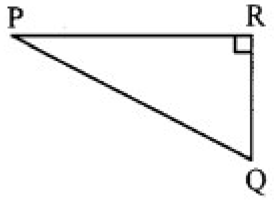
- *Digvijay*
- *Arjun*

Practice Set 8.1 Geometry 9th Std Maths Part 2 Answers Chapter 8 Trigonometry

Question 1.
In the given figure, ∠R is the right angle of ΔPQR. Write the following ratios.



i. sin P
ii. cos Q
iii. tan P
iv. tan Q
Solution:

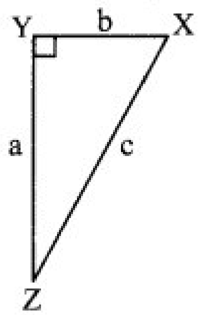
i. $\sin P = \frac{\text{Opposite side of } \angle P}{\text{Hypotenuse}} = \frac{\mathbf{QR}}{\mathbf{PQ}}$

ii. $\cos Q = \frac{\text{Adjacent side of } \angle Q}{\text{Hypotenuse}} = \frac{\mathbf{QR}}{\mathbf{PQ}}$

iii. $\tan P = \frac{\text{Opposite side of } \angle P}{\text{Adjacent side of } \angle P} = \frac{\mathbf{QR}}{\mathbf{PR}}$

iv. $\tan Q = \frac{\text{Opposite side of } \angle Q}{\text{Adjacent side of } \angle Q} = \frac{\mathbf{PR}}{\mathbf{QR}}$

Question 2.
In the right angled ΔXYZ, ∠XYZ = 90° and a, b, c are the lengths of the sides as shown in the figure. Write the following ratios.



i. sin x
ii. tan z

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iii. cos x
iv. tan x.
Solution:

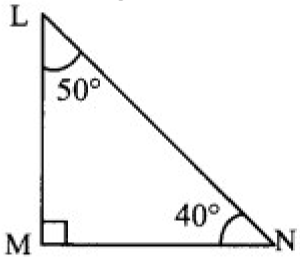
i. $\sin X = \frac{\text{Opposite side of } \angle X}{\text{Hypotenuse}} = \frac{YZ}{XZ} = \frac{a}{c}$

ii. $\tan Z = \frac{\text{Opposite side of } \angle Z}{\text{Adjacent side of } \angle Z} = \frac{XY}{YZ} = \frac{b}{a}$

iii. $\cos X = \frac{\text{Adjacent side of } \angle X}{\text{Hypotenuse}} = \frac{XY}{XZ} = \frac{b}{c}$

iv. $\tan X = \frac{\text{Opposite side of } \angle X}{\text{Adjacent side of } \angle X} = \frac{YZ}{XY} = \frac{a}{b}$

Question 3.
In right angled ΔLMN, ∠LMN = 90°, ∠L = 50° and ∠N = 40°. Write the following ratios.



i. sin 50°
ii. cos 50°
iii. tan 40°
iv. cos 40°
Solution:

i. $\sin 50° = \frac{\text{Opposite side of } 50°}{\text{Hypotenuse}} = \frac{MN}{LN}$

ii. $\cos 50° = \frac{\text{Adjacent side of } 50°}{\text{Hypotenuse}} = \frac{LM}{LN}$

iii. $\tan 40° = \frac{\text{Opposite side of } 40°}{\text{Adjacent side of } 40°} = \frac{LM}{MN}$

iv. $\cos 40° = \frac{\text{Adjacent side of } 40°}{\text{Hypotenuse}} = \frac{MN}{LN}$

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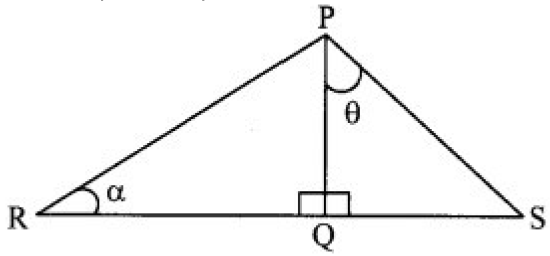
Question 4.
In the given figure, ∠PQR = 90°, ∠PQS = 90°, ∠PRQ = α and ∠QPS = θ. Write the following trigonometric ratios.
i. sin α, cos α , tan α
ii. sin θ, cos θ, tan θ



Solution:
i. In ΔPQR,

$$\sin \alpha = \frac{\text{Opposite side of } \alpha}{\text{Hypotenuse}} = \frac{\mathbf{PQ}}{\mathbf{PR}}$$

$$\cos \alpha = \frac{\text{Adjacent side of } \alpha}{\text{Hypotenuse}} = \frac{\mathbf{RQ}}{\mathbf{PR}}$$

$$\tan \alpha = \frac{\text{Opposite side of } \alpha}{\text{Adjacent side of } \alpha} = \frac{\mathbf{PQ}}{\mathbf{RQ}}$$

ii. In ΔPQS,

$$\sin \theta = \frac{\text{Opposite side of } \theta}{\text{Hypotenuse}} = \frac{\mathbf{QS}}{\mathbf{PS}}$$

$$\cos \theta = \frac{\text{Adjacent side of } \theta}{\text{Hypotenuse}} = \frac{\mathbf{PQ}}{\mathbf{PS}}$$

$$\tan \theta = \frac{\text{Opposite side of } \theta}{\text{Adjacent side of } \theta} = \frac{\mathbf{QS}}{\mathbf{PQ}}$$

Maharashtra Board Class 9 Maths Chapter 8 Trigonometry Practice Set 8.1 Intext Questions and Activities

Question 1.
In the figure gIven below, ΔPQR is a right angled triangle. Write the names of sides opposite and adjacent to ∠P and ∠R. (Textbook pg no. 102)

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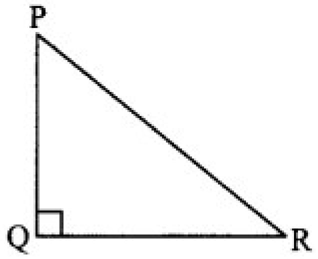

Solution:
In right angled ΔPQR,
i. side opposite to ∠P = QR
ii. side opposite to ∠R = PQ
iii. side adjacent to ∠P = PQ
iv. side adjacent to ∠R = QR

Practice Set 8.2 Geometry 9th Std Maths Part 2 Answers Chapter 8 Trigonometry

Question 1.
In the following table, a ratio is given in each column. Find the remaining two ratios in the column and complete the table.

