6 Introduction to Trigonometry

Multiple Choice Questions (MCQs)

DIRECTIONS : *This section contains multiple choice questions. Each question has 4 choices (a), (b), (c) and (d) out of which ONLY ONE is correct.*

1. If $(\sec^2\theta)(1+\sin\theta)(1-\sin\theta) = k$, then find the value of k.
(a) $\sin\theta$ (b) $\sec\theta$
(c) 1 (d) $\cot\theta$

2. If $\cot\theta = \left(\frac{15}{8}\right)$, then evaluate $\frac{(2+2\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(2-2\cos\theta)}$
(a) 1 (b) $\frac{225}{64}$
(c) $\frac{156}{7}$ (d) -1

3. If $x = a(\operatorname{cosec}\theta + \cot\theta)$ and $y = \frac{b(1-\cos\theta)}{\sin\theta}$, then $xy =$
(a) $\frac{a^2+b^2}{a^2-b^2}$ (b) $a^2 - b^2$
(c) ab (d) $\frac{a}{b}$

4. If $p\sin\theta + q\cos\theta = a$ and $p\cos\theta - q\sin\theta = b$, then $\frac{p+a}{q+b} + \frac{q-b}{p-a} =$
(a) 1 (b) $a^2 + b^2$
(c) 0 (d) 2

5. If $x = r\sin A\cos C$, $y = r\sin A\sin C$, $z = r\cos A$, then
(a) $r^2 = x^2 + y^2 + z^2$ (b) $r^2 = 2xy$
(c) $r^2 = x + y + z$ (d) $r^2 = y^2 + z^2 + 2xy$

6. If $\tan^2\theta = 1 - a^2$, then the value of $\sec\theta + \tan^3\theta\operatorname{cosec}\theta$ is
(a) $(2-a^2)$ (b) $(2-a^2)^{1/2}$
(c) $(2-a^2)^{2/3}$ (d) $(2-a^2)^{3/2}$

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

8. If $\cos A = \frac{3}{5}$, find the value of $9\cot^2 A - 1$.
(a) 1 (b) $\frac{16}{65}$
(c) $\frac{65}{16}$ (d) 0

9. $\cos 1° . \cos 2° . \cos 3°$ .... $\cos 179°$ is equal to
(a) -1 (b) 0
(c) 1 (d) $1/\sqrt{2}$

10. $\sin^2\theta + \operatorname{cosec}^2\theta$ is always
(a) greater than 1
(b) less than 1
(c) greater than or equal to 2
(d) equal to 2

11. If $x = p\sec\theta$ and $y = q\tan\theta$, then
(a) $x^2 - y^2 = p^2q^2$
(b) $x^2q^2 - y^2p^2 = pq$
(c) $x^2q^2 - y^2p^2 = \frac{1}{p^2q^2}$
(d) $x^2q^2 - y^2p^2 = p^2q^2$

12. If $b\tan\theta = a$, the value of $\frac{a\sin\theta - b\cos\theta}{a\sin\theta + b\cos\theta}$ is
(a) $\frac{a-b}{a^2+b^2}$ (b) $\frac{a+b}{a^2+b^2}$
(c) $\frac{a^2+b^2}{a^2-b^2}$ (d) $\frac{a^2-b^2}{a^2+b^2}$

13. $(\cos^4 A - \sin^4 A)$ is equal to
(a) $1 - 2\cos^2 A$ (b) $2\sin^2 A - 1$
(c) $\sin^2 A - \cos^2 A$ (d) $2\cos^2 A - 1$

14. If $\tan\theta = \dfrac{a\sin\phi}{1-a\cos\phi}$ and $\tan\phi = \dfrac{b\sin\theta}{1-b\cos\theta}$, then $\dfrac{a}{b}$ =

