UDAAN

2026

Trigonometry

MATHS LECTURE-3

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Topics *to be covered*

A Questions on T-ratios for some specific angles

T. Ratios / θ	0°	30°	45°	60°	90°
sin θ	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1
cos θ	1	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$	0
tan θ	0	$1/\sqrt{3}$	1	$\sqrt{3}$	Not defined
cosec θ	Not defined	2	$\sqrt{2}$	$2/\sqrt{3}$	1
sec θ	1	$2/\sqrt{3}$	$\sqrt{2}$	2	Not defined
cot θ	Not defined	$\sqrt{3}$	1	$1/\sqrt{3}$	0

Trigonometric Ratios of Some Specific Angles

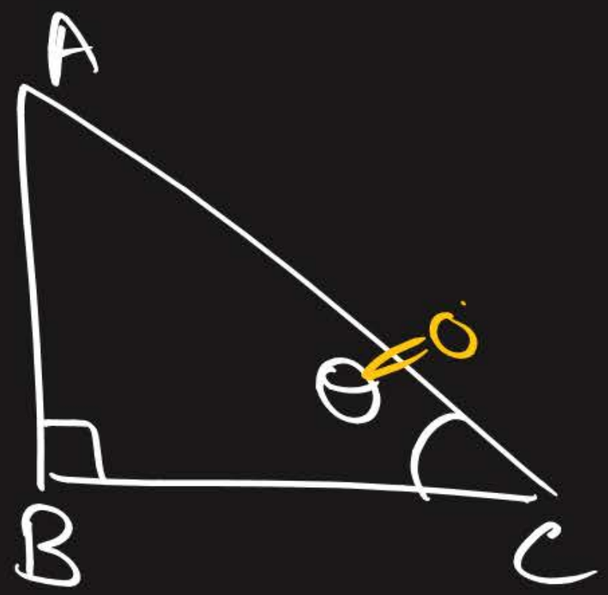
Trigonometric Ratios of 0° and 90°

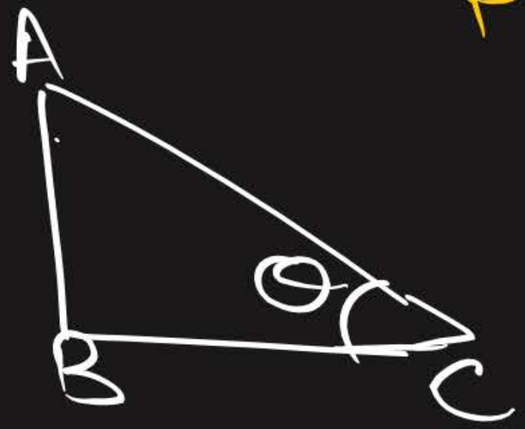
$\theta \to$ decrease

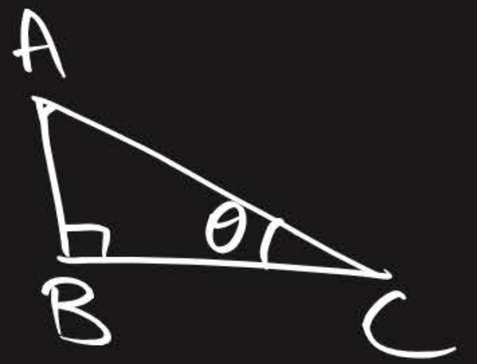
$\theta = 0$

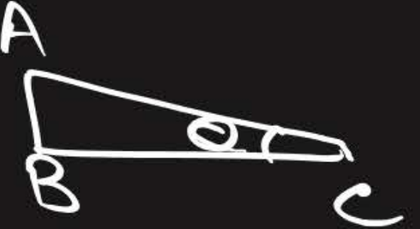
$AB = 0$

$AC = BC$









$\cot 0 = \frac{B}{P} = \frac{BC}{AB} = \frac{BC}{0} =$ nd

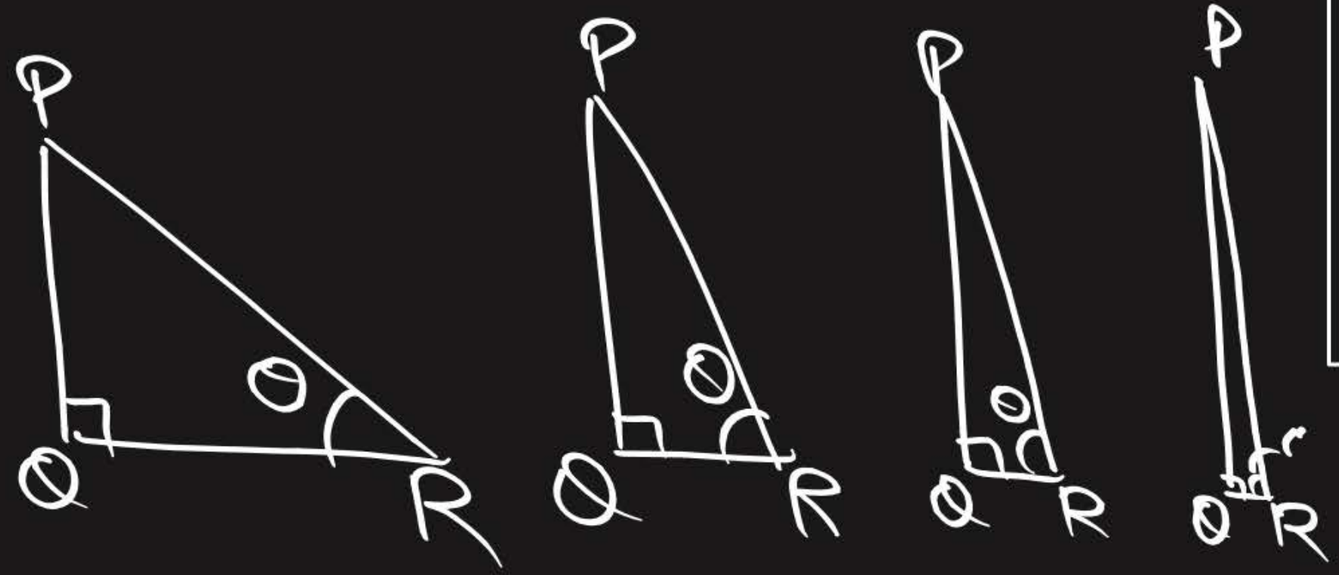
$\sin 0 = \frac{P}{H} = \frac{AB}{AC} = \frac{0}{AC} = 0$