Sr. No.	i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.
sin θ		$\frac{11}{61}$		$\frac{1}{2}$				$\frac{3}{5}$	
cos θ	$\frac{35}{37}$				$\frac{1}{\sqrt{3}}$				
tan θ			1			$\frac{21}{20}$	$\frac{8}{15}$		$\frac{1}{2\sqrt{2}}$

Solution:
i. cos θ = 3537 …(i))[Given]

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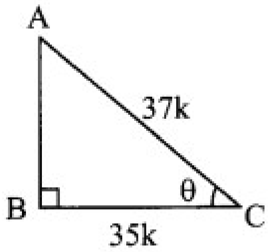
In right angled ΔABC,



∠C = θ.

$$\cos\theta = \frac{\text{Adjacent side of }\theta}{\text{Hypotenuse}}$$

$$\therefore \quad \cos\theta = \frac{BC}{AC} \quad \ldots\text{(ii)}$$

$$\therefore \quad \frac{BC}{AC} = \frac{35}{37} \quad \ldots\text{[From (i) and (ii)]}$$

Let the common multiple be k.

∴ BC = 35k and AC = 37k

Now, $AC^2 = AB^2 + BC^2$ ...[Pythagoras theorem]

∴ $(37k)^2 = AB^2 + (35k)^2$

$1369k^2 = AB^2 + 1225k^2$

AB2 = $1369k^2 – 1225k^2$

= $144k^2$

AB = $144k^2$

AB = 2ghK−−−−−√2 ... [Taking square root of both sides]

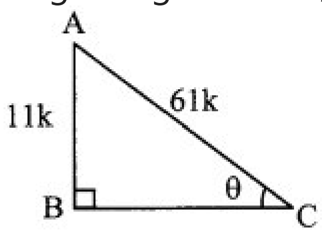
= 12k

$$\therefore \quad \sin\theta = \frac{\text{Opposite side of }\theta}{\text{Hypotenuse}} = \frac{AB}{AC} = \frac{12k}{37k} = \mathbf{\frac{12}{37}}$$

$$\tan\theta = \frac{\text{Opposite side of }\theta}{\text{Adjacent side of }\theta} = \frac{AB}{BC} = \frac{12k}{35k} = \mathbf{\frac{12}{35}}$$

ii. sin θ = 1161 .....(i) [Given]

In right angled ΔABC, ∠C = θ.



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$$\sin\theta = \frac{\text{Opposite side of } \theta}{\text{Hypotenuse}}$$

$\therefore \quad \sin\theta = \frac{AB}{AC}$ ...(ii)

$\therefore \quad \frac{AB}{AC} = \frac{11}{61}$ ...[From (i) and (ii)]

Let the common multiple be k.

AB = 11k and AC = 61k

Now, $AC^2 = AB^2 + BC^2$ ...[Pythagoras theorem]

$\therefore (61k)^2 = (11k)^2 + BC^2$

$\therefore 3721k^2 = 121k^2 + BC^2$

$\therefore BC^2 = 3721k^2 – 121k^2 = 3600k^2$

BC = $\sqrt{3600k^2}$ .. .[Taking square root of both sides]

= 60k

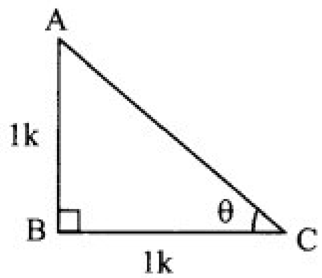
$$\therefore \quad \cos\theta = \frac{\text{Adjacent side of } \theta}{\text{Hypotenuse}} = \frac{BC}{AC} = \frac{60k}{61k} = \mathbf{\frac{60}{61}}$$

$$\tan\theta = \frac{\text{Opposite side of } \theta}{\text{Adjacent side of } \theta} = \frac{AB}{BC} = \frac{11k}{60k} = \mathbf{\frac{11}{60}}$$

iii. tan θ = 1 = 11 ..(i) [Given]

In right angled ΔABC,

∠C = θ.



$$\tan\theta = \frac{\text{Opposite side of } \theta}{\text{Adjacent side of } \theta}$$

$\therefore \quad \tan\theta = \frac{AB}{BC}$ ...(ii)

$\therefore \quad \frac{AB}{BC} = \frac{1}{1}$ ...[From (i) and (ii)]

Let the common multiple be k.

∴ AB = 1k and BC = 1k

Now, $AC^2 = AB^2 + BC^2$ ...[Pythagoras theorem]

$= K^2 + K^2$

$= 2K^2$

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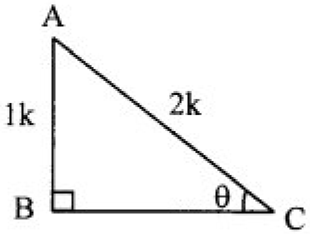
- *Arjun*

∴ AC = $\sqrt{2}k$

$$\therefore \quad \sin \theta = \frac{\text{Opposite side of } \theta}{\text{Hypotenuse}} = \frac{AB}{AC} = \frac{1k}{\sqrt{2}k} = \frac{1}{\sqrt{2}}$$

$$\cos \theta = \frac{\text{Adjacent side of } \theta}{\text{Hypotenuse}} = \frac{BC}{AC} = \frac{1k}{\sqrt{2}k} = \frac{1}{\sqrt{2}}$$

iv. sin θ = 12 ..(i) [Given]
In right angled ΔABC,
∠C = θ.



