

Trigonometry/त्रिकोणमिति

(Practice Sheet With Solution)

Level-01

1. Find the value of $\frac{(\tan 69^\circ + \tan 66^\circ)}{(1 - \tan 69^\circ \tan 66^\circ)}$?

$\frac{(\tan 69^\circ + \tan 66^\circ)}{(1 - \tan 69^\circ \tan 66^\circ)}$ का मान ज्ञात कीजिए?

- (a) 1 (b) -1
(c) 2 (d) -2
2. Show that the value of $3\sin 15^\circ - 4\sin^3 15^\circ$ is?
दर्शाइए कि $3\sin 15^\circ - 4\sin^3 15^\circ$ का मान क्या होगा?

- (a) $\frac{1}{\sqrt{3}}$ (b) $\frac{1}{4}$
(c) $\frac{1}{\sqrt{2}}$ (d) $\sqrt{3}$

3. What is the value of $\sin 79^\circ \cos 19^\circ - \cos 79^\circ \sin 19^\circ$.
 $\sin 79^\circ \cos 19^\circ - \cos 79^\circ \sin 19^\circ$ का मान क्या होगा?

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

4. What is the value of $\cos 70^\circ \cos 40^\circ + \sin 70^\circ \sin 40^\circ$?
 $\cos 70^\circ \cos 40^\circ + \sin 70^\circ \sin 40^\circ$ का मान क्या है?

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

5. If $0 < \theta < 90^\circ$, solve the following equations:
 $2 \cos^2 \theta + \sin \theta - 2 = 0$.

यदि $0 < \theta < 90^\circ$, निम्नलिखित समीकरणों को हल करें:
 $2 \cos^2 \theta + \sin \theta - 2 = 0$

- (a) $\theta = 0$ (b) $\theta = \frac{\pi}{6}$
(c) $\theta = 1$ (d) None of these

6. If $7\sin^2 \theta + 3\cos^2 \theta = 4$ and $0^\circ \leq \theta \leq \left(\frac{\pi}{2}\right)$, then
the value of $\tan \theta$ is:

यदि $7\sin^2 \theta + 3\cos^2 \theta = 4$ और $0^\circ \leq \theta \leq \left(\frac{\pi}{2}\right)$ है,
तो $\tan \theta$ का मान है:

- (a) $\sqrt{\left(\frac{3}{7}\right)}$ (b) $\sqrt{\left(\frac{2}{7}\right)}$
(c) $\frac{1}{\sqrt{3}}$ (d) $\frac{1}{\sqrt{7}}$

7. Find the value of/का मान ज्ञात कीजिए:

$$\left(\frac{\cos 60^\circ}{\sin 30^\circ}\right) + \left(\frac{\cos 65^\circ \operatorname{cosec} 25^\circ}{\tan 10^\circ \tan 30^\circ \tan 45^\circ \tan 60^\circ \tan 80^\circ}\right)$$

(a) 1 (b) -1
(c) 0 (d) 2

8. Find the value of/का मान ज्ञात कीजिए:

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

(a) $\cos \theta$ (b) $\cos \theta / 2$
(c) $2 \cos \theta$ (d) $\sqrt{2} \cos \theta$

9. Evaluate: $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ$
मूल्यांकन करें: $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ$

- (a) $\frac{1}{8}$ (b) $\frac{1}{16}$
(c) $\frac{1}{4}$ (d) $\frac{1}{32}$

10. Evaluate: $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ$
मूल्यांकन करें: $\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ$

- (a) $\frac{1}{16}$ (b) $\frac{3}{16}$
(c) $\frac{5}{16}$ (d) $\frac{7}{16}$

11. Find $\tan 20^\circ \tan 40^\circ \tan 80^\circ$
 $\tan 20^\circ \tan 40^\circ \tan 80^\circ$ का मान ज्ञात करें।

- (a) 1 (b) $\sqrt{3}$
(c) 2 (d) $\frac{1}{16}$

12. Find the value of/का मान ज्ञात करें।
 $x = \cos 10^\circ \cos 20^\circ \cos 40^\circ$

- (a) $\frac{1}{4} \tan 10^\circ$ (b) $\frac{1}{8} \tan 10^\circ$
(c) $\frac{1}{4} \cot 10^\circ$ (d) $\frac{1}{8} \cot 10^\circ$

13. Find $1 - \sin 10^\circ \sin 50^\circ \sin 70^\circ$?

$1 - \sin 10^\circ \sin 50^\circ \sin 70^\circ$ का मान ज्ञात करें?

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

(c) $\frac{7}{8}$ (d) $\frac{5}{8}$

14. The value of $(\cos 15^\circ \cos 45^\circ \cos 75^\circ)$

$(\cos 15^\circ \cos 45^\circ \cos 75^\circ)$ का मान ज्ञात करें?

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

(c) $\frac{\sqrt{3}}{8}$ (d) $\frac{1}{8}$

15. The value of $\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ \cos 90^\circ$

$\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ \cos 90^\circ$ का मान ज्ञात करें?

(a) 3 (b) 0

(c) 5 (d) 1

16. If $\alpha + \beta = 90^\circ$, then the value of $(1 - \sin^2 \alpha)(1 - \cos^2 \alpha) \times (1 + \cot^2 \beta)(1 + \tan^2 \beta)$ is?

यदि $\alpha + \beta = 90^\circ$, तो $(1 - \sin^2 \alpha)(1 - \cos^2 \alpha) \times (1 + \cot^2 \beta)(1 + \tan^2 \beta)$ का मान ज्ञात करें?