$\sec 0 = \frac{H}{B} = \frac{AC}{BC} = \frac{BC}{BC} = 1$

Trigonometric Ratios of Some Specific Angles

$\theta \to 90^\circ$

Trigonometric Ratios of 0° and 90°



$\theta = 90^\circ$

$QR = 0$

$PR = PQ$

$\sin 90^\circ = \frac{P}{H} = \frac{PQ}{PR} = \frac{PR}{PR} = 1$

$\tan 90^\circ = \frac{P}{B} = \frac{PQ}{QR} = \frac{PQ}{0}$

$= n \cdot d$

$\sec 90^\circ = \frac{H}{B} = \frac{PR}{QR}$

$= \frac{PR}{0}$

$= n \cdot d$

Trigonometry

$0 \leq \text{Angles} \leq 90$

① $\sin\theta = \frac{1}{2}$

$\sin\theta = \sin 30$

on comparison,

$\theta = 30$

② $\cos A = \frac{1}{\sqrt{2}}$

$\cos A = \cos 45$

on comp...

$A = 45$

③ $\sin 2\theta = \frac{1}{2}$

$\sin\theta = \frac{1}{4}$

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

$\sin\theta = \frac{1}{4}$

$\sin 2\theta = \sin 30$

On comp...

$2\theta = 30$

$\theta = \frac{30}{2}$

$\theta = 15$

#Q. Solve each of the following equations for $0° < \theta < 90°$.