(a) $\dfrac{\sin\theta}{1-\cos\theta}$ (b) $\dfrac{\sin\theta}{1-\cos\phi}$

(c) $\dfrac{\sin\phi}{\sin\theta}$ (d) $\dfrac{\sin\theta}{\sin\phi}$

15. If cosec x – cot x = $\dfrac{1}{3}$, where $x \neq 0$, then the value of $\cos^2 x - \sin^2 x$ is

(a) $\dfrac{16}{25}$ (b) $\dfrac{9}{25}$

(c) $\dfrac{8}{25}$ (d) $\dfrac{7}{25}$

16. If cosec x + sin x = a and sec x + cos x = b, then

(a) $(a^2b)^{\frac{2}{3}} + (ab^2)^{\frac{2}{3}} = 1$

(b) $(ab^2)^{\frac{2}{3}} + (a^2b^2)^{\frac{2}{3}} = 1$

(c) $a^2 + b^2 = 1$

(d) $b^2 - a^2 = 1$

17. If $\tan^2\theta = 1 - e^2$, then the value of $\sec\theta + \tan^3\theta \operatorname{cosec}\theta$ is equal to

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

(c) $(2 - e^2)^{3/2}$ (d) $(1 - e^2)^{3/2}$

18. If $\sin\theta + \sin^3\theta = \cos^2\theta$, then the value of $\cos^6\theta - 4\cos^4\theta + 8\cos^2\theta$ is

(a) 1 (b) 4

(c) 2 (d) 0

19. If cosec A + cot A = $\dfrac{11}{2}$, then tan A

(a) $\dfrac{21}{22}$ (b) $\dfrac{15}{16}$

(c) $\dfrac{44}{117}$ (d) $\dfrac{11}{117}$

20. $\dfrac{2\tan 30^\circ}{1+\tan^2 30^\circ}$ is equal to

(a) sin 30° (b) cos 60°

(c) $\dfrac{1}{2}$ (d) $\dfrac{\sqrt{3}}{2}$

21. $\dfrac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$ is equal to

(a) sec θ (b) tan θ

(c) $\sqrt{\sec\theta - 1}$ (d) cot θ

22. If $\dfrac{\cos\theta}{1-\sin\theta} + \dfrac{\cos\theta}{1+\sin\theta} = 4$, then

(a) $\cos\theta = \dfrac{\sqrt{3}}{2}$ (b) $\sin\theta = \dfrac{1}{2}$

(c) θ = 60° (d) $\tan\theta = \dfrac{1}{\sqrt{3}}$

23. $\dfrac{\tan\theta - \cot\theta}{\sin\theta\cos\theta}$ is equal to

(a) $\sec^2\theta + \operatorname{cosec}^2\theta$ (b) $\cot^2\theta - \tan^2\theta$

