X Test 03
Answer key

Q1 c)

Q2 a)

Q3 b)

Q4 a)

Q5 a)

Q6 b)

Q7 d)

Q8 a)

Q9 d)

Q10 b)

11. (A) $4(1)^2 - (2)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 + P = \frac{3}{4}$

$4 - 2 + \frac{3}{4} + P = \frac{3}{4}$

$P = -2$

(B) $2\left(\frac{1}{\sqrt{2}}\right)^2 - 3(1)^2 + 4(1)^2$

$1 - 3 + 4$

$= 2$

12 $\sin(A+B) = 1$

$A + B = 90^\circ$ — (1)

$2\cos(A-B) = \sqrt{3}$

$\cos(A-B) = \frac{\sqrt{3}}{2}$

$A - B = 30^\circ$ — (2)

Solve (1) & (2)

$A + B = 90$

$A - B = 30$

$2A = 120$

$A = 60^\circ, B = 30^\circ$

14. $\frac{\cos\theta - \sin\theta}{\cos\theta + \sin\theta} = \frac{1-\sqrt{3}}{1+\sqrt{3}}$

$\frac{1-\tan\theta}{1+\tan\theta} = \frac{(1-\sqrt{3})^2}{(1)^2-(\sqrt{3})^2}$

(In LHS Divide Nr & Dr by $\cos\theta$,
In RHS rationalise the dr)

$\frac{1-\tan\theta}{1+\tan\theta} = \frac{1+3-2\sqrt{3}}{-2}$

$= \frac{4-2\sqrt{3}}{-2}$

$\frac{1-\tan\theta}{1+\tan\theta} = \frac{2(\sqrt{3}-2)}{-2}$

$1-\tan\theta = \sqrt{3}(1+\tan\theta)$
$-2(1+\tan\theta)$

$1-\tan\theta = \sqrt{3}+\sqrt{3}\tan\theta - 2 - 2\tan\theta$

$1+2-\sqrt{3} = \sqrt{3}\tan\theta - 2\tan\theta + \tan\theta$

$3-\sqrt{3} = (\sqrt{3}-1)\tan\theta$

$\frac{3-\sqrt{3}}{\sqrt{3}-1} = \tan\theta$

$\frac{(3-\sqrt{3})(\sqrt{3}+1)}{2} = \tan\theta$

$$\frac{3\sqrt{3}+\sqrt{3}-3-\sqrt{3}}{2} = \tan\theta$$

$$\frac{2\sqrt{3}}{2} = \tan\theta$$

$$\sqrt{3} = \tan\theta$$

$$\theta = 60^\circ$$

B(A) $\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$ (given)

$$= \frac{\frac{1}{2}+\frac{1}{3}}{1-\frac{1}{2}\times\frac{1}{3}}$$

$$= \frac{5}{6} \times \frac{6}{5}$$

$\tan(A+B) = 1$

$A+B = 45^\circ$

(B) $\cos A = \frac{4}{5}$ $\sin A = \sqrt{1-\cos^2 A}$

$= \sqrt{1-\frac{16}{25}} = \frac{3}{5}$

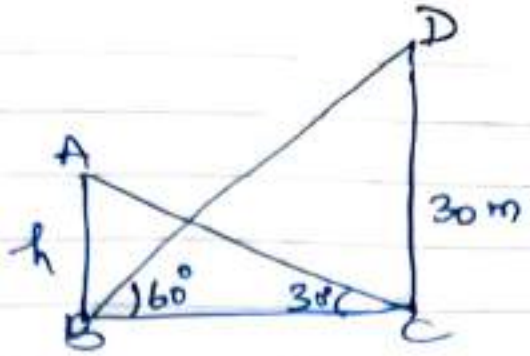
$\sec A = \frac{5}{4}$ $\tan A = \frac{\sin A}{\cos A} = \frac{3/5}{4/5}$

$= \frac{3}{4}$

(i) $\sec^2 A - \tan^2 A = 1$

(ii) $\frac{1-\sin^2 A}{1+\sin^2 A} = \frac{16}{34} = \frac{8}{17}$

15.



In $\triangle DBC$, rt. angle at C

$$\tan 60^\circ = \frac{30}{BC}$$

$$\sqrt{3} = \frac{30}{BC} \Rightarrow BC = \frac{30}{\sqrt{3}} = 10\sqrt{3}\,m$$

Distance between two building is $10\sqrt{3}$ m.