(i) $2 \cos 3\theta = 1$

$\cos 3\theta = \frac{1}{2}$

$\cos 3\theta = \cos 60°$

on comp.

$3\theta = 60°$

$\theta = 20$

(ii) $2 \sin 2\theta = \sqrt{3}$

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

$\sin 2\theta = \sin 60°$

on comp.

$2\theta = 60°$

$\theta = 30$

(iii) $\tan 5\theta = 1$

$\tan 5\theta = \tan 45°$

on comp.

$5\theta = 45$

$\theta = 9$

#Q. Find the value of x : $2\sin\frac{x}{2} = 1$

$2\sin\frac{x}{2} = 1$

$2\sin x = 2$

$\frac{2\sin x}{2} = 1$

$2\sin x = 2$

$2\sin\frac{x}{2} = 1$

$\sin\frac{x}{2} = \frac{1}{2}$

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

On Comp.

$\frac{x}{2} = 30$

$x = 60$

A 15°

B 30°

C 45°

D 60°

#Q. Find the value of x: $\sqrt{3}\sin x = \cos x$

A 15°

B 30°

C 45°

D 60°

$\sqrt{3}\sin x = 1 \times \cos x$

$\frac{\sin x}{\cos x} = \frac{1}{\sqrt{3}}$

$\tan x = \frac{1}{\sqrt{3}}$

$\tan x = \tan 30^\circ$

on comp,

$x = 30$

#Q. Find the value of x: $\sqrt{3}\tan 2x = \cos 60° + \sin 45° \cos 45°$

A. 15°

B. 30°

C. 45°

D. 60°

$\sqrt{3}\tan 2x = \frac{1}{2} + \frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}}$

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

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

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

$\sqrt{3}\tan 2x = 1$

$\tan 2x = \frac{1}{\sqrt{3}}$

$\tan 2x = \tan 30$

on comp,

$2x = 30$

$x = 15$

Angle

$\sin(A+B) = \frac{1}{2}$

$\sin(A+B) = \sin 30^\circ$

On comparing

$\boxed{A+B = 30^\circ}$

$A+B = ?$

#Q. If $\tan(A + B) = 1$ and $\tan(A - B) = 1/\sqrt{3}$, $0° < A + B < 90°$, $A > B$, then find the values of A and B.

A. $A = 30°, B = 15°$

B. $A = 37.5°, B = 22.5°$

C. $A = 37.5°, B = 7.5°$

D. $A = 7.5°, B = 27.5°$

$\tan(A+B) = 1$

$\tan(A+B) = \tan 45°$

on comp,

$A + B = 45°$ ... (1)

$\tan(A-B) = \frac{1}{\sqrt{3}}$

$\tan(A-B) = \tan 30°$

on comp,

$A - B = 30°$ ... (2)

$A + B = 45°$

$A - B = 30°$ (+)

$2A = 75°$

$A = \frac{75}{2}$

$A = 37.5°$

$A - B = 30°$

$37.5 - B = 30$

$37.5 - 30 = B$

$7.5° = B$

#S²BD

#Q. If A and B are acute angles such that $\sin(A - B) = 0$ and $2\cos(A + B) - 1 = 0$, then find angles A and B.

A. $A = 30°, B = 30°$

B. $A = 15°, B = 30°$

C. $A = 30°, B = 15°$

D. $A = 15°, B = 15°$

$\sin(A-B) = 0$

$\sin(A-B) = \sin 0$

$A - B = 0$ ... (1)

$2\cos(A+B) - 1 = 0$

$2\cos(A+B) = 1$

$\cos(A+B) = \frac{1}{2}$

$\cos(A+B) = \cos 60$

$A + B = 60$ ... (2)

$A - B = 0$

$A + B = 60$

(+)

$2A = 60$

$A = 30$

$B = 30$

#Q. If θ is an acute angle and $\sin\theta = \cos\theta$, find the value of $2\tan^2\theta + \sin^2\theta - 1$.

