CLASS 10 · MATHEMATICS · CHAPTER 8

# Introduction to Trigonometry - Exercise 8.1

Exercise 8.1 with independently verified solutions.

| CHAPTER | RESOURCE | SOURCE |
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| Introduction to Trigonometry | NCERT Exercises | NCERT Mathematics, Reprint 2026-27 |

PART 1

## Verified NCERT questions and solutions

**Verified NCERT questions and solutions**

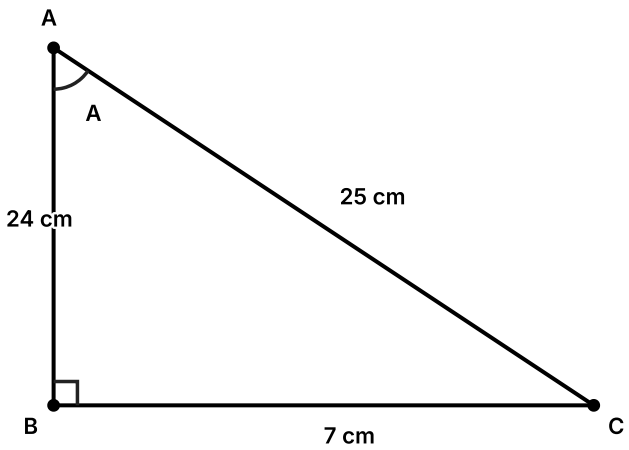
Solutions are checked independently and follow the supplied NCERT chapter edition.

QUESTION

## Question 1

trigonometric ratios · right triangle

In right triangle ABC, right-angled at B, AB = 24 cm and BC = 7 cm. Find (i) sin A, cos A and (ii) sin C, cos C.




Right triangle for Question 1 — explanatory sketch (not to scale).

## Solution

Board-exam working:

$$AC = \sqrt{AB^2 + BC^2} = \sqrt{24^2 + 7^2} = 25 \text{ cm}$$

**(i) For angle A:**

$$\sin A = \frac{BC}{AC} = \frac{7}{25}$$

$$\cos A = \frac{AB}{AC} = \frac{24}{25}$$

**(ii) For angle C:**

$$\sin C = \frac{AB}{AC} = \frac{24}{25}$$

$$\cos C = \frac{BC}{AC} = \frac{7}{25}$$

## Final answer

$$\text{(i) } \sin A = \frac{7}{25},\ \cos A = \frac{24}{25}; \qquad \text{(ii) } \sin C = \frac{24}{25},\ \cos C = \frac{7}{25}$$

QUESTION

# Question 2

tan · cot · figure

In Figure 8.13, find tan P – cot R.

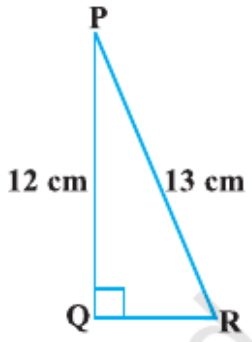


Fig. 8.13

Figure 8-13 from the supplied NCERT chapter.

## Solution

Board-exam working:

$$QR = \sqrt{PR^2 - PQ^2} = \sqrt{13^2 - 12^2} = 5 \text{ cm}$$

$$\tan P = \frac{QR}{PQ} = \frac{5}{12}$$

$$\cot R = \frac{QR}{PQ} = \frac{5}{12}$$

$$\tan P - \cot R = \frac{5}{12} - \frac{5}{12} = 0$$

## Final answer

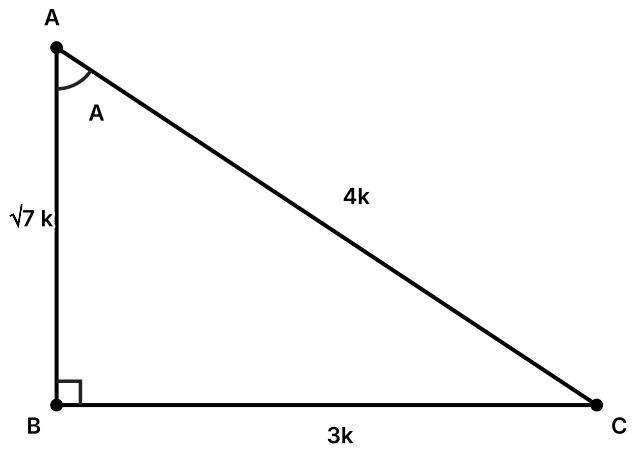
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QUESTION

# Question 3

given sine · Pythagoras theorem

If sin A = 3/4, calculate cos A and tan A.