(a) 1 (b) -1

(c) 0 (d) 2

17. Find the value of $\tan 4^\circ \tan 43^\circ \tan 47^\circ \tan 86^\circ$

$\tan 4^\circ \tan 43^\circ \tan 47^\circ \tan 86^\circ$ का मान ज्ञात कीजिए?

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

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

18. Simplify $\cos(36^\circ - A) \cos(36^\circ + A) + \cos(54^\circ - A) \cos(54^\circ + A)$

निम्न का मान ज्ञात कीजिए?

$\cos(36^\circ - A) \cos(36^\circ + A) + \cos(54^\circ - A) \cos(54^\circ + A)$

(a) $\cos A$ (b) $\sin 2A$

(c) $\cos 2A$ (d) $\sin A$

19. If $\sec \alpha = \operatorname{cosec} \beta$ $0^\circ \leq (\alpha, \beta) \leq 90^\circ$

Then find $\cos^2 (\alpha + \beta)$

यदि $\sec \alpha = \operatorname{cosec} \beta$ $0^\circ \leq (\alpha, \beta) \leq 90^\circ$

तब $\cos^2 (\alpha + \beta)$ का मान ज्ञात करें?

(a) 0 (b) 1

(c) 2 (d) 3

20. If $7\sin^2 \theta + 3\cos^2 \theta = 4$ ($0 \leq \theta \leq 90$) then value of θ is.

यदि $7\sin^2 \theta + 3\cos^2 \theta = 4$ ($0 \leq \theta \leq 90$) है, तो θ का मान ज्ञात कीजिए।

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

(c) $\frac{\pi}{6}$ (d) $\frac{\pi}{4}$

21. The numerical value of $\frac{5}{\sec^2 \theta} + \frac{2}{1 + \cot^2 \theta} + 3\sin^2 \theta$ is?

$\frac{5}{\sec^2 \theta} + \frac{2}{1 + \cot^2 \theta} + 3\sin^2 \theta$ का संख्यात्मक मान क्या होगा?

(a) 5 (b) 2

(c) 3 (d) 4

22. If $\angle A$ and $\angle B$ are complementary to each other, then the value of $\sec^2 A + \sec^2 B - \sec^2 A \sec^2 B$

यदि $\angle A$ और $\angle B$ एक दूसरे के पूरक हैं, तो $\sec^2 A + \sec^2 B - \sec^2 A \sec^2 B$ का मान ज्ञात कीजिए?

(a) 1 (b) -1

(c) 2 (d) 0

23. If $0^\circ < \theta < 90^\circ$, the value of $(\sin \theta + \cos \theta)$ is?

यदि $0^\circ < \theta < 90^\circ$ है, तो $(\sin \theta + \cos \theta)$ का मान ज्ञात करें?

(a) equal to 1 (b) greater than 1

(c) less than 1 (d) equal to 2

24. If $\frac{\sec \theta + \tan \theta}{\sec \theta - \tan \theta} = \frac{5}{3}$ then $\sin \theta$ is equal to?

यदि $\frac{\sec \theta + \tan \theta}{\sec \theta - \tan \theta} = \frac{5}{3}$ है, तो $\sin \theta$ का मान ज्ञात कीजिए?

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

(c) $\frac{2}{3}$ (d) $\frac{3}{4}$

25. For any real value of $\theta = \sqrt{\frac{(\sec \theta - 1)}{(\sec \theta + 1)}}$ is.

$\theta = \sqrt{\frac{(\sec \theta - 1)}{(\sec \theta + 1)}}$ का वास्तविक मान ज्ञात करें।

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

(c) $\operatorname{cosec} \theta - \cot \theta$ (d) $\tan \theta - \sec \theta$

26. If $\frac{\cos^2 \theta}{\cot^2 \theta - \cos^2 \theta} = 3$ and $0^\circ < \theta < 90^\circ$ then the value of θ is.

यदि $\frac{\cos^2 \theta}{\cot^2 \theta - \cos^2 \theta} = 3$ और $0^\circ < \theta < 90^\circ$ है, तो θ का मान ज्ञात कीजिए।

- (a) 30° (b) 45°
(c) 60° (d) None

27. Find the maximum and minimum value of $8\cos A + 15\sin A + 15$ is:

$8\cos A + 15\sin A + 15$ का अधिकतम और न्यूनतम मान ज्ञात कीजिए।

- (a) $11\sqrt{2} + 15$ (b) 30, 8
(c) 32, -2 (d) 23, 8

28. If $\cos x + \cos y = 2$ then value of $\sin x + \sin y$ is.

यदि $\cos x + \cos y = 2$ है, तो $\sin x + \sin y$ का मान ज्ञात कीजिए।

- (a) 0 (b) 1
(c) 2 (d) -1

29. Find the simplest numerical value of $3(\sin x - \cos x)^4 + 4(\sin^6 x + \cos^6 x) + 6(\sin x + \cos x)^2$

$3(\sin x - \cos x)^4 + 4(\sin^6 x + \cos^6 x) + 6(\sin x + \cos x)^2$ का सबसे सरल संख्यात्मक का मान ज्ञात कीजिए?