$\sin\theta = \cos\theta \times 1$

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

$\tan\theta = 1$

$\tan\theta = \tan 45^\circ$

on comp,

$\theta = 45^\circ$

$= 2\tan^2 45^\circ + \sin^2 45^\circ - 1$

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

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

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

$= \frac{3}{2}$

#Q. If $\sqrt{3}\tan\theta = 1$, then find the value of $\sin^2\theta - \cos^2\theta$.

M.I

$\tan\theta = \frac{1}{\sqrt{3}} = \frac{P}{B}$

$P = 1x$

$B = \sqrt{3}x$

$H = 2x$

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

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

M.II

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

$\tan\theta = \tan 30^\circ$

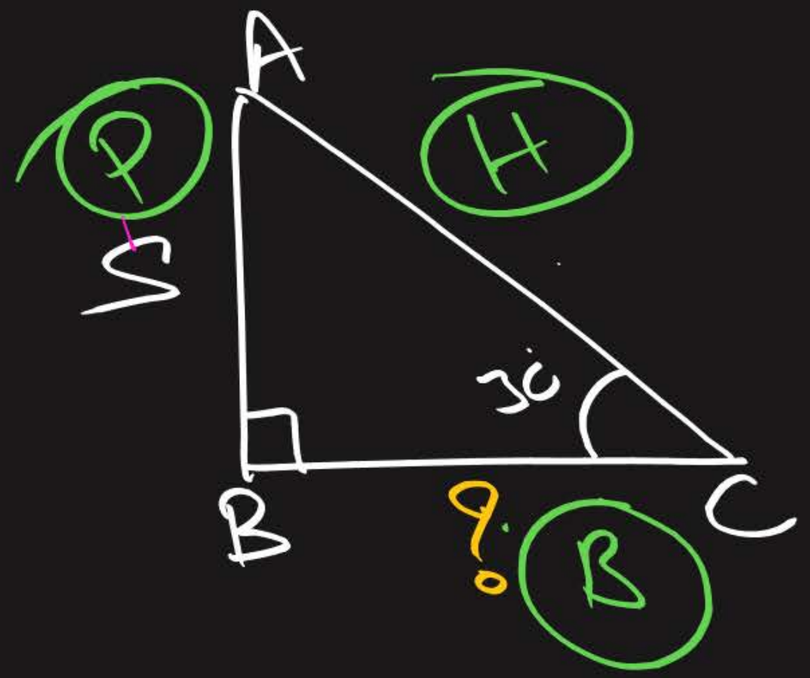
on comparing

$\theta = 30^\circ$

$= \sin^2 30 - \cos^2 30$

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

Abbkration



$$\tan 30 = \frac{P}{B} = \frac{AB}{BC}$$

$$\frac{1}{\sqrt{3}} = \frac{5}{BC}$$

$$BC = 5\sqrt{3}$$

$$\frac{P}{H} = \sin 30$$

$$\frac{AB}{AC} = \frac{1}{2}$$

$$\frac{5}{AC} = \frac{1}{2}$$

$$10 = AC$$

#Q. In ΔPQR, right-angled at Q, PQ = 3 cm and PR = 6 cm. Determine ∠P and ∠R.