Sine ratio with opposite side 3 — explanatory sketch (not to scale).

## Solution

Board-exam working:

$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{3}{4}$$

Let opposite side = 3k and hypotenuse = 4k.

$$\text{adjacent side} = \sqrt{(4k)^2 - (3k)^2} = k\sqrt{7}$$

$$\cos A = \frac{\sqrt{7}}{4}$$

$$\tan A = \frac{3}{\sqrt{7}} = \frac{3\sqrt{7}}{7}$$

## Final answer

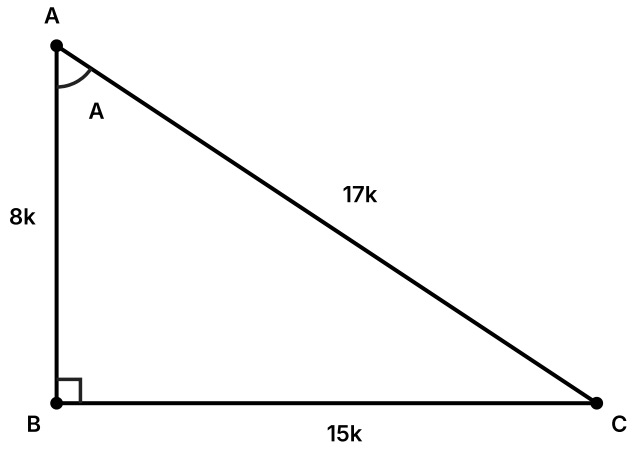
$$\cos A = \frac{\sqrt{7}}{4}, \qquad \tan A = \frac{3\sqrt{7}}{7}$$

QUESTION

# Question 4

cotangent · right triangle

Given 15 cot A = 8, find sin A and sec A.




Cotangent ratio 8 to 15 — explanatory sketch (not to scale).

## Solution

Board-exam working:

$$15\cot A = 8 \Rightarrow \cot A = \frac{8}{15}$$

Let adjacent side = 8k and opposite side = 15k.

$$\text{hypotenuse} = \sqrt{(8k)^2 + (15k)^2} = 17k$$

$$\sin A = \frac{15k}{17k} = \frac{15}{17}$$

$$\sec A = \frac{17k}{8k} = \frac{17}{8}$$

## Final answer

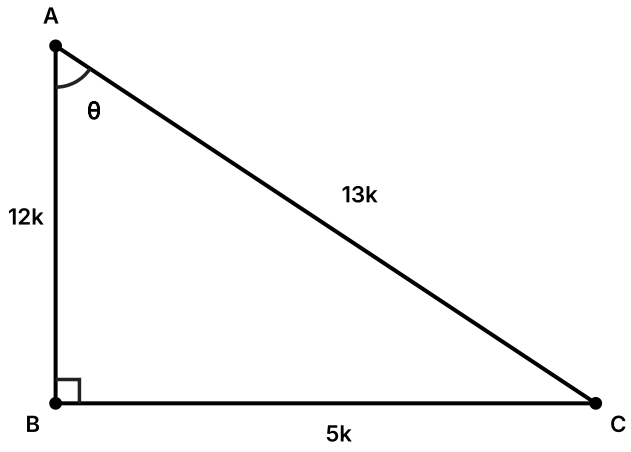
$$\sin A = \frac{15}{17}, \qquad \sec A = \frac{17}{8}$$

QUESTION

# Question 5

secant · all ratios

Given sec θ = 13/12, calculate all other trigonometric ratios.




Secant ratio 13 to 12 — explanatory sketch (not to scale).

## Solution

Board-exam working:

$$\sec\theta = \frac{\text{hypotenuse}}{\text{adjacent}} = \frac{13}{12}$$

Let hypotenuse = 13k and adjacent side = 12k.

$$\text{opposite side} = \sqrt{(13k)^2 - (12k)^2} = 5k$$

$$\sin\theta = \frac{5}{13}$$

$$\cos\theta = \frac{12}{13}$$

$$\tan\theta = \frac{5}{12}$$

$$\cot\theta = \frac{12}{5}$$

$$\operatorname{cosec}\theta = \frac{13}{5}$$

## Final answer

$$\sin\theta = \frac{5}{13},\ \cos\theta = \frac{12}{13},\ \tan\theta = \frac{5}{12},\ \cot\theta = \frac{12}{5},\ \operatorname{cosec}\theta = \frac{13}{5}$$