- (a) 12 (b) 10
(c) 21 (d) 13

30. If $\tan 15^\circ = 2 - \sqrt{3}$ then find the value $\tan 15^\circ \cot 75^\circ + \tan 75^\circ \cot 15^\circ$.

यदि $\tan 15^\circ = 2 - \sqrt{3}$ है, तो $\tan 15^\circ \cot 75^\circ + \tan 75^\circ \cot 15^\circ$ का मान ज्ञात कीजिए।

- (a) 14 (b) 12
(c) 10 (d) 8

31. If $A = \tan 11^\circ \tan 29^\circ$ and $B = 2\cot 61^\circ \cot 79^\circ$ then:

यदि $A = \tan 11^\circ \tan 29^\circ$ और $B = 2\cot 61^\circ \cot 79^\circ$ तब:

- (a) $A = 2B$ (b) $A = -2B$
(c) $2A = B$ (d) $2A = -B$

32. If $\cos \theta + \sec \theta = k$, then what is the value of $\sin^2 \theta - \tan^2 \theta$?

यदि $\cos \theta + \sec \theta = k$ है, तो $\sin^2 \theta - \tan^2 \theta$ का मान क्या है?

- (a) $4 - k$ (b) $4 - k^2$
(c) $k^2 - 4$ (d) $k^2 + 2$

33. If $\theta \leq \alpha, \beta \leq 90^\circ$ such that $\cos(\alpha - \beta) = 1$, then what is $\sin \alpha - \sin \beta + \cos \alpha - \cos \beta$ equal to?

यदि $\theta \leq \alpha, \beta \leq 90^\circ$ ऐसा है कि $\cos(\alpha - \beta) = 1$, तो $\sin \alpha - \sin \beta + \cos \alpha - \cos \beta$ किसके बराबर है?

- (a) -1 (b) 0
(c) 1 (d) 2

34. What is the expression

$(\sin^4 x - \cos^4 x + 1) \operatorname{cosec}^2 x$ equal to?

$(\sin^4 x - \cos^4 x + 1) \operatorname{cosec}^2 x$ अभिव्यक्ति किसके बराबर है?

- (a) 1 (b) 2
(c) 0 (d) -1

35. If $x + y = 90^\circ$, then what is

$\sqrt{\cos x \operatorname{cosec} y - \cos x \sin y}$ equal to?

यदि $x + y = 90^\circ$, तो $\sqrt{\cos x \operatorname{cosec} y - \cos x \sin y}$ किसके बराबर है?

- (a) $\cos x$ (b) $\sin x$
(c) $\sqrt{\cos x}$ (d) $\sqrt{\sin x}$

36. If $\tan^2 y \operatorname{cosec}^2 x - 1 = \tan^2 y$; then which one of the following is correct?

यदि $\tan^2 y \operatorname{cosec}^2 x - 1 = \tan^2 y$; तो निम्न में से कौन सा सही है?

- (a) $x - y = 0$ (b) $x = 2y$
(c) $y = 2x$ (d) $x - y = 1^\circ$

37. For what value of θ is $(\sin \theta + \operatorname{cosec} \theta) = 2.5$, where $0 < \theta < 90^\circ$?

θ के किस मान के लिए $(\sin \theta + \operatorname{cosec} \theta) = 2.5$ है, जहाँ $0 < \theta < 90^\circ$ है।

- (a) 30° (b) 45°
(c) 60° (d) 90°

Level -02

38. Evaluate : $\cos^2 45^\circ - \sin^2 15^\circ$.

मूल्यांकन करें: $\cos^2 45^\circ - \sin^2 15^\circ$

- (a) $\frac{1}{\sqrt{2}}$ (b) $\frac{\sqrt{2}}{3}$
(c) $\frac{\sqrt{3}}{4}$ (d) $\sqrt{4}$

39. The expression $\frac{\tan 57^\circ + \cot 37^\circ}{\tan 33^\circ + \cot 53^\circ}$ is equal to?

$\frac{\tan 57^\circ + \cot 37^\circ}{\tan 33^\circ + \cot 53^\circ}$ व्यंजक के बराबर होगा?

- (a) $\tan 33^\circ \cot 57^\circ$ (b) $\tan 57^\circ \cot 37^\circ$
(c) $\tan 33^\circ \cot 53^\circ$ (d) $\tan 53^\circ \cot 37^\circ$

40. Evaluate : $(\cot^4 \theta - \operatorname{Cosec}^4 \theta + \cot^2 \theta + \operatorname{Cosec}^2 \theta)$

मूल्यांकन करें: $(\cot^4 \theta - \operatorname{Cosec}^4 \theta + \cot^2 \theta + \operatorname{Cosec}^2 \theta)$

