Exercise 1

DIRECTIONS : *This section contains multiple choice questions. Each question has 4 choices (1), (2), (3) and (4) out of which only one is correct.*

1. The value of

$$\frac{\cos(90°-\theta)\sec(90°-\theta)\tan\theta}{\operatorname{cosec}(90°-\theta)\sin(90°-\theta)\cot(90°-\theta)} + \frac{\tan(90°-\theta)}{\cot\theta} \text{ is}$$

(1) 1 (2) – 1
(3) 2 (4) – 2

2. If θ and 2θ – 45° are acute angles such that $\sin\theta = \cos(2\theta - 45°)$, then tan θ is equal to

(1) 1 (2) –1
(3) $\sqrt{3}$ (4) $\frac{1}{\sqrt{3}}$

3. If $\frac{x\operatorname{cosec}^2 30°\ \sec^2 45°}{8\cos^2 45°\sin^2 60°} = \tan^2 60° - \tan^2 30°$, then x =

(1) 1 (2) – 1
(3) 2 (4) 0

4. If $x \sin(90° - \theta)\cot(90° - \theta)$, then x =

(1) 0 (2) 1
(3) – 1 (4) 2

5. sin 2A = 2 sin A is true when A =

(1) 0° (2) 30°
(3) 45° (4) 60°

6. If A, B and C are interior angles of a triangle ABC, then $\sin\left(\frac{B+C}{2}\right) =$

(1) $\sin\frac{A}{2}$ (2) $\cos\frac{A}{2}$
(3) $-\sin\frac{A}{2}$ (4) $-\cos\frac{A}{2}$

7. $\tan^2\theta.\cos^2\theta$ is equal to :

(1) $1+\sin^2\theta$ (2) $1+\cos^2\theta$
(3) $1-\sin^2\theta$ (4) $1-\cos^2\theta$

8. $\sin 81° + \tan 81°$ is equal to

(1) $\operatorname{cosec}81° + \cot 81°$ (2) $\cos 81° + \cot 81°$
(3) $\cos 9° + \cot 9°$ (4) $\cos 81° + \sec 81°$

9. If sinθ = cos(θ – 6°) where (3θ) and (θ – 6°) are both acute angles, then the value of θ is

(1) 18° (2) 24°
(3) 36° (4) 30°

10. A tree 6 m tall casts a 4 m long shadow. At the same time, a flag pole casts a shadow 50 m long. How long is the flag pole?

(1) 75 m (2) 100 m
(3) 150 m (4) 50 m

11. A 25 m ladder is placed against a vertical wall of a building. The foot of the ladder is 7 m from the base of the building. If the top of the ladder slips 4 m, then the foot of the ladder will slide

(1) 5 m (2) 8 m
(3) 9 m (4) 15 m

12. In ΔABC, ∠A = 30° and ∠B = 90°. If AC = 6 cm, then its area is

(1) $16\sqrt{3}$ cm^2 (2) 16 cm^2
(3) $8\sqrt{3}$ cm^2 (4) $6\sqrt{3}$ cm^2

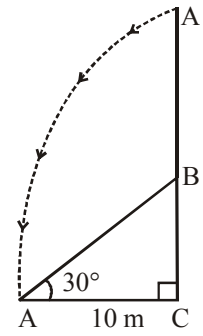
13. If $\sin\theta = \frac{24}{25}$ and θ lies in the second quadrant, then $\sec\theta + \tan\theta =$

(1) –7 (2) 6
(3) 4 (4) –5

14. If the length of the shadow of a tower is $\sqrt{3}$ times that of its height, then the angle of elevation of the sun is

(1) 15° (2) 30°
(3) 45° (4) 60°

15. The top of a broken tree has its top touching the ground (shown in the figure) at a distance of 10 *m* from the bottom. If the angle made by the broken part with ground is 30°, then the length of the broken part is



(1) $10\sqrt{3}$ m (2) $\frac{20}{\sqrt{3}}$ m
(3) 20 m (4) $20\sqrt{3}$ m

16. If $x = a\cos^2\theta + b\sin^2\theta$ then $(x - a)(b - x)$ is equal to

(1) $(a - b)\sin\theta\cos\theta$
(2) $(a - b)^2\sin^2\theta\cos^2\theta$
(3) $(a - b)^2\sin\theta\cos\theta$
(4) $(a - b)\sin^2\theta\cos^2\theta$