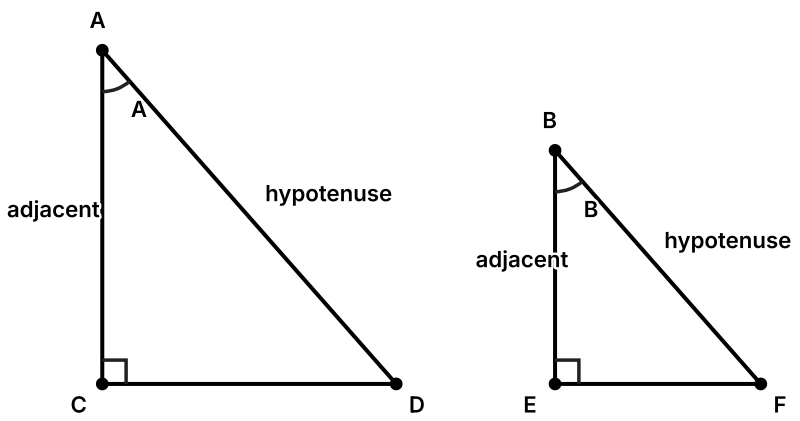
QUESTION

# Question 6

equal cosines · acute angles

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If A and B are acute angles such that cos A = cos B, show that A = B.




Comparing two equal cosine ratios — explanatory sketch (not to scale).

## Solution

Board-exam working:

For acute angles, cosine has one distinct value for each angle and decreases from 1 to 0 as the angle increases from 0° to 90°.

$$\cos A = \cos B$$

**Therefore A and B cannot be different acute angles.**

$$\angle A = \angle B$$

## Final answer

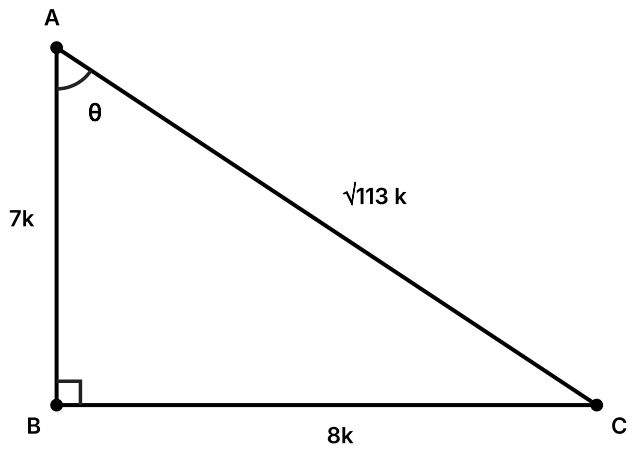
Hence, ∠A = ∠B.

QUESTION

# Question 7

cotangent · identity

If cot θ = 7/8, evaluate (i) [(1 + sin θ)(1 − sin θ)]/[(1 + cos θ)(1 − cos θ)] and (ii) cot²θ.




Cotangent ratio 7 to 8 — explanatory sketch (not to scale).

## Solution

Board-exam working:

(i)

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

$$= \frac{\cos^2\theta}{\sin^2\theta} = \cot^2\theta$$

$$= \left(\frac{7}{8}\right)^2 = \frac{49}{64}$$

(ii)

$$\cot^2\theta = \left(\frac{7}{8}\right)^2 = \frac{49}{64}$$

## Final answer

$$\text{(i)}\ \frac{49}{64}; \qquad \text{(ii)}\ \frac{49}{64}$$

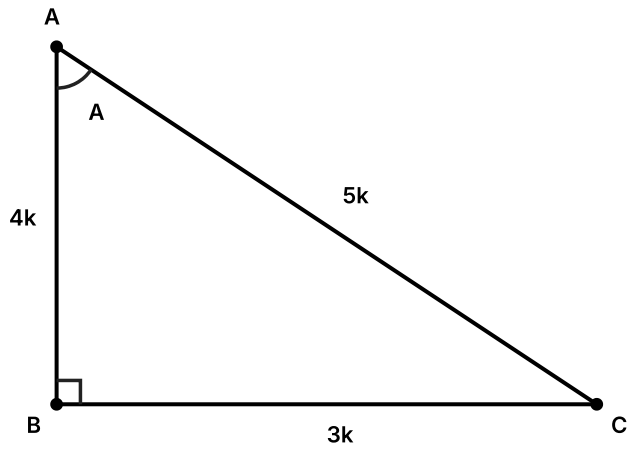
QUESTION

# Question 8

verification · identity

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If 3 cot A = 4, check whether (1 – tan²A)/(1 + tan²A) = cos²A – sin²A.