-

A ∠P = 45°, ∠R = 45°

B ∠P = 15°, ∠R = 35°

C ∠P = 60°, ∠R = 30°

D ∠P = 30°, ∠R = 60°

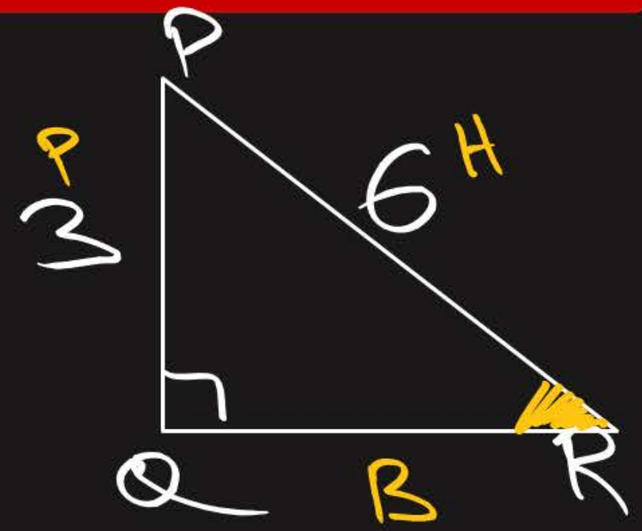
$\sin R = \frac{P}{H} = \frac{PQ}{PR}$

$\sin R = \frac{3}{6}$

$\sin R = \frac{1}{2}$

$\sin R = \sin 30$

$R = 30$



$\angle P = ?$

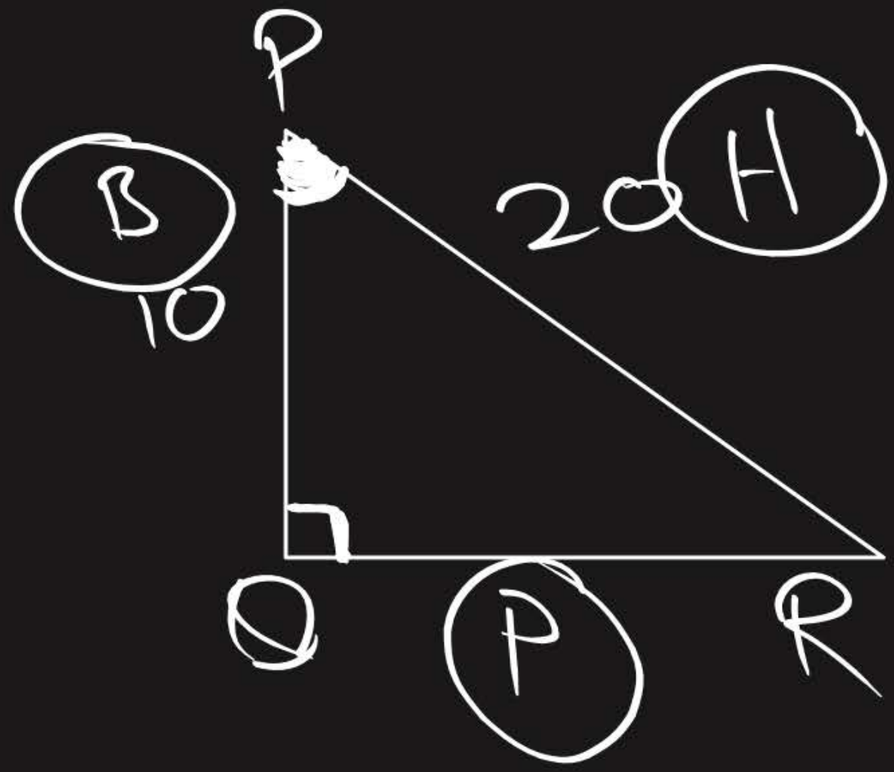
$\cos P = \frac{B}{H} = \frac{PQ}{PR}$

$\cos P = \frac{10}{20}$

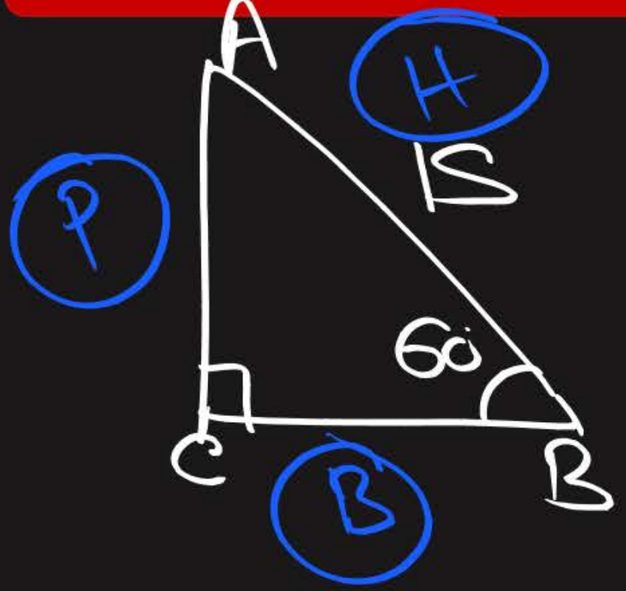
$\cos P = \frac{1}{2}$

$\cos P = \cos 60$

$P = 60$



#Q. If a right triangle ABC, right angled at C, if $\angle B = 60°$ and AB = 15 units. Find the remaining angles and sides.