Also, In $\triangle ABC$, rt angle at B

$$\tan 30^\circ = \frac{h}{BC}$$

$$\frac{1}{\sqrt{3}} \times BC = h$$

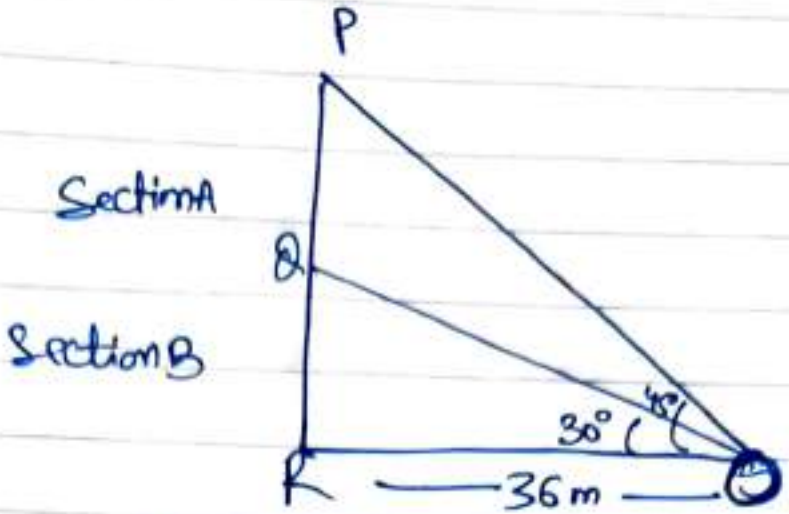
$$\frac{1}{\sqrt{3}} \times 10\sqrt{3} = h$$

$$10 = h$$

height of second building is 10m

16

(i)



In $\triangle QRO$, rt. angle at R

$$\tan 30^\circ = \frac{QR}{36}$$

$$\frac{1}{\sqrt{3}} \times 36 = QR$$

$$12\sqrt{3}\ m = QR$$

Height of section B is $12\sqrt{3}$ m.

(ii) In $\triangle QRO$, rt angle at R

$$\cos 30^\circ = \frac{RO}{QO}$$

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

$$\Rightarrow QO = \frac{36 \times 2}{\sqrt{3}}$$

$$= 24\sqrt{3}\ m$$

length of wire QO is $24\sqrt{3}$ m.

In ΔPRO, rt. angle at R

(iii)(A) $\tan 45^\circ = \frac{PR}{RO}$

$1 = \frac{PQ + QR}{36}$

$36 = PQ + 12\sqrt{3}$

$36 - 12\sqrt{3} = PQ$

$12(3 - \sqrt{3}) = PQ$

Height of section A = $12(3 - \sqrt{3})$ m.

OR

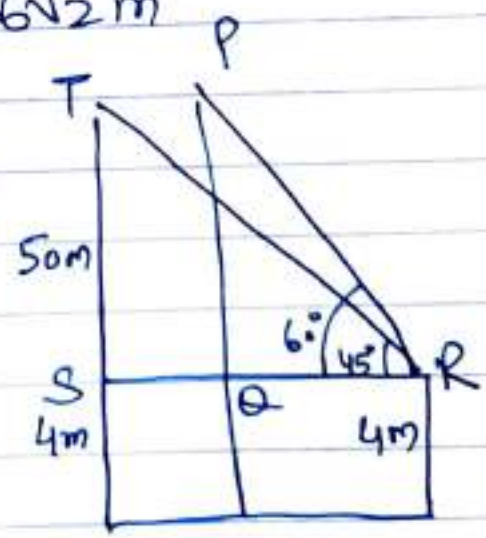
(B) In ΔPRO, rt. angle at R

$\cos 45^\circ = \frac{36}{PO}$

$\frac{1}{\sqrt{2}} = \frac{36}{PO}$

$PO = 36\sqrt{2}$ m

Q-17 (i)



In ΔPQR, rt. angle at Q

$\sin 60^\circ = \frac{PQ}{PR}$

$\frac{\sqrt{3}}{2} = \frac{50}{PR}$

$PR = \frac{100\sqrt{3}}{3}$ m. $= \frac{173}{3} = 37.6$ m

(ii) In ΔPQR, rt angle at Q

$$\tan 60^\circ = \frac{PQ}{QR}$$

$$\sqrt{3} = \frac{50}{QR}$$

$$QR = \frac{50\sqrt{3}}{3} \text{ m.} = 28.83\text{m}$$

iii (A)

In ΔTSR, rt. angle at S

$$\tan 45^\circ = \frac{TS}{SR}$$

$$SR = TS$$

$$SQ + QR = 50$$

$$SQ = 50 - QR$$

$$= 50 - \frac{50\sqrt{3}}{3} = 50 - 28.83$$

$$= 21.17\text{ m}$$

3) Let speed be m/s

In 8 sec, pigeon covers PT = SQ

$$\text{Speed} = \frac{D}{T}$$

$$x = \frac{21.17}{8} \quad \text{(find as done in (ii)a)}$$

$$= 2.64 \text{ m/s}$$

Speed is 2.64m/s.