Cotangent ratio 4 to 3 — explanatory sketch (not to scale).

## Solution

Board-exam working:

$$3\cot A = 4 \Rightarrow \cot A = \frac{4}{3} \Rightarrow \tan A = \frac{3}{4}$$

Left-hand side:

$$\text{LHS} = \frac{1 - \left(\frac{3}{4}\right)^2}{1 + \left(\frac{3}{4}\right)^2} = \frac{7}{25}$$

Using sides 3, 4 and 5:

$$\sin A = \frac{3}{5}, \qquad \cos A = \frac{4}{5}$$

Right-hand side:

$$\text{RHS} = \left(\frac{4}{5}\right)^2 - \left(\frac{3}{5}\right)^2 = \frac{7}{25}$$

$$\text{LHS} = \text{RHS}$$

## Final answer

Yes, the equality is true.

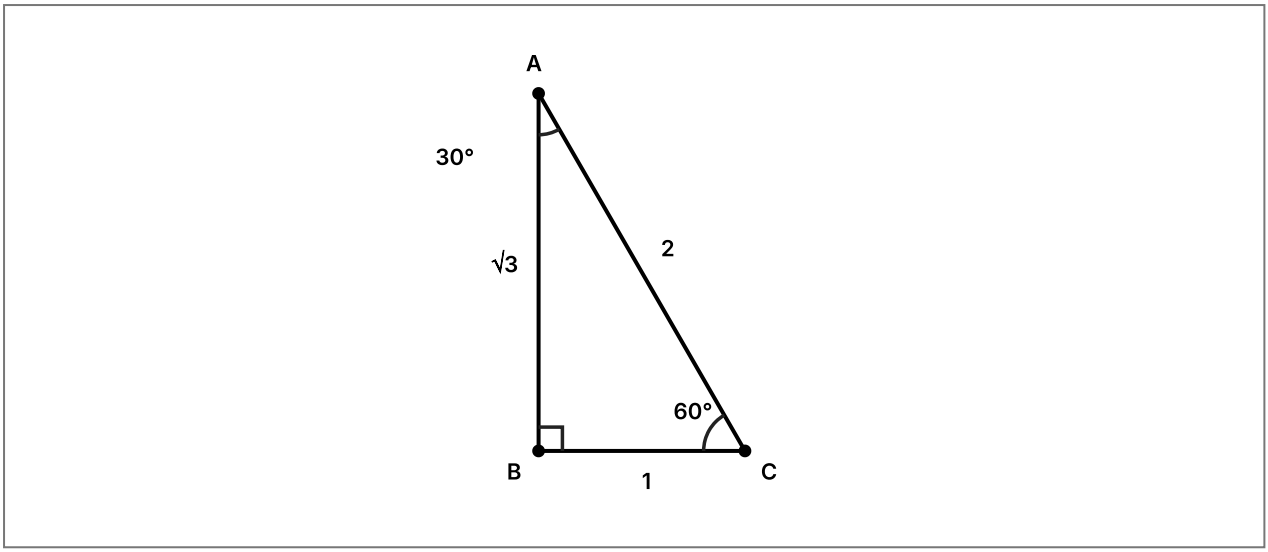
QUESTION

# Question 9

complementary angles · special angles

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In triangle ABC, right-angled at B, tan A = 1/√3. Find (i) sin A cos C + cos A sin C and (ii) cos A cos C − sin A sin C.




Complementary acute angles A and C — explanatory sketch (not to scale).