$$\sin \theta = \frac{\text{Opposite side of } \theta}{\text{Hypotenuse}}$$

$$\therefore \quad \sin \theta = \frac{AB}{AC} \qquad \ldots\text{(ii)}$$

$$\therefore \quad \frac{AB}{AC} = \frac{1}{2} \qquad \ldots\text{[From (i) and (ii)]}$$

Let the common multiple be k.
∴ AB = 1k and BC = 2k
Now, $AC^2 = AB^2 + BC^2$ …[Pythagoras theorem]
∴ $2K^2 = K^2 + BC^2$
∴ $4K^2 = K^2 + BC^2$
∴ $BC^2 = 4K^2 – K^2 = 3K^2$
∴ BC = $\sqrt{3k^2}$ .. .[Taking square root of both sides]
= $\sqrt{3}k$

$$\therefore \quad \cos \theta = \frac{\text{Adjacent side of } \theta}{\text{Hypotenuse}} = \frac{BC}{AC} = \frac{\sqrt{3}k}{2k} = \frac{\sqrt{3}}{2}$$

$$\tan \theta = \frac{\text{Opposite side of } \theta}{\text{Adjacent side of } \theta} = \frac{AB}{BC} = \frac{1k}{\sqrt{3}k} = \frac{1}{\sqrt{3}}$$

v. cos θ = 13√ ..(i) [Given]
In right angled ΔABC,
∠C = θ.

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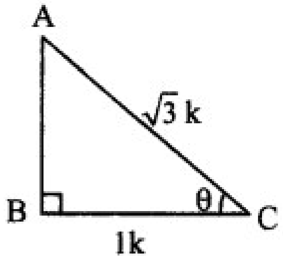


$$\cos\theta = \frac{\text{Adjacent side of }\theta}{\text{Hypotenuse}}$$

$\therefore \quad \cos\theta = \frac{BC}{AC} \quad \ldots\text{(ii)}$

$\therefore \quad \frac{BC}{AC} = \frac{1}{\sqrt{3}} \quad \ldots\text{[From (i) and (ii)]}$

Let the common multiple be k.

∴ AB = 1k and BC = √3k

Now, $AC^2 = AB^2 + BC^2$ ...[Pythagoras theorem]

∴ $(\sqrt{3}K)^2 = AB^2 + K^2$

∴ $3K^2 = 3K^2 - K^2 = 2K^2$

∴ AB = 2k2−−−√ .. .[Taking square root of both sides]

AB = √2K

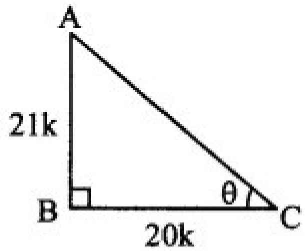
$$\therefore \quad \sin\theta = \frac{\text{Opposite side of }\theta}{\text{Hypotenuse}} = \frac{AB}{AC} = \frac{\sqrt{2}k}{\sqrt{3}k} = \frac{\sqrt{2}}{\sqrt{3}}$$

$$\tan\theta = \frac{\text{Opposite side of }\theta}{\text{Adjacent side of }\theta} = \frac{AB}{BC} = \frac{\sqrt{2}k}{1k} = \sqrt{2}$$

vi. cos θ = 2120√ ..(i) [Given]

In right angled ΔABC,

∠C = θ.



$$\tan\theta = \frac{\text{Opposite side of }\theta}{\text{Adjacent side of }\theta}$$

$\therefore \quad \tan\theta = \frac{AB}{BC} \quad \ldots\text{(ii)}$

$\therefore \quad \frac{AB}{BC} = \frac{21}{20} \quad \ldots\text{[From (i) and (ii)]}$

Let the common multiple be k.

∴ AB = 21k and BC = 20k

Now, $AC^2 = AB^2 + BC^2$ ...[Pythagoras theorem]

$= (21)K^2 + (20K)^2$

$= 441K^2 – 400^2$

$= 841K^2$

∴ AB = $\sqrt{841k^2}$ .. .[Taking square root of both sides]

= 29K

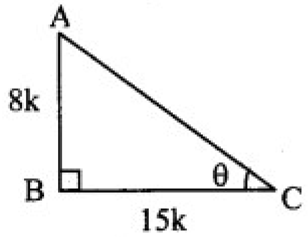
$$\therefore \quad \sin\theta = \frac{\text{Opposite side of }\theta}{\text{Hypotenuse}} = \frac{AB}{AC} = \frac{21k}{29k} = \frac{\mathbf{21}}{\mathbf{29}}$$

$$\cos\theta = \frac{\text{Adjacent side of }\theta}{\text{Hypotenuse}} = \frac{BC}{AC} = \frac{20k}{29k} = \frac{\mathbf{20}}{\mathbf{29}}$$

vii. tan θ = $\frac{8}{15}$ ..(i) [Given]

In right angled ΔABC,

∠C = θ.



$$\tan\theta = \frac{\text{Opposite side of }\theta}{\text{Adjacent side of }\theta}$$

$$\therefore \quad \tan\theta = \frac{AB}{BC} \quad \ldots\text{(ii)}$$

$$\therefore \quad \frac{AB}{BC} = \frac{8}{15} \quad \ldots\text{[From (i) and (ii)]}$$

Let the common multiple be k.

