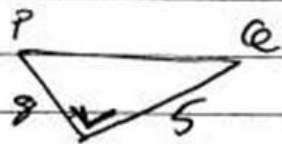
$$\text{Total wood} = 2(127.7) + 2(120) + 43.68 + 2(21.5)$$

$$= 582.08$$

$$= 582 \text{ cm.}$$

Q13

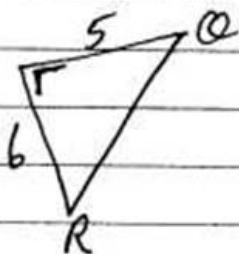
find the 3 sides of PQR.



$$x^2 = 8^2 + 5^2$$

$$x^2 = 89$$

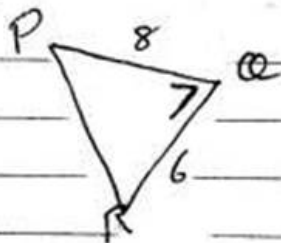
$$x = 9.43$$



$$x^2 = 6^2 + 5^2$$

$$x^2 = 61$$

$$x = 7.81$$

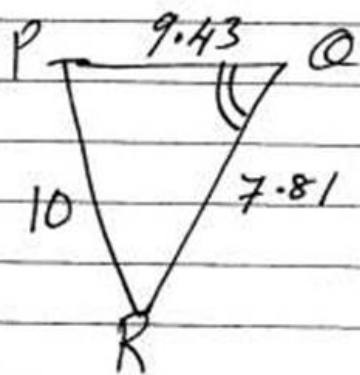


$$x^2 = 8^2 + 6^2$$

$$x^2 = 100$$

$$x = 10$$

$$x = 10$$



$$10^2 = (9.43)^2 + (7.81)^2 - 2(9.43)(7.81)\cos X$$

$$100 = 149.92 - 147.3 \cos X$$

$$100 - 149.92 = -147.3 \cos X$$

$$\oplus 49.92 = \oplus 147.3 \cos X$$

$$\frac{49.92}{147.3} = \cos X$$

$$0.3389 = \cos X$$

$$\cos^{-1}(0.3389) = x$$

$$70^\circ = x$$