17. If $a\cos^3\theta + 3a\cos\theta\sin^2\theta = m$ and $a\sin^3\theta + 3a\cos^2\theta\sin^2\theta = n$ then $(m+n)^{2/3} + (m-n)^{2/3}$ is equal to

(1) $a^{2/3}$ (2) $2a^{1/3}$

(3) $2a^{2/3}$ (4) $a^{1/3}$

18. If $\tan^2\theta = 1 - a^2$ then the value of $\sec\theta + \tan^3\theta\,\text{cosec}\,\theta$ is

(1) $(2-a^2)$ (2) $(2-a^2)^{1/2}$

(3) $(2-a^2)^{2/3}$ (4) $(2-a^2)^{3/2}$

19. Which of the following relationship is true ?

(1) $\cos A \sec A = 1$

(2) $\sin A \cot A = 1$

(3) $\sin A + \text{cosec}\, A = 1$

(4) $\sec A \cot A = 1$

20. If $\frac{x}{a\cos\theta} = \frac{y}{b\sin\theta}$ and $\frac{ax}{\cos\theta} - \frac{by}{\sin\theta} = a^2 - b^2$ then the value of $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ is

(1) 1 (2) – 1

(3) $\sin^2\theta$ (4) $\cos^2\theta$

21. If $\tan\theta = \frac{x\sin\phi}{1 - x\cos\phi}$ and $\tan\phi = \frac{y\sin\theta}{1 - y\cos\theta}$ then the value of $\frac{x}{y}$ is

(1) $\frac{\sin\phi}{\sin\theta}$ (2) $\frac{\sin\theta}{\sin\phi}$

(3) $\frac{\sin\theta}{1-\cos\theta}$ (4) $\frac{\sin\theta}{1-\cos\phi}$

22. If angle θ be divided into two parts such that the tangent of one part is k times the tangent of the other and ϕ is their difference, then sin θ =

(1) $\frac{k+1}{k-1}\sin\phi$ (2) $\frac{k-1}{k+1}\sin\phi$

(3) $\frac{2k-1}{2k+1}\sin\phi$ (4) None of these

23. If θ is an acute angle of a right triangle, then the value of $\sin\theta\cos(90° - \theta) + \cos\theta\sin(90° - \theta)$ is

(1) 0 (2) $2\sin\theta\cos\theta$

(3) 1 (4) $2\sin^2\theta$

24. If $\cos(40° + x) = \sin 30°$ and $40° + x$ is an acute angle, then the value of x is

(1) 20° (2) 30°

(3) 40° (4) 45°

25. If $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 3$, $0° < \theta_1, \theta_2, \theta_3 \leq 90°$, then $\cos\theta_1 + \cos\theta_2 + \cos\theta_3 =$

(1) 3 (2) 1

(3) 0 (4) 2

26. If $\sin x + \text{cosec}\, x = 2$, then $\sin^{19}x + \text{cosec}^{20}x$ is equal to

(1) 2^{19} (2) 2^{20}

(3) 2 (4) 2^{39}

27. A ladder is included to a wall making an angle of 30° with it. A man is ascending the ladder at the rate of 2 metres/ second. How fast is he approaching the wall?

(1) 2 m/s (2) 1.5 m/s

(3) 1 m/s (4) 2.5 m/s

28. A professor standing on one end of a football field observes the elevation of the top of a flood light tower at an angle of α. He then walks a distance equal to twice the height of the tower and finds that the elevation of the top of the top is now at an angle of 2α. What is the value of α?

(1) 30º (2) 60º

(3) 15º (4) 45º

29. AB is a vertical pole. The end A is on the level ground, C is the middle point of AB and P is a point on the level ground. The portion CB subtends an angle β at P. If AP = nAB, then tan β equal

(1) $\frac{n}{2n^2+1}$ (2) $\frac{n}{n^2-1}$

(3) $\frac{n}{n^2+1}$ (4) None of these

30. The angle of elevation of the top of a tower, as seen from two points A and B situated in the same line and at distance p and q respectively from the foot of the tower, are complementary, then the height of the tower is.