∴ AB = 8k and BC = 15k

Now, $AC^2 = AB^2 + BC^2$ ...[Pythagoras theorem]

$= (8)K^2 + (15K)^2$

$= 64K^2 – 225^2$

$= 289K^2$

∴ AC = $\sqrt{289k^2}$ .. .[Taking square root of both sides]

= 17K

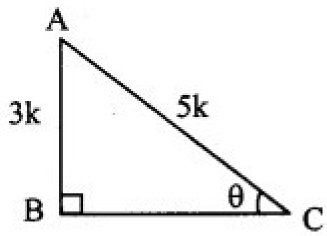
$$\therefore \quad \sin\theta = \frac{\text{Opposite side of }\theta}{\text{Hypotenuse}} = \frac{AB}{AC} = \frac{8k}{17k} = \mathbf{\frac{8}{17}}$$

$$\cos\theta = \frac{\text{Adjacent side of }\theta}{\text{Hypotenuse}} = \frac{BC}{AC} = \frac{15k}{17k} = \mathbf{\frac{15}{17}}$$

viii. sin θ = 35 ..(i) [Given]

In right angled ΔABC,

∠C = θ.



$$\sin\theta = \frac{\text{Opposite side of }\theta}{\text{Hypotenuse}}$$

$$\therefore \quad \sin\theta = \frac{AB}{AC} \quad \ldots\text{(ii)}$$

$$\therefore \quad \frac{AB}{AC} = \frac{3}{5} \quad \ldots\text{[From (i) and (ii)]}$$

Let the common multiple be k.

∴ AB = 3k and AC = 5k

Now, $AC^2 = AB^2 + BC^2$ ...[Pythagoras theorem]

∴ $(5)K^2 = (3)K^2 + BC^2$

∴ $25K^2 = 9K^2 – 225^2$

∴ $BC^2 = 25K^2 – 9K^2$

∴ BC = 16k2−−−−√ .. .[Taking square root of both sides]

= 4K

$$\cos\theta = \frac{\text{Adjacent side of }\theta}{\text{Hypotenuse}} = \frac{BC}{AC} = \frac{4k}{5k} = \mathbf{\frac{4}{5}}$$

$$\tan\theta = \frac{\text{Opposite side of }\theta}{\text{Adjacent side of }\theta} = \frac{AB}{BC} = \frac{3k}{4k} = \mathbf{\frac{3}{4}}$$

ix. tan θ = 122√ ..(i) [Given]

In right angled ΔABC,

∠C = θ.

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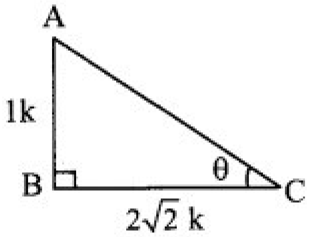

$$\tan\theta = \frac{\text{Opposite side of }\theta}{\text{Adjacent side of }\theta}$$

$$\therefore \quad \tan\theta = \frac{AB}{BC} \quad \ldots\text{(ii)}$$

$$\therefore \quad \frac{AB}{BC} = \frac{1}{2\sqrt{2}} \quad \ldots\text{[From (i) and (ii)]}$$

Let the common multiple be k.

∴ AB = 1k and AC = 2√2 k

Now, $AC^2 = AB^2 + BC^2$ ...[Pythagoras theorem]

= $K^2 + (2\sqrt{2}\ k)^2$

= $K^2 – 225^2$

= $25K^2 + 8K^2$

= $9K^2$

∴ AC = $\sqrt{9k^2}$ .. .[Taking square root of both sides]

= 3K

$$\therefore \quad \sin\theta = \frac{\text{Opposite side of }\theta}{\text{Hypotenuse}} = \frac{AB}{AC} = \frac{1k}{3k} = \frac{1}{3}$$

$$\cos\theta = \frac{\text{Adjacent side of }\theta}{\text{Hypotenuse}} = \frac{BC}{AC} = \frac{2\sqrt{2}k}{3k} = \frac{2\sqrt{2}}{3}$$

Sr. No.	i.	ii.	iii.	iv.	v.	vi.	vii.	viii.	ix.
sin θ	$\frac{12}{37}$	$\frac{11}{61}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	$\frac{\sqrt{2}}{\sqrt{3}}$	$\frac{21}{29}$	$\frac{8}{17}$	$\frac{3}{5}$	$\frac{1}{3}$
cos θ	$\frac{35}{37}$	$\frac{60}{61}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$	$\frac{20}{29}$	$\frac{15}{17}$	$\frac{4}{5}$	$\frac{2\sqrt{2}}{3}$
tan θ	$\frac{12}{35}$	$\frac{11}{60}$	1	$\frac{1}{\sqrt{3}}$	$\sqrt{2}$	$\frac{21}{20}$	$\frac{8}{15}$	$\frac{3}{4}$	$\frac{1}{2\sqrt{2}}$

Question 2.

Find the values of:

i. 5 sin 30° + 3 tan 45°

ii. $\frac{4}{5}\tan^2 60° + 3 \sin^2 60°$

iii. 2 sin 30° + cos 0° + 3 sin 90°

iv. $\frac{\tan 60^\circ}{\sin 60^\circ + \cos 60^\circ}$

v. $\cos^2 45° + \sin^2 30°$

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- *Arjun*

vi. cos 60° x cos 30° + sin 60° x sin 30°

Solution:

i. sin 30° = 12 and tan 45° = 1

$$5 \sin 30° + 3 \tan 45° = 5\left(\frac{1}{2}\right) + 3(1)$$

$$= \frac{5}{2} + 3$$

$$= \frac{5+6}{2}$$

$$\therefore \quad \mathbf{5 \sin 30° + 3 \tan 45° = \frac{11}{2}}$$

ii. 45tan2 60° + 3 sin2 60°

$$\frac{4}{5} \tan^2 60° + 3 \sin^2 60°$$

$$= \frac{4}{5} (\tan 60°)^2 + 3 (\sin 60°)^2$$

$$= \frac{4}{5} (\sqrt{3})^2 + 3\left(\frac{\sqrt{3}}{2}\right)^2$$

$$= \frac{4}{5} \times 3 + 3 \times \frac{3}{4}$$

$$= \frac{12}{5} + \frac{9}{4}$$

$$= \frac{48+45}{20}$$

$$= \frac{93}{20}$$

$$\therefore \quad \mathbf{\frac{4}{5} \tan^2 60° + 3 \sin^2 60° = \frac{93}{20}}$$

iii. 2 sin 30° + cos 0° + 3 sin 90°

2 sin 30° + cos0° + 3 sin 90° = 2 (12) + 1 + 3(1)