## Solution

Board-exam working:

$$\tan A = \frac{1}{\sqrt{3}} \Rightarrow A = 30^\circ$$

$$C = 90^\circ - A = 60^\circ$$

(i)

$$\sin 30^\circ \cos 60^\circ + \cos 30^\circ \sin 60^\circ$$

$$= \frac{1}{2}\cdot\frac{1}{2} + \frac{\sqrt{3}}{2}\cdot\frac{\sqrt{3}}{2} = \frac{1}{4} + \frac{3}{4} = 1$$

(ii)

$$\cos 30^\circ \cos 60^\circ - \sin 30^\circ \sin 60^\circ$$

$$= \frac{\sqrt{3}}{2}\cdot\frac{1}{2} - \frac{1}{2}\cdot\frac{\sqrt{3}}{2} = 0$$

## Final answer

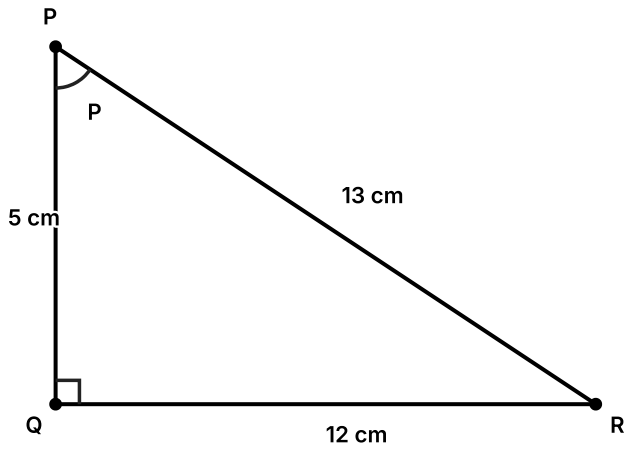
(i) 1; (ii) 0.

QUESTION

# Question 10

right triangle · trigonometric ratios

In right triangle PQR, right-angled at Q, PR + QR = 25 cm and PQ = 5 cm. Find sin P, cos P and tan P.




Right triangle PQR for Question 10 — explanatory sketch (not to scale).

## Solution

Board-exam working:

Let QR = x cm. Then PR = 25 − x cm.

$$PR^2 = PQ^2 + QR^2$$

$$(25 - x)^2 = 5^2 + x^2$$

$$625 - 50x + x^2 = 25 + x^2$$

$$x = 12$$

$$QR = 12\text{ cm}, \qquad PR = 13\text{ cm}$$

$$\sin P = \frac{12}{13}$$

$$\cos P = \frac{5}{13}$$

$$\tan P = \frac{12}{5}$$

## Final answer

$$\sin P = \frac{12}{13}, \qquad \cos P = \frac{5}{13}, \qquad \tan P = \frac{12}{5}$$

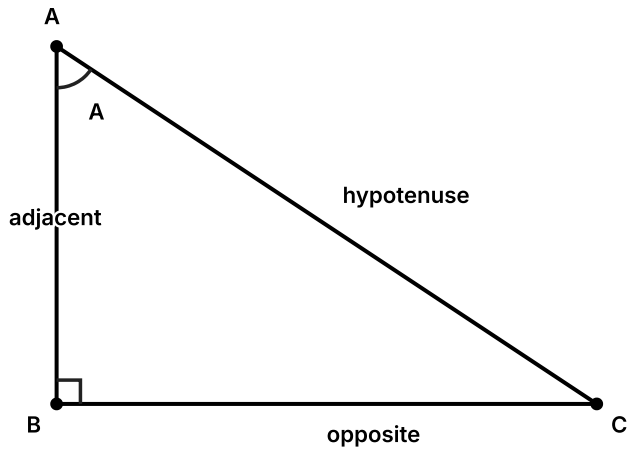
QUESTION

# Question 11

true or false · ratio definitions

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State true or false and justify: (i) tan A is always less than 1; (ii) sec A = 12/5 for some angle A; (iii) cos A abbreviates cosecant A; (iv) cot A is the product of cot and A; (v) sin θ = 4/3 for some angle θ.




Ratio definitions for true-or-false statements — explanatory sketch (not to scale).

## Solution

Board-exam working:

**(i) False.**

$$\tan 45^\circ = 1 \quad \text{and} \quad \tan 60^\circ = \sqrt{3} > 1$$

**(ii) True.**

$$\sec A = \frac{12}{5} \Rightarrow \cos A = \frac{5}{12}$$

**Since 0 < 5/12 < 1, such an acute angle exists.**

**(iii) False. cos A means cosine of A; cosecant is written cosec A.**

**(iv) False. cot A denotes the cotangent ratio of angle A.**

**(v) False.**

$$0 \le \sin\theta \le 1, \quad \text{but} \quad \frac{4}{3} > 1$$

## Final answer

(i) False; (ii) True; (iii) False; (iv) False; (v) False.