(c) $\cos^2\theta - \sin^2\theta$ (d) $\tan^2\theta - \cot^2\theta$

24. $\dfrac{2\tan 30^\circ}{1+\tan^2 30^\circ}$ =

(a) sin 60° (b) cos 60°

(c) tan 60° (d) sin 30°

25. $\dfrac{1-\tan^2 45^\circ}{1+\tan^2 45^\circ}$ =

(a) tan 90° (b) 1

(c) sin 45° (d) 0

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

(a) 0° (b) 30°

(c) 45° (d) 60°

27. $\dfrac{2\tan 30^\circ}{1-\tan^2 30^\circ}$ =

(a) cos 60° (b) sin 60°

(c) tan 60° (d) sin 30°

28. $9\sec^2 A - 9\tan^2 A$ =

(a) 1 (b) 9

(c) 8 (d) 0

29. (1 + tan θ + sec θ) (1 + cot θ– cosec θ) =

(a) 0 (b) 1

(c) 2 (d) –1

30. (sec A + tan A) (1 – sin A) =

(a) sec A (b) sin A

(c) cosec A (d) cos A

31. $\dfrac{1+\tan^2 A}{1+\cot^2 A}$ = L

(a) $\sec^2 A$ (b) –1

(c) $\cot^2 A$ (d) $\tan^2 A$

32. The value of (sin 30° + cos 30°) – (sin 60° + cos 60°) is

(a) –1 (b) 0

(c) 1 (d) 2

33. The value of $\frac{\tan 30°}{\cot 60°}$ is

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

(c) $\sqrt{3}$ (d) 1

34. The value of (sin 45° + cos 45°) is

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

(c) $\frac{\sqrt{3}}{2}$ (d) 1

35. Given that $\sin\theta = \frac{a}{b}$, then cos θ is equal to

(a) $\frac{b}{\sqrt{b^2-a^2}}$ (b) $\frac{b}{a}$

(c) $\frac{\sqrt{b^2-a^2}}{b}$ (d) $\frac{a}{\sqrt{b^2-a^2}}$

36. If $\sin A + \sin^2 A = 1$, then the value of the expression $(\cos^2 A + \cos^4 A)$ is

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

(c) 2 (d) 3

37. If $\sin(A+B) = \frac{\sqrt{3}}{2}$ and $\sin 2B = \frac{1}{2}$, then

(a) $\tan B = 1$ (b) $B = 30°$

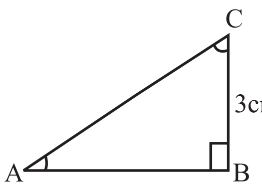
(c) $B = 45°$ (d) $\cos A = \frac{1}{2}$

Case/Passage Based Questions

DIRECTIONS : *Study the given Case/Passage and answer the following questions.*

Case/Passage

In ΔABC, right angled at B



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

38. The value of cot C is

[From CBSE Question Bank-2021]

(a) $\frac{3}{4}$ (b) $\frac{1}{4}$

(c) $\frac{5}{4}$ (d) None of these

39. The value of sec C is

(a) $\frac{4}{3}$ (b) $\frac{5}{3}$

(c) $\frac{1}{3}$ (d) None of these

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

(a) 0 (b) 1

(c) –1 (d) None of these

Assertion & Reason

DIRECTIONS : *Each of these questions contains an Assertion followed by reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.*

(a) If both **Assertion** and **Reason** are **correct** and Reason is the **correct explanation** of Assertion.

(b) If both **Assertion** and **Reason** are correct, but Reason is **not the correct explanation** of Assertion.

(c) If **Assertion** is **correct** but **Reason** is **incorrect**.

(d) If **Assertion** is **incorrect** but **Reason** is **correct**.

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

Reason: $(\text{greatest side})^2 = (\text{hypotenuse})^2 = (\text{perpendicular})^2 + (\text{base})^2$.

42. **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: $\tan\theta = \frac{\sin\theta}{\cos\theta}$

Match the Following

DIRECTIONS : *Each question contains statements given in two columns which have to be matched. Statements (A, B, C, D) in column-I have to be matched with statements (p, q, r, s) in column-II.*

43. In ΔABC, $\angle B = 90°$, $AB = 3$ cm and $BC = 4$ cm, then match the column.

Column-I	**Column-II**
(A) sin C	(p) 3/5
(B) cos C	(q) 4/5
(C) tan A	(r) 5/3
(D) sec A	(s) 4/3

44.

Column-I	Column-II
(A) $\dfrac{\cos A}{1+\sin A}+\dfrac{1+\sin A}{\cos A}$	(p) cosec A + cot A
(B) $\dfrac{\cos A-\sin A+1}{\cos A+\sin A-1}$	(q) 2 sec A
(C) $\sqrt{\dfrac{1+\sin A}{1-\sin A}}$	(r) sec A + tan A
(D) $\dfrac{\sin^2 A}{1-\cos A}$	(s) $\dfrac{1+\sec A}{\sec A}$

45. If $\sin A = \dfrac{7}{25}$, then

Column-I	Column-II
(A) cos A	(p) 24/25
(B) tan A	(q) 7/24
(C) cosec A	(r) 25/7
(D) sec A	(s) 25/24