= 1 + 1 + 3

∴ 2 sin 30° + cos 0° + 3 sin 90° = 5

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- *Arjun*

iv. tan60∘sin60∘+cos60∘

$$\frac{\tan 60^\circ}{\sin 60^\circ + \cos 60^\circ} = \frac{\sqrt{3}}{\frac{\sqrt{3}}{2} + \frac{1}{2}}$$

$$= \frac{\sqrt{3}}{\frac{\sqrt{3}+1}{2}}$$

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

$$\therefore \quad \frac{\tan 60^\circ}{\sin 60^\circ + \cos 60^\circ} = \frac{2\sqrt{3}}{\sqrt{3}+1}$$

v. $\cos^2 45° + \sin^2 30°$

$$\cos 45^\circ = \frac{1}{\sqrt{2}} \text{ and } \sin 30^\circ = \frac{1}{2}$$

$$\cos^2 45^\circ + \sin^2 30^\circ = (\cos 45^\circ)^2 + (\sin 30^\circ)^2$$

$$= \left(\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{2}\right)^2$$

$$= \frac{1}{2} + \frac{1}{4}$$

$$= \frac{2+1}{4}$$

$$\therefore \quad \cos^2 45^\circ + \sin^2 30^\circ = \frac{3}{4}$$

vi. cos 60° x cos 30° + sin 60° x sin 30°

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

and $\sin 30° = \frac{1}{2}$

$\cos 60° \times \cos 30° + \sin 60° \times \sin 30°$

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

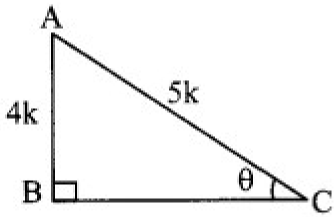
$= \frac{\sqrt{3}}{4} + \frac{\sqrt{3}}{4}$

$= \frac{\sqrt{3}+\sqrt{3}}{4}$

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

$\therefore \quad \mathbf{\cos 60° \times \cos 30° + \sin 60° \times \sin 30° = \frac{\sqrt{3}}{2}}$

Question 3.
If sin θ = 45 , then find cos θ.
Solution:
sin θ = 45 .. .(i)[Given]
In right angled ΔABC,
∠C = θ.



$\sin \theta = \frac{\text{Opposite side of } \theta}{\text{Hypotenuse}}$

$\therefore \quad \sin \theta = \frac{AB}{AC}$ ...(ii)

$\therefore \quad \frac{AB}{AC} = \frac{4}{5}$ ...[From (i) and (ii)]

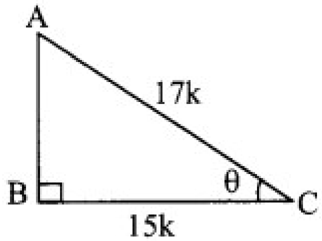
Let the common multiple be k.
∴ AB = 4k and AC = 5k
Now, $AC^2 = AB^2 + BC^2$ ... [Pythagoras theorem]
∴ $(5\text{ k})^2 = (4k)^2 + BC^2$

- *Digvijay*
- *Arjun*

$\therefore 25k^2 = 16k^2 + BC^2$
$\therefore BC^2 = 25k^2 - 16k^2 = 9k^2$
$\therefore BC = \sqrt{9k^2}$ . .[Taking square root of both sides]
$= 3k$

$$\therefore \quad \cos\theta = \frac{\text{Adjacent side of }\theta}{\text{Hypotenuse}} = \frac{BC}{AC} = \frac{3k}{5k} = \mathbf{\frac{3}{5}}$$

Question 4.
If $\cos\theta = \frac{15}{17}$, then find $\sin\theta$.
Solution:
$\cos\theta = \frac{15}{17}$ .. .(i)[Given]
In right angled ΔABC,
$\angle C = \theta$.



$$\cos\theta = \frac{\text{Adjacent side of }\theta}{\text{Hypotenuse}}$$

$$\therefore \quad \cos\theta = \frac{BC}{AC} \quad \ldots\text{(ii)}$$

$$\therefore \quad \frac{BC}{AC} = \frac{15}{17} \qquad \ldots\text{[From (i) and (ii)]}$$

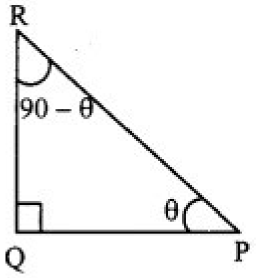
Let the common multiple be k.
$\therefore BC = 15k$ and $AC = 17k$
Now, $AC^2 = AB^2 + BC^2$ ... [Pythagoras theorem]
$\therefore (17\ k)^2 = AB^2 + (15K)^2$
$\therefore 289k^2 = AB^2 + 225^2$
$\therefore AB^2 = 289k^2 - 225k^2$
$= 64k^2$
$\therefore AB = \sqrt{64k^2}$ . .[Taking square root of both sides]
$= 8k$

$$\therefore \quad \sin\theta = \frac{\text{Opposite side of }\theta}{\text{Hypotenuse}} = \frac{AB}{AC} = \frac{8k}{17k} = \mathbf{\frac{8}{17}}$$

Maharashtra Board Class 9 Maths Chapter 8 Trigonometry Practice Set 8.2 Intext Questions and Activities