(1) pq (2) $\frac{p}{q}$

(3) $\sqrt{pq}$ (4) none of these

Exercise 2

Matching Based Questions

DIRECTIONS (Qs. 1 to 2) : *Match the Column-I with Column-II and select the correct answer given below the columns.*

1.

	Column-I		Column-II
(A)	If $2\sin 2\theta = \sqrt{3}$ then the value of θ is	(p)	20°
(B)	If $2\cos 3\theta = 1$ then the value of θ is	(q)	$\frac{7}{25}$
(C)	If $\tan 3x = \sin 45° \cos 45° + \sin 30°$ then the value of x is	(r)	0
(D)	If $\tan\theta = \frac{3}{4}$ then $\cos^2\theta - \sin^2\theta$ is	(s)	15°
(E)	The value of $\cos^2 17° - \sin^2 73°$ is	(t)	30°

(1) A → t; B → p; C → s; D → q; E → r
(2) A → t; B → p; C → q; D → s; E → r
(3) A → p; B → t; C → s; D → q; E → r
(4) A → r; B → q; C → t; D → s; E → p

2.

	Column-I		Column-II
(A)	The angle of elevation of the sun if the length of the shadow of a tower is $\sqrt{3}$ times the height of the tower, is	(p)	45°
(B)	The angle of elevation of the top of a tower from a point 20 metres away from its base is 45°. The height of the tower is	(q)	70 m
(C)	At a point $15\sqrt{3}$ metres away from the base of a $15\sqrt{3}$ metres high house. The angle of elevation of the top is	(r)	20 m
(D)	The angle of depression of the top of a tower at a point 70 m from the house is 45°. Then the height of the tower is	(s)	30°

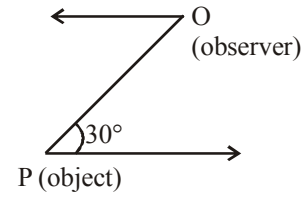
(1) A → p; B → r; C → s; D → q
(2) A → s; B → r; C → p; D → q
(3) A → p; B → r; C → q; D → s
(4) A → r; B → s; C → q; D → p

Statement Based Questions

3. Consider the following statements :
I. The value of sinA or cos A never exceeds 1.
II. The value of secA or cosecA is always equal to 1.
III. The value of $\sin\theta + \cos\theta$ for $\theta = 0°$ is 1.
IV. The value of $\sin\theta$ is $\left(a + \frac{1}{a}\right)$, where 'a' is a positive number.

Which of the statements given above is/are correct?
(1) 'I' and 'III' (2) 'II' and 'IV'
(3) Neither 'I' nor 'III' (4) Neither 'II' nor 'IV'

4. Consider the following statements :
I. The angle of elevation or depression is always measured from horizontal line through the point of observation.
II. If the length of shadow of a vertical pole is equal to its height, then the angle of elevation of the sun is 45°.
III. In the adjoining figure, the positions of observer and object are marked. The angle of depression is 20°.



IV. The height of an object or the distance between distant objects can be determined with the help of trigonometric ratios.

Which of the statements given above are correct?
(1) I, II and III (2) I, II and IV
(3) I, III and IV (4) II, III and IV

5. Consider the following statements:
I. Sin A is not the product of 'sin' and 'A'.
II. Only 'sin' has no meaning.
Which of the statement (s) given above is/are correct?
(1) only I (2) only II
(3) Both I and II (4) Neither I nor II

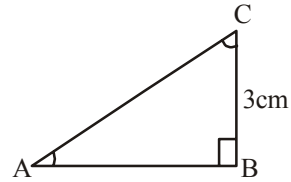
6. Consider the following identities:
I. $\sin^2\theta + \cos^2\theta = 1$
II. $\sec^2\theta = 1 + \tan^2\theta$
III. $\text{cosec}^2\theta = 1 + \cot^2\theta$
Which of the identities given above is/are correct?
(1) Both I and II (2) Both I and III
(3) Neither I, II nor III (4) All the above

Passage Based Questions

DIRECTIONS (Qs. 7 to 12) : *Read the passage(s) given below and answer the questions that follow.*

PASSAGE - 1

In ΔABC, right angled at B



$AB + AC = 9$ cm and $BC = 3$cm.