Fill in the Blanks

DIRECTIONS : *Complete the following statements with an appropriate word / term to be filled in the blank space(s).*

46. The value of sin A or cos A never exceeds ......
47. $\sin^2 A + \cos^2 A$ = ...
48. If tan A = 4/3, then sin A ....
49. In a right trianlge ABC, right angled at B, if tan A = 1, sin A cos A = ...
50. In Δ ABC, right-angled at B, AB = 24 cm, BC = 7 cm. sin A = ...
51. If 15 cot A = 8, sec A = ...
52. In Δ PQR, right-angled at Q, $PR + QR$ = 25 cm and PQ = 5 cm. The value of tan P is ....
53. sin 60° cos 30° + sin 30° cos60° = ...
54. $2\tan^2 45° + 3\cos^2 30° - \sin^2 60°$ = ...
55. $\dfrac{\cos 45°}{\sec 30° + \text{cosec } 30°} =$ ....

True / False

DIRECTIONS : *Read the following statements and write your answer as true or false.*

56. The value of tan A is always less than 1.
57. sec A = 12/5, for some value of angle A.
58. cos A is the abbreviation used for the cosecant of angle A.
59. cot A is the product of cot and A.
60. $\sin\theta = \dfrac{4}{3}$, for some angle θ.
61. sin $(A + B)$ = sin A + sin B.
62. cot A is not defined for A = 0°.
63. If $\angle B$ and $\angle Q$ are acute angles such that sin B = sin Q, then $\angle B \neq \angle Q$.

ANSWER KEY & SOLUTIONS

1. **(c)** $\sec^2\theta\,(1+\sin\theta)(1-\sin\theta) = k$

$$\left(\frac{1}{\cos^2\theta}\right)(1-\sin^2\theta) = k$$

$$\Rightarrow \left(\frac{1}{\cos^2\theta}\right)(\cos^2\theta) = k \Rightarrow 1 = k.$$

2. **(b)** $\dfrac{(2+2\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(2-2\cos\theta)} = \dfrac{2(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(2)(1-\cos\theta)}$

$$= \frac{2(1-\sin^2\theta)}{2(1-\cos^2\theta)} = \frac{2\cos^2\theta}{2\sin^2\theta} = \cot^2\theta = \left(\frac{15}{8}\right)^2 = \frac{225}{64}$$

3. **(c)** We have, $x = a(\operatorname{cosec}\theta + \cot\theta)$

$$\Rightarrow \frac{x}{a} = (\operatorname{cosec}\theta + \cot\theta) \qquad ...(1)$$

and $y = b\left(\dfrac{1-\cos\theta}{\sin\theta}\right) \Rightarrow \dfrac{y}{b} = \dfrac{1}{\sin\theta} - \dfrac{\cos\theta}{\sin\theta}$

$$\Rightarrow \frac{y}{b} = \operatorname{cosec}\theta - \cot\theta \qquad ...(2)$$

$$\Rightarrow \frac{x}{a}\times\frac{y}{b} = (\operatorname{cosec}\theta + \cot\theta)(\operatorname{cosec}\theta - \cot\theta)$$

$$\Rightarrow \frac{xy}{ab} = (\operatorname{cosec}^2\theta - \cot^2\theta) \quad \therefore\ xy = ab$$