- *Digvijay*
- *Arjun*

Question 1.
In right angled ΔPQR, ∠Q = 900. Therefore ∠P and ∠R are complementary angles of each other. Verify the following ratios.
i. sin θ = cos (90 – θ)
ii. cos θ = sin (90 – θ)
iii. sin 30° = cos (90° – 30°) = cos 60°
iv. cos 30° = sin (90° – 30°) = sin 60° (Textbook pg. no. 107)
Solution:
In ΔPQR, ∠Q = 90°, ∠P = θ
∴ ∠R = 90 – θ



i. sin θ = cos (90 – θ)

$$\sin\theta = \frac{\text{Opposite side of }\theta}{\text{Hypotenuse}}$$

$$= \frac{QR}{PR} \quad \ldots(i)$$

$$\cos(90-\theta) = \frac{\text{Adjacent side of }\theta}{\text{Hypotenuse}}$$

$$= \frac{QR}{PR} \quad \ldots(ii)$$

$$\therefore \quad \mathbf{\sin\theta = \cos(90-\theta)} \quad \ldots[\text{From (i) and (ii)}]$$

ii. cos θ = sin (90 – θ)

$$\cos\theta = \frac{\text{Adjacent side of }\theta}{\text{Hypotenuse}}$$

$$= \frac{PQ}{PR} \quad \ldots(i)$$

$$\sin(90-\theta) = \frac{\text{Opposite side of }\theta}{\text{Hypotenuse}}$$

$$= \frac{PQ}{PR} \quad \ldots(ii)$$

$$\therefore \quad \mathbf{\cos\theta = \sin(90-\theta)} \quad \ldots[\text{From (i) and (ii)}]$$

iii. Let ∠P = θ = 30°

∴ ∠R = 90° – 30°

$$\sin 30° = \frac{\text{Opposite side of } 30°}{\text{Hypotenuse}}$$

$$= \frac{QR}{PR} \quad \ldots(i)$$

$$\cos (90° - 30°) = \frac{\text{Adjacent side of } (90° - 30°)}{\text{Hypotenuse}}$$

$$= \frac{QR}{PR} \quad \ldots(ii)$$

sin 30° = cos (90° – 30°) … [From (i) and (ii)]

sin 30° = cos 60°

iv. cos 30° = sin (90° – 30°) = sin 60°

$$\cos 30° = \frac{\text{Adjacent side of } 30°}{\text{Hypotenuse}} \ldots[\because \theta = 30°]$$

$$= \frac{PQ}{PR} \quad \ldots(i)$$

$$\sin (90° - 30°) = \frac{\text{Opposite side of } (90° - 30°)}{\text{Hypotenuse}}$$

$$= \frac{PQ}{PR} \quad \ldots(ii)$$

∴ cos 30° = sin (90° – 30°) .,.[From (i) and (ii)]

∴ cos 30° = sin 60°

Question 2.

In right angled ΔPQR, ∠Q = 90°, ∠R = θ and if sin θ = 513, then find cos θ and tan θ. (Textbook pg. no. 110)

Solution:

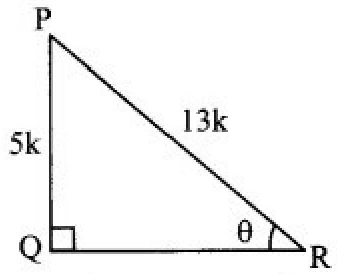
i. Take the given trigonometric ratio as 13k equation (i).

sin θ = 513 .. .(i)[Given]

By using the definition write the trigonometric ratio of sin O and take it as equation (ii).

In right angled ΔPQR, ∠R = θ

- *Digvijay*
- *Arjun*



$$\sin\theta = \frac{\text{Opposite side of } \theta}{\text{Hypotenuse}}$$

$\therefore \quad \sin\theta = \frac{PQ}{PR}$ ...(ii)

$\therefore \quad \frac{PQ}{PR} = \frac{5}{13}$ ...[From (i) and (ii)]

Let the common multiple be k.
∴ PQ = 5k and PR = 13k
Find QR by using Pythagoras theorem.
$PR^2 = PQ^2 + QR^2$ ... [Pythagoras theorem]
∴ $(13k)^2 = (5k)^2 + QR^2$
∴ $169k^2 = 25k^2 + QR^2$
∴ $QR^2 = 169k^2 - 25k^2$
$= 144k^2$
∴ QR = $\sqrt{144k^2}$ . . . [Taking square root of both sides]
= 12k

$$\therefore \quad \cos\theta = \frac{\text{Adjacent side of } \theta}{\text{Hypotenuse}} = \frac{QR}{PR} = \frac{12k}{13k} = \frac{\mathbf{12}}{\mathbf{13}}$$

$$\tan\theta = \frac{\text{Opposite side of } \theta}{\text{Adjacent side of } \theta} = \frac{PQ}{QR} = \frac{5k}{12k} = \frac{\mathbf{5}}{\mathbf{12}}$$

Question 3.
While solving the above Illustrative example, why the lengths of PQ and PR are taken 5k and 13k? (Textbook pg. no. 111)
Solution:
$\frac{PQ}{PR} = \frac{5}{13}$ ... [Given]
Here, the ratio of the lengths of sides PQ and PR is 5 : 13.
The actual lengths of the sides can be any multiple of the ratio. Hence, we consider the multiple k while solving.
Question 4.
While solving the above illustrative example, can we take the lengths of PQ and PR as 5 and 13? If so, then what changes are needed In the writing of the solution. (Tcxtbook pg. no. 111)

- *Digvijay*
- *Arjun*

Solution:
Yes, we can take lengths of PQ and PR as 5 and 13.
In that case, we will have to take k = 1 and solve the problem accordingly.

