Class 10 Mathematics · Chapter 8: Introduction to Trigonometry

Answer key and marking scheme · 20 marks · about 40 minutes · based on NCERT

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1. In ΔPQR, right-angled at Q, PQ = 8 cm, QR = 15 cm and PR = 17 cm. The value of cos R is [1]

(a) $\frac{8}{17}$ (b) $\frac{15}{17}$

(c) $\frac{8}{15}$ (d) $\frac{17}{15}$

Answer: (b) For angle R the adjacent side is QR = 15 cm and the hypotenuse is PR = 17 cm, so cos R = 15/17. (8/17 is cos P.)

2. If $\sin A = \frac{2}{3}$, then cosec A is [1]

(a) $\frac{2}{3}$ (b) $\frac{\sqrt{5}}{3}$

(c) $\frac{3}{\sqrt{5}}$ (d) $\frac{3}{2}$

Answer: (d) cosec A is the reciprocal of sin A, so cosec A = 1 ÷ (2/3) = 3/2.

3. In ΔABC, right-angled at B, AB = 5 cm, BC = 12 cm and AC = 13 cm. The value of sin A is [1]

(a) $\frac{12}{13}$ (b) $\frac{5}{13}$

(c) $\frac{12}{5}$ (d) $\frac{5}{12}$

Answer: (a) The side opposite A is BC = 12 cm and the hypotenuse is AC = 13 cm, so sin A = 12/13.

4. The value of cos 0° + sin 90° + sin 0° is [1]

(a) 0 (b) 1

(c) 2 (d) 3

Answer: (c) cos 0° = 1, sin 90° = 1 and sin 0° = 0, so the sum is 2.

5. The value of tan 45° + sin 45° cos 45° is [1]

(a) $\frac{3}{2}$ (b) 1

(c) 2 (d) $\frac{1}{2}$

Answer: (a) tan 45° = 1 and sin 45° cos 45° = (1/√2)(1/√2) = 1/2, so the sum is 3/2.

6. Evaluate: (tan 45° + sin 60°)(tan 45° − sin 60°). [2]

tan 45° = 1 and sin 60° = √3/2. The product is (1 + √3/2)(1 − √3/2) = 1 − 3/4 = 1/4.

- tan 45° = 1 and sin 60° = √3/2 (1)
- value = 1/4 (1)

7. If A is an acute angle and 3 sin A = 1, find cos A and cot A. [2]

sin A = 1/3. Let the opposite side be k and the hypotenuse 3k. The adjacent side = $\sqrt{(9k^2 - k^2)} = 2\sqrt{2}\,k$. So cos A = 2√2/3 (positive, as A is acute) and cot A = adjacent/opposite = 2√2 k/k = 2√2.

- finds the third side 2√2 k by Pythagoras (or uses cos A = $\sqrt{(1 - \sin^2 A)}$) (1)
- cos A = 2√2/3 and cot A = 2√2 (1)

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8. Write the values of sin 0° and cos 90°. Which one of tan 0° and tan 90° is not defined? Give a reason. [2]

sin 0° = 0 and cos 90° = 0. tan 0° = sin 0°/cos 0° = 0/1 = 0. tan 90° = sin 90°/cos 90° = 1/0, and division by zero is not defined, so tan 90° is not defined.

- sin 0° = 0 and cos 90° = 0 (1)
- tan 90° not defined, because cos 90° = 0 makes the quotient 1/0 (1)

9. In ΔPQR, right-angled at Q, PQ : QR = 20 : 21 and PR = 58 cm. Find PQ and QR, and hence sin P, cos P and tan P. [3]

Let PQ = 20k and QR = 21k. By Pythagoras, $(20k)^2 + (21k)^2 = 58^2$, so $400k^2 + 441k^2 = 841k^2 = 3364$, $k^2 = 4$ and k = 2. So PQ = 40 cm and QR = 42 cm. sin P = QR/PR = 42/58 = 21/29, cos P = PQ/PR = 40/58 = 20/29, tan P = QR/PQ = 42/40 = 21/20.

- sets up $841k^2 = 3364$ (1)
- k = 2, PQ = 40 cm, QR = 42 cm (1)
- sin P = 21/29, cos P = 20/29, tan P = 21/20 (1)

10. Prove that $\sec^4 A - \sec^2 A = \tan^4 A + \tan^2 A$. [3]

LHS = $\sec^2 A(\sec^2 A - 1)$. By $1 + \tan^2 A = \sec^2 A$, $\sec^2 A - 1 = \tan^2 A$, so LHS = $(1 + \tan^2 A)\tan^2 A = \tan^2 A + \tan^4 A$ = RHS.

- takes $\sec^2 A$ common (1)
- uses $\sec^2 A - 1 = \tan^2 A$ (1)
- writes $\sec^2 A = 1 + \tan^2 A$ and expands to the RHS (1)

11. Evaluate: $\dfrac{2\tan^2 60° + 6\cos^2 45° - 3\sec^2 30°}{\sin^2 60° + \cos^2 60° + \cot^2 30°}$. [3]

tan 60° = √3, cos 45° = 1/√2, sec 30° = 2/√3, so the numerator is 2(3) + 6(1/2) − 3(4/3) = 6 + 3 − 4 = 5. $\sin^2 60° + \cos^2 60° = 3/4 + 1/4 = 1$ and cot 30° = √3, so the denominator is 1 + 3 = 4. Value = 5/4.

- numerator = 5 (1)
- denominator = 4 (1)
- value = 5/4 (1)