7. The value of cot C is

(1) $\frac{3}{4}$ (2) $\frac{1}{4}$

(3) $\frac{5}{4}$ (4) none

8. The value of sec C is

(1) $\frac{4}{3}$ (2) $\frac{5}{3}$

(3) $\frac{1}{3}$ (4) none

9. $\sin^2 C + \cos^2 C =$

(1) 0 (2) 1

(3) –1 (4) none

PASSAGE - 2

From the top of a tower, the angles of depression of two objects on the same side of the tower are found to be α and β where $\alpha > \beta$.

10. If the distance between the objects is 'p' metres, then the height 'h' of the tower is

(1) $\frac{p\tan\alpha\tan\beta}{\tan\alpha - \tan\beta}$ (2) $\frac{\tan\alpha\tan\beta}{\tan\alpha - \tan\beta}$

(3) $\frac{p(\tan\alpha - \tan\beta)}{\tan\alpha\tan\beta}$ (4) none of these

11. The height of the tower if p = 50m, $\alpha = 60°$ and $\beta = 30°$, is

(1) 120 m (2) 130 m

(3) 140 m (4) none of these

12. The distance of the extreme object from the top of the tower is

(1) 65 m (2) 130 m

(3) 260 m (4) none of these

Assertion Reason Based Questions

DIRECTIONS (Qs. 13 to 17) : *Following questions consist of two statements, one labelled as the* ***'Assertion' (A)*** *and the other as* ***'Reason' (R)****. You are to examine these two statements carefully and select the answer to these items using the code given below.*

Code :

(1) Both A and R are individually true and R is the correct explanation of A:

(2) Both A and R are individually true but R is not the correct explanation of A.

(3) A is true but R is false

(4) A is false but R is true.

13. Assertion : In a right angled triangle, if $\tan\theta = \frac{3}{4}$, the greatest side of the triangle is 5 units.

Reason : (greatest side)^2 = (hypotenuse)^2 = (perpendicular)^2 + (base)^2.

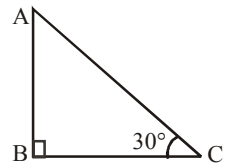
14. Assertion : In a right angled triangle, if $\cos\theta = \frac{1}{2}$ and $\sin\theta = \frac{\sqrt{3}}{2}$, then $\tan\theta = \sqrt{3}$

Reason : $\tan\theta = \frac{\sin\theta}{\cos\theta}$

15. Assertion : In a right angled triangle, sin 47° = cos 43°.

Reason : $\sin\theta = \cos(90 + \theta)$, where θ is an angle in the right angled triangle.

16. Assertion : If the above figure, if BC = 20 m, then height AB is 11.56 m.



Reason : $\tan\theta = \frac{AB}{BC} = \frac{\text{perpendicular}}{\text{base}}$ where θ is the angle $\angle ACB$.

17. Assertion : If the length of shadow of a vertical pole is equal to its height, then the angle of elevation of the sun is 45°.

Reason : According to pythagoras theorem, $h^2 = l^2 + b^2$, where h = hypotenuse, l = length and b = base

Correct Definition Based Questions

18. Which of the following is correct definition of sin θ ?

(1) $\sin\theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}}$ (2) $\sin\theta = \frac{\text{Base}}{\text{Hypotenuse}}$

(3) $\sin\theta = \frac{\text{Perpendicular}}{\text{Base}}$ (4) $\sin\theta = \frac{\text{Hypotenuse}}{\text{Perpendicular}}$

19. Which of the following is correct definition of cot θ ?

(1) $\cot\theta = \frac{\text{Perpendicular}}{\text{Base}}$ (2) $\cot\theta = \frac{\text{Base}}{\text{Perpendicular}}$

(3) $\cot\theta = \frac{\text{Hypotenuse}}{\text{Perpendicular}}$ (4) $\cot\theta = \frac{\text{Base}}{\text{Hypotenuse}}$