Question 5.
Verify that the equation '$\sin^2 \theta + \cos^2 \theta = 1$' is true when $\theta = 0°$ or $\theta = 90°$. (Textbook pg. no. 112)
Solution:
$\sin^2 \theta + \cos^2 \theta = 1$
i. If $\theta = 0°$,
L.H.S. = $\sin^2 \theta + \cos^2 \theta$
$= \sin^2 0° + \cos^2 0°$
$= 0 + 1$ ...[$\because \sin 0° = 0, \cos 0° = 1$]
= R.H.S.
$\therefore \sin^2 \theta + \cos^2 \theta = 1$

ii. If $\theta = 90°$,
L.H.S. = $\sin^2 \theta + \cos^2 \theta$
$= \sin^2 90° + \cos^2 90°$
$= 1 + 0$ ... [$\because \sin 90° = 1, \cos 90° = 0$]
$= 1$
= R.H.S.
$\therefore \sin^2 \theta + \cos^2 \theta = 1$

Problem Set 8 Geometry 9th Std Maths Part 2 Answers Chapter 8 Trigonometry

- *Digvijay*
- *Arjun*

Question 1.
Choose the correct alternative answer for the following multiple choice questions.

i. Which of the following statements is true?
(A) sin θ = cos (90 – θ)
(B) cos θ = tan (90 – θ)
(C) sin θ = tan (90 – θ)
(D) tan θ = tan (90 – θ)
Answer:
(A) sin θ = cos (90 – θ)

ii. Which of the following is the value of sin 90°?
(A) $3\sqrt{2}$
(B) 0
(C) 12
(D) 1
Answer:
(D) 1
iii. 2 tan 45° + cos 45° – sin 45° = ?
(A) 0
(B) 1
(C) 2
(D) 3
Answer:
2 tan 45° + cos 45° – sin
$=2(1)+12\sqrt{}-12\sqrt{}=2$
(C) 2
iv. $\cos 28^{\circ} \sin 62^{\circ}$ =?
(A) 2
(B) -1
(C) 0
(D) 1
Answer:
$\cos 28^{\circ} \sin 62^{\circ}$

- *Digvijay*
- *Arjun*

$= \frac{\sin(90° - 28°)}{\sin 62°}$

...[∵ $\cos \theta = \sin (90 - \theta)$]

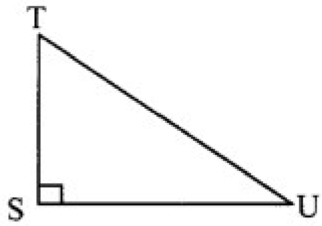
$= \frac{\sin 62°}{\sin 62°}$

$= 1$

(D) 1

Question 2.

In right angled ΔTSU, TS = 5, ∠S = 90°, SU = 12, then find sin T, cos T, tan T. Similarly find sin U, cos U, tan U.



Solution:

i. TS = 5, SU = 12 ...[Given]

In ΔTSU, ∠S = 90° ... [Given]

∴ $TU^2 = TS^2 + SU^2$ ...[Pythagoras theorem]

$= 5^2 + 12^2 = 25 + 144 = 169$

∴ TU = $169−−−\surd$ .. .[Taking square root of both sides]

= 13

ii. $\sin T = \frac{\text{Opposite side of } \angle T}{\text{Hypotenuse}} = \frac{SU}{TU} = \frac{\mathbf{12}}{\mathbf{13}}$

iii. $\cos T = \frac{\text{Adjacent side of } \angle T}{\text{Hypotenuse}} = \frac{TS}{TU} = \frac{\mathbf{5}}{\mathbf{13}}$

iv. $\tan T = \frac{\text{Opposite side of } \angle T}{\text{Adjacent side of } \angle T} = \frac{SU}{TS} = \frac{\mathbf{12}}{\mathbf{5}}$

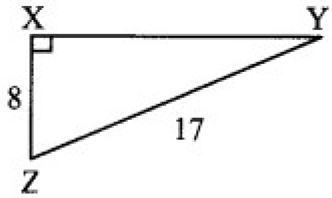
v. $\sin U = \frac{\text{Opposite side of } \angle U}{\text{Hypotenuse}} = \frac{TS}{TU} = \frac{\mathbf{5}}{\mathbf{13}}$

vi. $\cos U = \frac{\text{Adjacent side of } \angle U}{\text{Hypotenuse}} = \frac{SU}{TU} = \frac{\mathbf{12}}{\mathbf{13}}$

vii. $\tan U = \frac{\text{Opposite side of } \angle U}{\text{Adjacent side of } \angle U} = \frac{TS}{SU} = \frac{\mathbf{5}}{\mathbf{12}}$

Question 3.

In right angled ΔYXZ, ∠X = 90°, XZ = 8 cm, YZ = 17 cm, find sin Y, cos Y, tan Y, sin Z, cos Z, tan Z.



Solution:

i. XZ = 8 cm, YZ = 17 cm ...[Given]

In ΔYXZ, ∠X = 90° … [Given]

$\therefore YZ^2 = XY^2 + XZ^2$ .. .[Pythagoras theorem]

$\therefore 17^2 = XY^2 + 8^2$

$\therefore 289 = XY^2 + 64$

$\therefore XY^2 = 289 - 64$

$= 225$

$\therefore x = \sqrt{225}$ .. .[Taking square root of both sides]

$= 15$

ii. $\sin Y = \dfrac{\text{Opposite side of } \angle Y}{\text{Hypotenuse}} = \dfrac{XZ}{YZ} = \dfrac{8}{17}$

iii. $\cos Y = \dfrac{\text{Adjacent side of } \angle Y}{\text{Hypotenuse}} = \dfrac{XY}{YZ} = \dfrac{15}{17}$

iv. $\tan Y = \dfrac{\text{Opposite side of } \angle Y}{\text{Adjacent side of } \angle Y} = \dfrac{XZ}{XY} = \dfrac{8}{15}$

v. $\sin Z = \dfrac{\text{Opposite side of } \angle Z}{\text{Hypotenuse}} = \dfrac{XY}{YZ} = \dfrac{15}{17}$

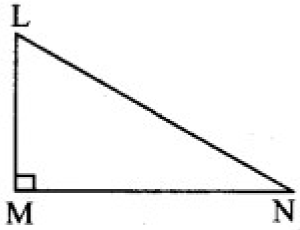
vi. $\cos Z = \dfrac{\text{Adjacent side of } \angle Z}{\text{Hypotenuse}} = \dfrac{XZ}{YZ} = \dfrac{8}{17}$

vii. $\tan Z = \dfrac{\text{Opposite side of } \angle Z}{\text{Adjacent side of } \angle Z} = \dfrac{XY}{XZ} = \dfrac{15}{8}$

Question 4.