- (a) 1 (b) 0
(c) -1 (d) 2

41. If $x = a \cos^3 \theta$ and $y = b \sin^3 \theta$, then $\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{b}\right)^{\frac{2}{3}} = ?$
- यदि $x = a \cos^3 \theta$ और $y = b \sin^3 \theta$, तो $\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{b}\right)^{\frac{2}{3}} = ?$
- (a) 1 (b) 0
(c) 2 (d) 4
42. Find the value of $\sin^2 10^\circ + \sin^2 20^\circ + \sin^2 30^\circ + \dots + \sin^2 80^\circ$
 $\sin^2 10^\circ + \sin^2 20^\circ + \sin^2 30^\circ + \dots + \sin^2 80^\circ$
का मान ज्ञात कीजिए?
- (a) 2 (b) 3
(c) 1 (d) 4
43. If $\sin 21^\circ = \frac{x}{y}$, then $\sec 21^\circ - \sin 69^\circ$ is equal to
- यदि $\sin 21^\circ = \frac{x}{y}$, तो $\sec 21^\circ - \sin 69^\circ$ किसके बराबर है?
- (a) $\frac{x^2}{y\sqrt{(y^2 - x^2)}}$ (b) $\frac{y^2}{y\sqrt{(y^2 - x^2)}}$
(c) $\frac{x^2}{y\sqrt{(x^2 - y^2)}}$ (d) $\frac{y^2}{x\sqrt{(x^2 - y^2)}}$
44. In $\triangle ABC$ $\angle A, \angle B, \angle C$ are angles then evaluate:
 $\sin 2A + \sin 2B + \sin 2C$
 $\triangle ABC$ में $\angle A, \angle B, \angle C$ कोण हैं तो मूल्यांकन करें:
 $\sin 2A + \sin 2B + \sin 2C$
- (a) $4 \sin A \sin B \sin C$
(b) $4 \sin A \cos B \sin C$
(c) $4 \sin A \sin B \cos C$
(d) $4 \cos A \cos B \cos C$
45. If $\sin \frac{\pi x}{2} = x^2 - 2x + 2$, then the value of x is
- यदि $\frac{\pi x}{2} = x^2 - 2x + 2$ तो x का मान ज्ञात करें।
- (a) 0 (b) 1
(c) -1 (d) None of these
46. If $\cos A, \sin A, \cot A$ are in geometric progression, then the value of $\tan^6 A - \tan^2 A$ is:
- यदि $\cos A, \sin A, \cot A$ ज्यामितीय प्रगति में हैं, तो $\tan^6 A - \tan^2 A$ का मान ज्ञात कीजिए।

- (a) $\frac{1}{2}$ (b) 3
(c) $\frac{1}{3}$ (d) 1
47. The value of expression $(1 + \sec 22^\circ + \cot 68^\circ)(1 - \operatorname{cosec} 22^\circ + \tan 68^\circ)$ is:
व्यंजक $(1 + \sec 22^\circ + \cot 68^\circ)(1 - \operatorname{cosec} 22^\circ + \tan 68^\circ)$ का मान है
- (a) 0 (b) -1
(c) 1 (d) 2
48. Find the value of expression:-
व्यंजक का मान ज्ञात कीजिए।
- $\frac{\tan A}{1 - \cot A} + \frac{\cot A}{1 - \tan A} - \frac{2}{\sin 2A}$
- (a) -1 (b) 0
(c) 1 (d) 2
49. If $\sec(\theta + \alpha) + \sec(\theta - \alpha) = 2 \sec \theta$ [$\alpha \neq 0$], Then the value of $\sin^2 \theta = ?$
यदि $\sec(\theta + \alpha) + \sec(\theta - \alpha) = 2 \sec \theta$ [$\alpha \neq 0$] है, तो $\sin^2 \theta = ?$
- (a) $-\sec \alpha$ (b) $-\sec \alpha$
(c) $-\cos \alpha$ (d) $-\sin \alpha \cos \alpha$
50. Find the value of $8 \cos 10^\circ \cos 20^\circ \cos 40^\circ$
 $8 \cos 10^\circ \cos 20^\circ \cos 40^\circ$ का मान ज्ञात कीजिए।
- (a) $\sin 10^\circ$ (b) $\cos 10^\circ$
(c) 1 (d) $4 \cos 10^\circ + \sqrt{3}$
51. For all $\alpha_i \{i = 1, 2, 3, \dots, 20\}$, $0 \leq \alpha \leq 90^\circ$. Given that $\sin \alpha_1 + \sin \alpha_2 + \dots + \sin \alpha_{20} = 20$ Then value (in degree) of $(\alpha_1 + \alpha_2 + \alpha_3 + \dots + \alpha_{20})$
सभी के लिए $\alpha_i \{i = 1, 2, 3, \dots, 20\}$, $0 \leq \alpha \leq 90^\circ$ दिया है तो $\sin \alpha_1 + \sin \alpha_2 + \dots + \sin \alpha_{20} = 20$ $(\alpha_1 + \alpha_2 + \alpha_3 + \dots + \alpha_{20})$ का मान डिग्री में ज्ञात कीजिए।
- (a) 1800° (b) 900°
(c) 0° (d) 20°
52. If α, β are acute angle and $\cos 2\alpha = \frac{3 \cos 2\beta - 1}{3 - \cos 2\beta}$
then the value of $\tan \alpha \cot \beta$ is:
यदि α, β न्यूनकोण है और $\cos 2\alpha = \frac{3 \cos 2\beta - 1}{3 - \cos 2\beta}$ तो $\tan \alpha \cot \beta$ का मान ज्ञात कीजिए।

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

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

53. If $\sin\theta = a\cos\phi$ and $\cos\theta = b\sin\phi$ then the value of $(a^2 - 1) \cot^2\phi + (1 - b^2) \cot^2\theta$ is equal to.