4. **(c)** By squaring and adding both the given equations, we get

$p^2(\sin^2\theta + \cos^2\theta) + q^2(\cos^2\theta + \sin^2\theta)$

$= a^2 + b^2$

$\Rightarrow \quad p^2 + q^2 - a^2 - b^2 = 0$

$\Rightarrow \quad (p-a)(p+a) + (q-b)(q+b) = 0$

$$\Rightarrow \quad \frac{p+a}{q+b} + \frac{q-b}{p-a} = 0$$

5. **(a)** $x = r\sin A\cos C,\ y = r\sin A\sin C,\ z = r\cos A$

$x^2 + y^2 + z^2 = r^2\sin^2 A\cos^2 C + r^2\sin^2 A\sin^2 C + r^2\cos^2 A$

$$= \left(r^2\sin^2 A\right)\left(\cos^2 C + \sin^2 C\right) + r^2\cos^2 A$$

$$= r^2\sin^2 A(1) + r^2\cos^2 A = r^2(\sin^2 A + \cos^2 A) = r^2$$

6. **(d)** $\sec\theta + \tan^3\theta\operatorname{cosec}\theta$

$$= \sec\theta + \frac{\sin\theta}{\cos\theta}\tan^2\theta\operatorname{cosec}\theta = \sec\theta(1+\tan^2\theta)$$

$= (1+\tan^2\theta)^{3/2} = [1 + (1-a^2)]^{3/2}$

7. **(b)** $x - a = b\sin^2\theta - a\sin^2\theta = (b-a)\sin^2\theta$

$b - x = b\cos^2\theta - a\cos^2\theta = (b-a)\cos^2\theta$

$\therefore (x-a)(b-x) = (b-a)^2\sin^2\theta\cos^2\theta$

$= (a-b)^2\sin^2\theta\cos^2\theta$

8. **(c)** $\cos A = \dfrac{3}{5} \Rightarrow \sin A = \sqrt{1-\dfrac{9}{25}} = \dfrac{4}{5}$

Consider,

$$9\cot^2 A - 1 = \frac{9\cos^2 A}{\sin^2 A} - 1 = \frac{9\cos^2 A - \sin^2 A}{\sin^2 A}$$

$$= \frac{9\left(\frac{9}{25}\right) - \left(\frac{16}{25}\right)}{\frac{16}{25}} = \frac{(81-16)}{25}\times\frac{25}{16} = \frac{65}{16}$$

9. **(b)** **10.** **(c)**

11. **(d)** We know that $\sec^2\theta - \tan^2\theta = 1$ and $\sec\theta = \dfrac{x}{p}$, $\tan\theta = \dfrac{y}{q}$

$\therefore\ x^2q^2 - p^2y^2 = p^2q^2$

12. **(d)** Given, $\tan\theta = \dfrac{a}{b}$

$$\therefore\ \frac{a\sin\theta - b\cos\theta}{a\sin\theta + b\cos\theta} = \frac{a\tan\theta - b}{a\tan\theta + b} = \frac{a^2-b^2}{a^2+b^2}$$

13. **(d)** $(\cos^4 A - \sin^4 A) = (\cos^2 A)^2 - (\sin^2 A)^2$

$= (\cos^2 A - \sin^2 A)(\cos^2 A + \sin^2 A)$

$= (\cos^2 A - \sin^2 A)(1) = \cos^2 A - (1-\cos^2 A)$

$= 2\cos^2 A - 1$

14. **(d)** We have, $\tan\theta = \dfrac{a\sin\phi}{1-a\cos\phi}$

$$\Rightarrow \cot\theta = \frac{1}{a\sin\phi} - \cot\phi \Rightarrow \cot\theta + \cot\phi = \frac{1}{a\sin\phi} \qquad ...(i)$$

and $\tan\phi = \dfrac{b\sin\theta}{1-b\cos\theta}$

$$\Rightarrow \cot\phi = \frac{1}{b\sin\theta} - \cot\theta$$

$\Rightarrow \cot\phi + \cot\theta = \dfrac{1}{b\sin\theta}$ ...(ii)

From (i) and (ii), we have

$$\frac{1}{a\sin\phi} \quad \frac{1}{b\sin\theta} \Rightarrow \frac{a}{b} = \frac{\sin\theta}{\sin\phi}$$