$\angle A = 30°$

$\sin 60° = \frac{AC}{AB}$

$\frac{\sqrt{3}}{2} = \frac{AC}{15}$

$\frac{15\sqrt{3}}{2} = AC$

7.5$\sqrt{3}$ units = AC

$\cos 60° = \frac{BC}{AB}$

$\frac{1}{2} = \frac{BC}{15}$

$\frac{15}{2} = BC$

7.5 units = BC

CBSE

#Q. The rod AC of a TV disc antenna is fixed at right angles to the wall AB and a rod CD is supporting the disc as shown in figure below.

If AC = 1.5 m long and CD = 3 m, find:

(i) tan θ

(ii) sec θ + cosec θ.

#Gaplu

$CD^2 = AC^2 + AD^2$

$3^2 = (1.5)^2 + AD^2$

$9 = \left(\frac{15}{10}\right)^2 + AD^2$

$9 = \frac{9}{4} + AD^2$

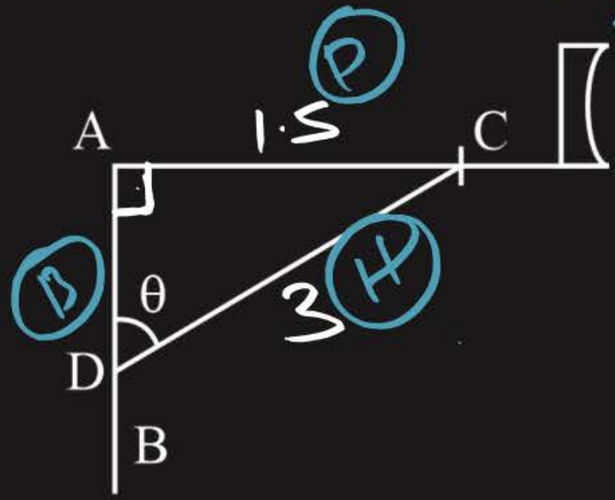
$9 - \frac{9}{4} = AD^2$

$\frac{27}{4} = AD^2$

$\pm\sqrt{\frac{27}{4}} = AD$

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

$\sqrt{27} = \sqrt{3\times3\times3} = 3\sqrt{3}$



(i) $\tan\theta = \frac{P}{B} = \frac{1.5}{3\sqrt{3}/2} = \frac{3/2}{3\sqrt{3}/2} = \frac{3}{3\sqrt{3}} = \frac{1}{\sqrt{3}}$

#Q. In a ΔABC right angled at B, $\angle A = \angle C$.
Find the value of : $\sin A \cos C + \cos A \sin C$

#Gpu

A 0

B 1

C $\sqrt{2}$

D NOTA

#Q. If $4\cot^2 45° - \sec^2 60° + \sin^2 60° + p = \frac{3}{4}$, find the value of p.