यदि $\sin\theta = a\cos\phi$ और $\cos\theta = b\sin\phi$ है, तो $(a^2 - 1) \cot^2\phi + (1 - b^2) \cot^2\theta$ का मान बराबर है।

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

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

54. Find the value/का मान ज्ञात कीजिए।

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

(a) $\sec\theta + \tan\theta$ (b) $1 - \sin\theta$

(c) $1 + \sin\theta$ (d) None

55. If $x = \frac{2\sin\theta}{(1 + \cos\theta + \sin\theta)}$ then the value of

$$\frac{1 - \cos\theta + \sin\theta}{(1 + \sin\theta)}$$
 is:

यदि $x = \frac{2\sin\theta}{(1 + \cos\theta + \sin\theta)}$ है, तो $\frac{1 - \cos\theta + \sin\theta}{(1 + \sin\theta)}$ का मान ज्ञात कीजिए।

(a) $\frac{x}{(1+x)}$ (b) x

(c) $\frac{1}{x}$ (d) $\frac{(1+x)}{x}$

56. In $\triangle ABC$, If $\cos B = \frac{\sin A}{2\sin C}$, then the triangle is

$\triangle ABC$ में यदि $\cos B = \frac{\sin A}{2\sin C}$, तो त्रिभुज है।

(a) isosceles triangle

(b) Equilateral "

(c) Right angle "

(d) Scalene triangle

57. If $\sin x + \sin y = a$ and $\cos x + \cos y = b$ then $\tan\left(\frac{x+y}{2}\right)$ is:

यदि $\sin x + \sin y = a$ और $\cos x + \cos y = b$ है, तो

$\tan\left(\frac{x+y}{2}\right)$ का मान ज्ञात कीजिए।

(a) $\frac{4}{a^2 + b^2}$

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

(c) $\frac{a}{b}$

(d) $\frac{4}{a^2 - b^2}$

58. If $0^\circ < x < 45^\circ$ and $45^\circ < y < 90^\circ$, Then which one of the following is correct?

यदि $0^\circ < x < 45^\circ$ और $45^\circ < y < 90^\circ$ तो निम्नलिखित में से कौन-सा सही है?

(a) $\sin x = \sin y$

(b) $\sin x < \sin y$

(c) $\sin x \neq \sin y$

(d) $\sin x \leq \sin y$

59. In a right angle triangle XYZ, right angle at Y, if $XY = 2\sqrt{6}$ and $XZ - YZ = 2$ then $\sec x + \tan x$ is.

एक समकोण त्रिभुज XYZ में, Y पर समकोण यदि $XY = 2\sqrt{6}$ और $XZ - YZ = 2$ तो $\sec x + \tan x$ है।

(a) $\frac{1}{\sqrt{6}}$

(b) $\sqrt{6}$

(c) $2\sqrt{6}$

(d) $\frac{\sqrt{6}}{2}$

60. ABCD is a rectangle of which AC is a diagonal. The value of $(\tan^2 \angle CAD + 1) \sin^2 \angle BAC$

ABCD एक आयत है जिसका AC एक विकर्ण है। $(\tan^2 \angle CAD + 1) \sin^2 \angle BAC$ का मान है।

(a) 2

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

(c) 1

(d) 0

61. If $\sin \alpha = \frac{4}{5}$ and $\cos \beta = \frac{5}{13}$ then $\cos \frac{(\alpha - \beta)}{2}$

यदि $\sin \alpha = \frac{4}{5}$ और $\cos \beta = \frac{5}{13}$ तो $\cos \frac{(\alpha - \beta)}{2}$

(a) $\frac{4}{\sqrt{65}}$

(b) $\frac{63}{65}$

(c) $\frac{4}{\sqrt{65}}$

(d) $\frac{8}{\sqrt{65}}$

62. If $x\sin^3\theta + y\cos^3\theta = \sin\theta \cos\theta$ and $x\sin\theta - y\cos\theta = 0$, then the value of $(x^2 + y^2)$.

यदि $x\sin^3\theta + y\cos^3\theta = \sin\theta \cos\theta$ और $x\sin\theta - y\cos\theta = 0$ है, तो $(x^2 + y^2)$ का मान ज्ञात कीजिए।

(a) 1

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

(c) $\frac{3}{2}$

(d) 2

63. If $(a^2 - b^2) \sin \theta + 2ab \cos \theta = a^2 + b^2$ then $\tan \theta = ?$

यदि $(a^2 - b^2) \sin \theta + 2ab \cos \theta = a^2 + b^2$ तब $\tan \theta = ?$

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

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

64. If x, y are acute angles $0 < (x + y) < 90^\circ$ and $\sin(2x - 20) = \cos(2y + 20)$ then the value of $\tan(x + y)$

यदि x, y न्यूनकोण हैं $0 < (x + y) < 90^\circ$ और $\sin(2x - 20) = \cos(2y + 20)$ तो $\tan(x + y)$ का मान ज्ञात कीजिए।

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

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

65. If $\frac{2\sin x}{(1 + \cos x + \sin x)} = t$ then $\frac{1 - \cos x + \sin x}{(1 + \sin x)}$ can be written as.

यदि $\frac{2\sin x}{(1 + \cos x + \sin x)} = t$ है, तो $\frac{1 - \cos x + \sin x}{(1 + \sin x)}$ एक के रूप में लिखा जाएगा।

(a) $\frac{1}{t}$ (b) t
(c) $\sqrt{t} \sec x$ (d) $\frac{t}{\sin x}$

66. $\sin 75^\circ + \sin 15^\circ$ can be expressed as.

$\sin 75^\circ + \sin 15^\circ$ के रूप में व्यक्त किया जा सकता है।

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

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

67. If $3\sin x + 4\cos x + r$ is always greater than or equal to 10. Then what is the smallest value 'r' can take?

यदि $3\sin x + 4\cos x + r$ हमेशा 10 से अधिक या उसके बराबर है, तो 'r' का सबसे छोटा मान क्या लिया जा सकता है?