18 A) $\tan A = n \tan B$, $\sin A = m \sin B$

$$\frac{\tan A}{\tan B} = n$$

$$\frac{\sin A}{\sin B} = m$$

$$\frac{\sin A}{\cos A} \times \frac{\cos B}{\sin B} = n$$

$$\frac{\sin A}{\sin B} \times \frac{\cos B}{\cos A} = n$$

$$m \frac{\cos B}{\cos A} = n$$

$$\frac{m}{n} = \frac{\cos A}{\cos B}$$

Sq: both side

$$\frac{m^2}{n^2} = \frac{\cos^2 A}{\cos^2 B}$$

$$\cos^2 B \frac{m^2}{n^2} = \cos^2 A$$

$$(1 - \sin^2 B) m^2 = n^2 \cos^2 A$$

$$m^2 - m^2 \sin^2 B = n^2 \cos^2 A$$

$$m^2 - \sin^2 A = n^2 \cos^2 A \quad (\because \sin A = m \sin B)$$

$$m^2 - (1 - \cos^2 A) = n^2 \cos^2 A$$

$$m^2 - 1 = n^2 \cos^2 A - \cos^2 A$$

$$m^2 - 1 = (n^2 - 1) \cos^2 A$$

$$\frac{m^2 - 1}{n^2 - 1} = \cos^2 A \quad \text{(H.P.)}$$

B) LHS $\dfrac{(\cos^2 x - \sin^2 x)(\cos^2 x + \sin^2 x)}{1 - \tan x}$

$$\frac{\cos^2 x - \sin^2 A}{1 - \tan x}$$

$$\frac{(\cos x - \sin x)(\cos x + \sin x)\cos x}{(\cos x - \sin x)}$$

$$\cos^2 x + \sin x \cos x$$

LHS

$$\frac{\cot x + 1}{\sec x \operatorname{cosec} x}$$

$$\left(\frac{\cos x}{\sin x} + 1\right) \times \cos x \times \sin x$$

$$(\cos x + \sin x)\cos x$$

LHS = RHS

HP

RHS

Q9 A) $$\frac{\frac{\sin\theta}{\cos\theta}}{1-\frac{\cos\theta}{\sin\theta}} + \frac{\frac{\cos\theta}{\sin\theta}}{1-\frac{\sin\theta}{\cos\theta}}$$

$$\frac{\sin\theta}{\cos\theta} \times \frac{\sin\theta}{\sin\theta-\cos\theta} + \frac{\cos\theta}{\sin\theta} \times \frac{\cos\theta}{\cos\theta-\sin\theta}$$

$$\frac{\sin^2\theta}{\cos\theta(\sin\theta-\cos\theta)} - \frac{\cos^2\theta}{\sin\theta(\sin\theta-\cos\theta)}$$

$$\frac{\sin^3\theta - \cos^3\theta}{\sin\theta\cos\theta(\sin\theta-\cos\theta}$$

$$\frac{(\sin\theta-\cos\theta)(1+\sin\theta\cos\theta)}{\sin\theta\cos\theta(\sin\theta-\cos\theta)}$$

$$\frac{1}{\sin\theta\cos\theta} + 1$$

RHS $1+\tan\theta+\cot\theta$

$$= 1 + \frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta}$$

$$1 + \frac{\sin^2\theta+\cos^2\theta}{\sin\theta\cos\theta} = 1 + \frac{1}{\sin\theta\cos\theta}$$

LHS = RHS (HP)

LHS

B) $\frac{\tan^2 A}{\tan^2 A - 1} + \frac{\operatorname{Cosec}^2 A}{\sec^2 A - \operatorname{Cosec}^2 A}$

$\frac{\sin^2 A}{\cos^2 A} \times \frac{\cos^2 A}{\sin^2 A - \cos^2 A} + \frac{1}{\sin^2 A} \times \frac{\sin^2 A \cos^2 A}{\sin^2 A - \cos^2 A}$

$\frac{\sin^2 A + \cos^2 A}{\sin^2 A - \cos^2 A}$

$\frac{1}{\sin^2 A - \cos^2 A}$

$\frac{1}{(1 - \cos^2 A) - \cos^2 A}$

$\frac{1}{1 - 2\cos^2 A}$

$= RHS$

(HP).