15. **(d)** Let cosec x – cot x = $\dfrac{1}{3}$

$$\Rightarrow \frac{1}{\sin x} - \frac{\cos x}{\sin x} = \frac{1}{3}$$

$$\Rightarrow \frac{1-\cos x}{\sin x} = \frac{1}{3} \Rightarrow \frac{2\sin^2\frac{x}{2}}{2\sin\frac{x}{2}\cos\frac{x}{2}} = \frac{1}{3}$$

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

Consider

$$\tan x = \frac{2\tan\frac{x}{2}}{1-\tan^2\frac{x}{2}} = \frac{\frac{2}{3}}{1-\frac{1}{9}} = \frac{3}{4}$$

Thus $\sin x = \dfrac{3}{5}, \cos x = \dfrac{4}{5}$

$$\therefore \quad \cos^2 x - \sin^2 x = \frac{16}{25} - \frac{9}{25} = \frac{7}{25}$$

16. **(a)** cosec x – sin x = a & sec x – cos x = b

$$\operatorname{cosec} x - \frac{1}{\operatorname{cosec} x} = a \;\&\; \sec x - \frac{1}{\sec x} = b$$

$$\Rightarrow \frac{\operatorname{cosec}^2 x - 1}{\operatorname{cosec} x} = a \;\&\; \frac{\sec^2 x - 1}{\sec x} = b$$

$$\Rightarrow \frac{\cot^2 x}{\operatorname{cosec} x} = a \;\&\; \frac{\tan^2 x}{\sec x} = b$$

$$\frac{\cos^2 x}{\sin x} = a \;\&\; \frac{\sin^2 x}{\cos x} = b$$

Now, $a^2 b = \dfrac{\cos^4 x}{\sin^2 x}.\dfrac{\sin^2 x}{\cos x} = \cos^3 x$

$\Rightarrow \quad \cos x = (a^2b)^{1/3} \Rightarrow \cos^2 x = (a^2b)^{2/3}$

Similarly, $\sin^2 x = (ab^2)^{2/3}$

We know that, $\sin^2 x + \cos^2 x = 1$

$\Rightarrow \quad (ab^2)^{2/3} + (a^2b)^{2/3} = 1$

17. **(c)** $\because \tan^2\theta = 1 - e^2$

$\Rightarrow \sec\theta = \sqrt{1+\tan^2\theta} = \sqrt{1+1-e^2}$

$\Rightarrow \sec\theta = \sqrt{2-e^2}$ ...(i)

$$\therefore \sec\theta + \tan^3\theta \operatorname{cosec}\theta = \frac{1}{\cos\theta} + \tan^2\theta.\frac{\sin\theta}{\cos\theta}.\frac{1}{\sin\theta}$$

$$= \frac{1}{\cos\theta}(1+\tan^2\theta) = \frac{\sec^2\theta}{\cos\theta} = \sec^3\theta = (2-e^2)^{3/2} \quad \text{[from (i)]}$$

18. **(b)** $\sin\theta + \sin^3\theta = \cos^2\theta$

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

$\Rightarrow \sin^2\theta(2 - \cos^2\theta)^2 = \cos^4\theta$

$\Rightarrow (1 - \cos^2\theta)(4 + \cos^4\theta - 4\cos^2\theta) = \cos^4\theta$

$\Rightarrow 4 + \cos^4\theta - 4\cos^2\theta - 4\cos^2\theta - \cos^6\theta + 4\cos^4\theta = \cos^4\theta$

$\Rightarrow \cos^6\theta - 4\cos^4\theta + 8\cos^2\theta = 4$

19. **(c)**

20. **(d)** We have, $\dfrac{2\tan 30°}{1+\tan^2 30°}$

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

Alternate method:

$$\left(\text{Using identity}, \sin 2A = \frac{2\tan A}{1+\tan^2 A}\right)$$

$$\sin 60° = \frac{2\tan 30°}{1+\tan^2 30°} = \frac{\sqrt{3}}{2}$$

21. **(b)** We have,

$$\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \frac{\sin\theta(1-2\sin^2\theta)}{\cos\theta(2\cos^2\theta - 1)}$$

$$= \tan\theta\left[\frac{1-2(1-\cos^2\theta)}{2\cos^2\theta - 1}\right] = \tan\theta\left[\frac{(2\cos^2\theta - 1)}{2\cos^2\theta - 1}\right]$$