(a) 5 (b) -5
(c) 4 (d) 3

68. If $x = \operatorname{cosec} \theta - \cos \theta$ and $y = \sec \theta - \cos \theta$ then the relation between x and y is.

यदि $x = \operatorname{cosec} \theta - \cos \theta$ और $y = \sec \theta - \cos \theta$ तो x और y के बीच संबंध है।

(a) $x^2 + y^2 + 3 = 1$
(b) $x^2 y^2 (x^2 + y^2 + 3) = 1$
(c) $x^2 (x^2 + y^2 - 5) = 1$
(d) $y^2 (x^2 + y^2 - 5) = 1$

69. $\tan x = a$ and $\tan y = b$

What is the value of $(\tan x + \tan y)(1 - \cot x \cot y) + (\cot x + \cot y)(1 - \tan x \tan y)$ equal to?

$\tan x = a$ और $\tan y = b$

$(\tan x + \tan y)(1 - \cot x \cot y) + (\cot x + \cot y)(1 - \tan x \tan y)$ किसके बराबर है?

(a) $\frac{a-b}{a+b}$ (b) $\frac{ab-1}{ab}$
(c) 0 (d) 1

70. A rectangle is 48 cm long and 14 cm wide. If the diagonal makes an angle θ with the longer side, then what is $(\sec \theta + \operatorname{cosec} \theta)$ equal to?

एक आयत 48 सेमी लंबा और 14 सेमी चौड़ा है। यदि विकर्ण बड़ी भुजा से θ कोण बनाता है, तो $(\sec \theta + \operatorname{cosec} \theta)$ किसके बराबर है?

(a) $\frac{775}{168}$ (b) 2
(c) $\frac{771}{107}$ (d) $\frac{770}{107}$

71. If $\operatorname{cosec} \theta - \sin \theta = m$ and $\sec \theta - \cos \theta = n$, then what is $m^{\frac{4}{3}} n^{\frac{2}{3}} + m^{\frac{2}{3}} n^{\frac{4}{3}}$ equal to?

यदि $\operatorname{cosec} \theta - \sin \theta = m$ और $\sec \theta - \cos \theta = n$, तो

$m^{\frac{4}{3}} n^{\frac{2}{3}} + m^{\frac{2}{3}} n^{\frac{4}{3}}$ किसके बराबर है?

(a) 0 (b) 1
(c) $\frac{1}{2}$ (d) $\frac{1}{4}$

72. If $\sin \theta + \cos \theta = \sqrt{2}$ then what is $\sin^6 \theta + \cos^6 \theta + 6\sin^2 \theta \cos^2 \theta$ equal to?

यदि $\sin \theta + \cos \theta = \sqrt{2}$ तो $\sin^6 \theta + \cos^6 \theta + 6\sin^2 \theta \cos^2 \theta$ किसके बराबर है?

(a) $\frac{1}{4}$ (b) $\frac{3}{4}$
(c) 1 (d) $\frac{7}{4}$

73. ABC is a triangle right angled at B and AB : BC = 3 : 4. What is $\sin A + \sin B + \sin C$ equal to?
- ABC एक त्रिभुज है जिसका कोण B समकोण है और AB : BC = 3 : 4 है। $\sin A + \sin B + \sin C$ किसके बराबर है?
- (a) 2 (b) $\frac{11}{5}$
(c) $\frac{12}{5}$ (d) 3
74. If $x = a \cos \theta$ and $y = b \cot \theta$, then $(ax^{-1} - by^{-1})(ax^{-1} + by^{-1})$ is equal to
- यदि $x = a \cos \theta$ और $y = b \cot \theta$, तो $(ax^{-1} - by^{-1})(ax^{-1} + by^{-1})$ के बराबर है
- (a) 0 (b) 1
(c) $\tan^2 \theta$ (d) $\sin^2 \theta$
75. If θ is an acute angle and $\sin \theta \cos \theta = 2 \cos^3 \theta - 1.5 \cos \theta$, then what is $\sin \theta$ equal to?
- यदि θ एक न्यूनकोण है और $\sin \theta \cos \theta = 2 \cos^3 \theta - 1.5 \cos \theta$, तो $\sin \theta$ किसके बराबर है?
- (a) $\frac{\sqrt{5}-1}{4}$ (b) $\frac{1-\sqrt{5}}{4}$
(c) $\frac{\sqrt{5}+1}{4}$ (d) $-\frac{(\sqrt{5}+1)}{4}$
76. What is the expression $\frac{\tan x}{1+\sec x} - \frac{\tan x}{1-\sec x}$ equal to?
- $\frac{\tan x}{1+\sec x} - \frac{\tan x}{1-\sec x}$ के बराबर है:
- (a) $\operatorname{cosec} x$ (b) $2 \operatorname{cosec} x$
(c) $2 \sin x$ (d) $2 \cos x$
77. In the given figure, BC = 15 cm and $\sin B = \frac{4}{5}$, what is the value of AB?
- दी गई आकृति में, BC = 15 cm सेमी और $\sin B = \frac{4}{5}$, AB का मान क्या है?
- (a) 25 cm (b) 20 cm
(c) 5 cm (d) 4 cm
78. If $x + y = 90^\circ$ and $\sin x : \sin y = \sqrt{3} : 1$ then what is $x : y$ equal to?

यदि $x + y = 90^\circ$ और $\sin x : \sin y = \sqrt{3} : 1$ तो $x : y$ किसके बराबर है?