In right angled ΔLMN, if ∠N = θ, ∠M = 90°, cos θ = 2425, find sin θ and tan θ. Similarly, find ($\sin^2\theta$) and ($\cos^2\theta$).

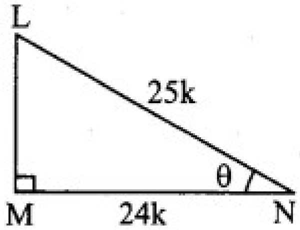
- *Digvijay*
- *Arjun*



Solution:
i. cos θ = 2425
In ΔLMN, ∠M = 90°, ∠N = θ

$$\therefore \quad \cos\theta = \frac{\text{Adjacent side of }\theta}{\text{Hypotenuse}}$$

$$\therefore \quad \cos\theta = \frac{MN}{LN} \quad \ldots\text{(ii)}$$



$$\therefore \quad \frac{MN}{LN} = \frac{24}{25} \quad \ldots\text{[From (i) and (ii)]}$$

Let the common multiple be k.
∴ MN = 24k and LN = 25k
Now, $LN^2 = LM^2 + MN^2$ … [Pythagoras theorem]
∴ $(25k)^2 = LM^2 + (24k)^2$
∴ $625\ k^2 = LM^2 + 576k^2$
∴ $LM^2 = 625k^2 - 576k^2$
∴ $LM^2 = 49k^2$
∴ LM = 49k2−−−−√ .. .[Taking square root of both sides]
= 7k

$$\text{ii.} \quad \sin\theta = \frac{\text{Opposite side of }\theta}{\text{Hypotenuse}} = \frac{LM}{LN} = \frac{7k}{25k} = \mathbf{\frac{7}{25}}$$

$$\therefore \quad \sin^2\theta = (\sin\theta)^2 = \left(\frac{7}{25}\right)^2 = \mathbf{\frac{49}{625}}$$

$$\text{iii.} \quad \tan\theta = \frac{\text{Opposite side of }\theta}{\text{Adjacent side of }\theta} = \frac{LM}{MN} = \frac{7k}{24k} = \mathbf{\frac{7}{24}}$$

$$\text{iv.} \quad \cos\theta = \frac{24}{25} \quad \ldots\text{[Given]}$$

$$\therefore \quad \cos^2\theta = (\cos\theta)^2 = \left(\frac{24}{25}\right)^2 = \mathbf{\frac{576}{625}}$$

Question 5.
Fill in the blanks.

i. sin 20° = cos $\boxed{}^\circ$

ii. tan 30° x tan $\boxed{}^\circ$ = 1

iii. cos 40° = sin $\boxed{}^\circ$

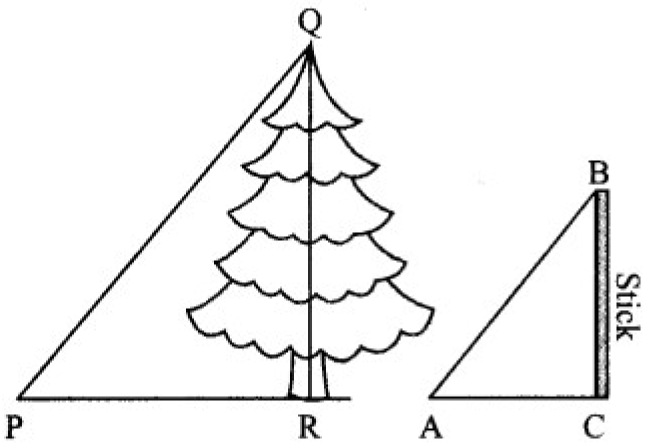
Solution:
i. sin 20° = cos (90° – 20°) .....[∵ sin θ = cos (90 – θ)]
= cos 70°

ii. tan θ x tan (90 – θ) = 1
Substituting θ = 30°,
tan 30° x tan (90 – 30)° = 1
∴ tan 30° x tan 60° = 1

iii. cos 40° = sin (90° – 40°) ...[∵ COS θ = sin (90 – θ)]
= sin 50°

Maharashtra Board Class 9 Maths Solutions Chapter 8 Trigonometry Problem Set 8

Question 1.
Measuring height of a tree using trigonometric ratios. (Textbook pg. no. 101)



This experiment can be conducted on a clear sunny day. Look at the figure given above. Height of the tree is QR, height of the stick is BC.
Thrust a stick in the ground as shown in the figure. Measure its height and length of its shadow. Also measure the length of the shadow of the tree.

- *Digvijay*
- *Arjun*

Using these values, how will you determine the height of the tree?
Solution:
Rays of sunlight are parallel.
So, ΔPQR and ΔABC are equiangular i.e., similar triangles.
Sides of similar triangles are proportional.
∴ QRBC = PRAC
∴ Height of the tree (QR) = BCAC x PR
Substituting the values of PR, BC and AC in the above equation, we can get length of QR i.e., the height of the tree.
Question 2.
It is convenient to do the above experiment between 11:30 am and 1:30 pm instead of doing it in the morning at 8'O clock. Can you tell why? (Textbook pg. no. 101)
Solution:
At 8'O clock in the morning, the sunlight is not very bright. At the same time, the sun is on the horizon and the shadow would by very long. It would be extremely difficult to measure shadow in that case.
Between 11:30 am and 1:30 pm, the sun is overhead and it would be easier to measure the length of shadow.

Question 3.
Conduct the above discussed activity and find the height of a tall tree in your surrounding. If there is no tree in the premises, then find the height of a pole. (Textbook pg. no. 101)