#GATE

A 0

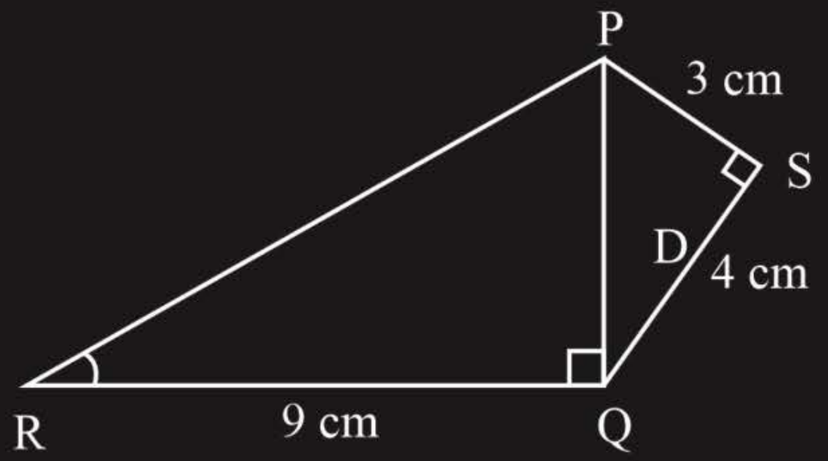
B 1

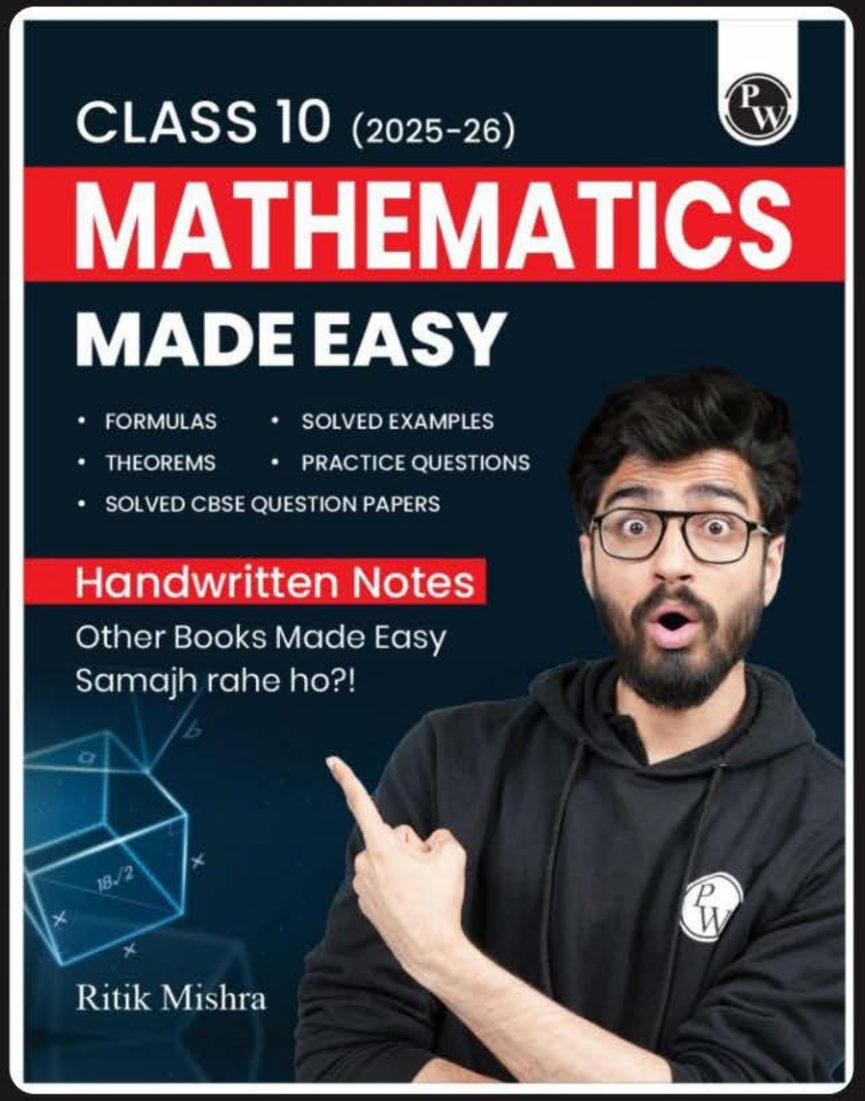
C $\sqrt{2}$

D NOTA

#Q. In figure below, PS = 3 cm, QS = 4 cm, $\angle PRQ = \theta$, $\angle PSQ = 90°$, PQ $\perp$ RQ and RQ = 9 cm. Evaluate $\tan\theta$.

#Gpy

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