$= \tan\theta$

22. **(c)** We have, $\dfrac{\cos\theta}{1-\sin\theta} + \dfrac{\cos\theta}{1+\sin\theta} = 4$

$$\Rightarrow \cos\theta\left(\frac{1+\sin\theta+1-\sin\theta}{1-\sin^2\theta}\right) = 4$$

$$\Rightarrow \frac{2\cos\theta}{\cos^2\theta} = 4 \Rightarrow \cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$$

23. **(d)** We have, $\dfrac{\tan\theta - \cot\theta}{\sin\theta\cos\theta}$

$$= \frac{\tan\theta}{\sin\theta\cos\theta} - \frac{\cot\theta}{\sin\theta\cos\theta}$$

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

$$= \frac{1}{\cos^2\theta} - \frac{1}{\sin^2\theta} = \sec^2\theta - \operatorname{cosec}^2\theta$$

$$= 1 + \tan^2\theta - 1 - \cot^2\theta = \tan^2\theta - \cot^2\theta$$

24. (a) $\dfrac{2\tan 30°}{1+\tan^2 30°} = \dfrac{2\left(\frac{1}{\sqrt{3}}\right)}{1+\left(\frac{1}{\sqrt{3}}\right)^2}$

$$= \frac{\frac{2}{\sqrt{3}}}{1+\frac{1}{3}} = \frac{2}{\sqrt{3}} \times \frac{3}{4} = \frac{\sqrt{3}}{2} = \sin 60°.$$

25. (d) $\dfrac{1-\tan^2 45°}{1+\tan^2 45°} = \dfrac{1-(1)^2}{1+(1)^2} = 0.$

26. (a) Here, when A = 0°

LHS = sin 2 A = sin 0° = 0

and RHS = 2 sin A= 2 sin 0° = 2 × 0 = 0

In the other options, we will find that

LHS ≠ RHS

27. (c) $\dfrac{2\tan 30°}{1-\tan^2 30°} = \dfrac{2\left(\frac{1}{\sqrt{3}}\right)}{1-\left(\frac{1}{\sqrt{3}}\right)^2}$

$$= \frac{\frac{2}{\sqrt{3}}}{1-\frac{1}{3}} = \frac{2}{\sqrt{3}} \times \frac{3}{2} = \sqrt{3} = \tan 60°.$$

28. (b) $9\sec^2 A - 9\tan^2 A = 9(\sec^2 A - \tan^2 A)$
$= 9 \times 1 = 9.$

29. (c) $(1+\tan\theta+\sec\theta)(1+\cot\theta-\operatorname{cosec}\theta)$

$$= \left\{1+\frac{\sin\theta}{\cos\theta}+\frac{1}{\cos\theta}\right\} \times \left\{1+\frac{\cos\theta}{\sin\theta}-\frac{1}{\sin\theta}\right\}$$

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

$$= \frac{(\cos\theta+\sin\theta)^2-(1)^2}{\cos\theta\times\sin\theta} \quad \{\because (a+b)(a-b)=a^2-b^2\}$$

$$= \frac{1+2\cos\theta\sin\theta-1}{\cos\theta\times\sin\theta} = 2.$$

30. (d) $(\sec A + \tan A)(1-\sin A)$

$$= \left(\frac{1}{\cos A}+\frac{\sin A}{\cos A}\right)\times(1-\sin A)$$

$$= \frac{(1+\sin A)(1-\sin A)}{\cos A}$$

$$= \frac{1-\sin^2 A}{\cos A} = \frac{\cos^2 A}{\cos A} \qquad (\because \cos^2 A = 1-\sin^2 A)$$

= cosA.