- (a) 1 : 1 (b) 1 : 2
(c) 2 : 1 (d) 3 : 2

79. $P = \tan^2 x + \cot^2 x$, then which one of the following is correct?

$P = \tan^2 x + \cot^2 x$, तो निम्नलिखित में से कौन सा सही है?

- (a) $P \leq 2$ (b) $P \geq 2$
(c) $P < 2$ (d) $P > 2$

80. If α is the angle of first quadrant such that $\operatorname{cosec}^4 \alpha = 17 + \cot^4 \alpha$, then what is the value of $\sin \alpha$?

यदि प्रथम चतुर्थांश का कोण α इस प्रकार है कि $\operatorname{cosec}^4 \alpha = 17 + \cot^4 \alpha$, तो $\sin \alpha$ का मान क्या है?

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

- (c) $\frac{1}{9}$ (d) $\frac{1}{16}$

81. If $\tan \theta = \frac{p}{q}$, then what is $\frac{p \sec \theta - q \operatorname{cosec} \theta}{p \sec \theta + q \operatorname{cosec} \theta}$ equal to?

यदि $\tan \theta = \frac{p}{q}$ तो $\frac{p \sec \theta - q \operatorname{cosec} \theta}{p \sec \theta + q \operatorname{cosec} \theta}$ किसके बराबर है?

- (a) $\frac{p-q}{p+q}$ (b) $\frac{q^2-p^2}{q^2+p^2}$

- (c) $\frac{p^2-q^2}{p^2+q^2}$ (d) 1

82. The value of $\operatorname{cosec}^2 \theta - 2 + \sin^2 \theta$ is always

$\operatorname{cosec}^2 \theta - 2 + \sin^2 \theta$ का मान सदैव होता है

- (a) less than zero (b) non-negative
(c) zero (d) 1

83. If α and β are complimentary angles, then what

is $\sqrt{\operatorname{cosec} \alpha \cdot \operatorname{cosec} \beta} \left(\frac{\sin \alpha}{\sin \beta} + \frac{\cos \alpha}{\cos \beta} \right)^{-\frac{1}{2}}$ equal to?

यदि α और β पूरक कोण हैं, तो $\sqrt{\operatorname{cosec} \alpha \cdot \operatorname{cosec} \beta}$

$\left(\frac{\sin \alpha}{\sin \beta} + \frac{\cos \alpha}{\cos \beta} \right)^{-\frac{1}{2}}$ किसके बराबर है?

- (a) 0 (b) 1
(c) 2 (d) None of these

84. $(1-\tan A)^2 + (1+\tan A)^2 + (1-\cot A)^2 + (1+\cot A)^2$ is equal to?/किसके बराबर है?

- (a) $\sin^2 A \cos^2 A$ (b) $\sec^2 A \operatorname{cosec}^2 A$
 (c) $2 \sec^2 A \operatorname{cosec}^2 A$ (d) None of these
85. If $\sec x \cdot \operatorname{cosec} x = 2$ then what is $\tan^n x + \cot^n x$ equal to?

यदि $\sec x \cdot \operatorname{cosec} x = 2$ तो $\tan^n x + \cot^n x$ किसके बराबर है?

- (a) 2 (b) 2^{n+1}
 (c) $2n$ (d) 2^{n-1}
86. What is the value of $\sin x \sqrt{\frac{1}{1+\cos x} + \frac{1}{1-\cos x}}$?

$\sin x \sqrt{\frac{1}{1+\cos x} + \frac{1}{1-\cos x}}$ का मान क्या है?

- (a) $\sqrt{2}$ (b) $2\sqrt{2}$
 (c) $\sqrt{2} \tan x$ (d) 0
87. If $A = \frac{\sin 45^\circ - \sin 30^\circ}{\cos 45^\circ + \cos 60^\circ}$ and $B = \frac{\sec 45^\circ - \tan 45^\circ}{\operatorname{cosec} 45^\circ + \cot 45^\circ}$ then which one of the following is correct?

यदि $A = \frac{\sin 45^\circ - \sin 30^\circ}{\cos 45^\circ + \cos 60^\circ}$ और $B = \frac{\sec 45^\circ - \tan 45^\circ}{\operatorname{cosec} 45^\circ + \cot 45^\circ}$ फिर निम्न में से कौन सा सही है?

- (a) $A = B$ (b) $A > B > 0$
 (c) $A < B$ (d) $B < A < 0$

Level-03

88. If $\operatorname{cosec} \theta - \sin \theta = P^3$ and $\sec \theta - \cos \theta = q^3$ then what is the value of $\tan \theta$?

यदि $\operatorname{cosec} \theta - \sin \theta = P^3$ और $\sec \theta - \cos \theta = q^3$ है तो $\tan \theta$ का मान क्या है?

- (a) $\frac{p}{q}$ (b) $\frac{q}{p}$
 (c) pq (d) $p^2 q^2$
89. If $\sin x + \cos x = C$ then $\sin^6 x + \cos^6 x$ is equal to
 अगर $\sin x + \cos x = C$ तो $\sin^6 x + \cos^6 x$ के बराबर है

- (a) $\frac{1+6C^2-3C^4}{16}$ (b) $\frac{1+6C^2-3C^4}{4}$
 (c) $\frac{1+6C^2+3C^4}{16}$ (d) $\frac{1+6C^2+3C^4}{4}$

90. $\frac{\cos x}{1+\operatorname{cosec} x} + \frac{\cos x}{\operatorname{cosec} x-1} = 2$, then which one of the following is one of the values of x ?