31. (d) $\dfrac{1+\tan^2 A}{1+\cot^2 A} = \dfrac{(\sec^2 A-\tan^2 A)+\tan^2 A}{(\operatorname{cosec}^2 A-\cot^2 A)+\cot^2 A}$

$$= \frac{\sec^2 A}{\operatorname{cosec}^2 A} = \frac{\sin^2 A}{\cos^2 A} = \left(\frac{\sin A}{\cos A}\right)^2 = \tan^2 A.$$

32. (b) (sin 30° + cos 30°) – (sin 60° + cos 60°)

$$= \left(\frac{1}{2}+\frac{\sqrt{3}}{2}\right)-\left(\frac{1}{2}+\frac{\sqrt{3}}{2}\right) = 0$$

33. (d) $\dfrac{\tan 30°}{\cot 60°} = \dfrac{\frac{1}{\sqrt{3}}}{\frac{1}{\sqrt{3}}} = 1$

34. (b) $\sin 45° + \cos 45° = \dfrac{1}{\sqrt{2}}+\dfrac{1}{\sqrt{2}} = \dfrac{2}{\sqrt{2}} = \sqrt{2}$

(on rationalizing)

35. (c) $\cos\theta = \sqrt{1-\sin^2\theta} = \sqrt{1-\dfrac{a^2}{b^2}} = \dfrac{\sqrt{b^2-a^2}}{b}$

36. (a) Given, $\sin A + \sin^2 A = 1$

$\Rightarrow \sin A = 1 - \sin^2 A = \cos^2 A$

Consider, $\cos^2 A + \cos^4 A = \sin A + (\sin A)^2 = 1$

37. (c) We have, $\sin(A+B) = \dfrac{\sqrt{3}}{2}$

$\Rightarrow A + B = 60°$ ...(i)

and $2B = 30° \quad \therefore \quad B = 15°$

Putting B in (i), we get

$A + 15° = 60° \Rightarrow A = 45°$

Sol. (38-40):

In ΔABC, by Pythagoras theorem,

$AC^2 = AB^2 + BC^2 \Rightarrow AB = 4$ cm.

$AC = 5$ cm.

38. (a) $\cot C = \dfrac{BC}{AB} = \dfrac{3}{4}$

39. (b) $\sec C = \dfrac{AC}{BC} = \dfrac{5}{3}$

40. (b) $\sin C = \dfrac{4}{5}, \ \cos C = \dfrac{3}{5}$

$$\text{L.H.S} = \sin^2 C + \cos^2 C = \left(\frac{4}{5}\right)^2 + \left(\frac{3}{5}\right)^2$$

$$= \frac{16+9}{25} = 1 = \text{R.H.S}$$

41. **(a)** Both Assertion and Reason are correct and Reason is the correct explanation of the assertion.

greatest side = $\sqrt{(3)^2 + (4)^2} = 5$ units.

42. **(a)** Both assertion and reason are correct and reason is the correct explanation of the assertion.

$\tan\theta = \frac{\sqrt{3}}{2} \times 2 = \sqrt{3}$.

43. (A) $\rightarrow$ p; (B) $\rightarrow$ q; (C) $\rightarrow$ s; (D) $\rightarrow$ r

44. (A) $\rightarrow$ q; (B) $\rightarrow$ p; (C) $\rightarrow$ r; (D) $\rightarrow$ s

45. (A) $\rightarrow$ p; (B) $\rightarrow$ q; (C) $\rightarrow$ r; (D) $\rightarrow$ s

46. 1 **47.** 1 **48.** 4/5

49. $\frac{1}{2}$ **50.** 7/25 **51.** 17/8

52. 12/5 **53.** 1

54. $\frac{7}{2}$ **55.** $\frac{3(\sqrt{3}-1)}{4}$

56. False **57.** True **58.** False

59. False **60.** False **61.** False

62. True **63.** False