$\frac{\cos x}{1+\operatorname{cosec} x} + \frac{\cos x}{\operatorname{cosec} x-1} = 2$, तो निम्नलिखित में से कौन सा x के मानों में से एक है?

- (a) $\frac{\pi}{2}$ (b) $\frac{\pi}{3}$
 (c) $\frac{\pi}{4}$ (d) $\frac{\pi}{6}$

91. The difference of the two angles in degree measure is 1 and their sum in circular measure is also 1. What are the angles in circular measure?

दो कोणों का अंशीय माप में अंतर 1 होता है और वृत्तीय माप में उनका योग भी 1 होता है। वृत्तीय माप में कौन से कोण होते हैं?

- (a) $\left(\frac{1}{2} - \frac{\pi}{360^\circ}\right), \left(\frac{1}{2} + \frac{\pi}{360^\circ}\right)$
 (b) $\left(\frac{1}{2} - \frac{90}{\pi}\right), \left(\frac{1}{2} + \frac{90}{\pi}\right)$
 (c) $\left(\frac{1}{2} - \frac{\pi}{180^\circ}\right), \left(\frac{1}{2} + \frac{\pi}{180^\circ}\right)$
 (d) None of these

92. If $\triangle ABC$ is a right angled triangle at C and having u units, v units and w units as the length of its sides, opposite to be vertices A, B and C respectively, then what is $\tan A + \tan B$ equal to?

यदि $\triangle ABC$, C पर एक समकोण त्रिभुज है और इसकी भुजाओं की लंबाई के रूप में u इकाइयाँ, v इकाइयाँ और w इकाइयाँ हैं, जो क्रमशः शीर्ष A, B और C के विपरीत हैं, तो $\tan A + \tan B$ किसके बराबर है?

- (a) $\frac{u^2}{uv}$ (b) 1
 (c) $u + v$ (d) $\frac{w^2}{uv}$

93. If $\tan A = \frac{1-\cos B}{\sin B}$ then what is $\frac{2 \tan A}{1-\tan^2 A}$ equal to?

यदि $\tan A = \frac{1-\cos B}{\sin B}$ तो $\frac{2 \tan A}{1-\tan^2 A}$ किसके बराबर है?

- (a) $\frac{\tan B}{2}$ (b) $2 \tan B$
 (c) $\tan B$ (d) $4 \tan B$

94. If $a^2 = \frac{1+2 \sin \theta \cos \theta}{1-2 \sin \theta \cos \theta}$, then what is the value of $\frac{a+1}{a-1}$?

यदि $a^2 = \frac{1+2 \sin \theta \cos \theta}{1-2 \sin \theta \cos \theta}$ है, तो $\frac{a+1}{a-1}$ का मान क्या है?

- (a) $\sec \theta$ (b) 1
 (c) 0 (d) $\tan \theta$

95. If $\sin A + \cos A = P$ and $\sin^3 A + \cos^3 A = q$, then which one of the following is correct?

यदि $\sin A + \cos A = P$ और $\sin^3 A + \cos^3 A = q$, तो निम्नलिखित में से कौन सा सही है?

- (a) $p^3 - 3p + q = 0$ (b) $q^3 - 3q + 2p = 0$
(c) $p^3 - 3p + 2q = 0$ (d) $p^3 + 3p + 2q = 0$

96. If $x = \frac{\sec^2 \theta - \tan \theta}{\sec^2 \theta + \tan \theta}$, then which one of the following is correct?

यदि $x = \frac{\sec^2 \theta - \tan \theta}{\sec^2 \theta + \tan \theta}$ है, तो निम्न में से कौन सा सही है?

(a) $\frac{1}{3} < x < 3$

(b) $x + \left[\frac{1}{3}, 3\right]$

(c) $-3 < x < -\frac{1}{3}$

(d) $\frac{1}{3} \leq x \leq 3$

97. If $\cot \theta (1 + \sin \theta) = 4m$ and $\cot \theta (1 - \sin \theta) = 4n$, then which of the following is correct?

यदि $\cot \theta (1 + \sin \theta) = 4m$ और $\cot \theta (1 - \sin \theta) = 4n$, तो निम्न में से कौन सा सही है?

- (a) $(m^2 + n^2)^2 = mn$
(b) $(m^2 - n^2)^2 = mn$
(c) $(m^2 - n^2)^2 = m^2 n^2$
(d) $(m^2 + n^2)^2 = m^2 n^2$

98. If $\frac{x}{a} - \frac{y \tan \theta}{b} = 1$ and $\frac{x \tan \theta}{a} + \frac{y}{b} = 1$ then the value of $\frac{x^2}{a^2} + \frac{y^2}{b^2}$ is.

यदि $\frac{x}{a} - \frac{y \tan \theta}{b} = 1$ और $\frac{x \tan \theta}{a} + \frac{y}{b} = 1$ हो, तो

$\frac{x^2}{a^2} + \frac{y^2}{b^2}$ का मान है।

- (a) $2 \sec^2 \theta$ (b) $\sec^2 \theta$
(c) $\cos^2 \theta$ (d) $2 \cos^2 \theta$

99. If $p = \cot \theta + \tan \theta$ and $q = \sec \theta - \cos \theta$ then

$(p^2 q)^{\frac{2}{3}} - (q^2 p)^{\frac{2}{3}}$ is equal to?

यदि $p = \cot \theta + \tan \theta$ और $q = \sec \theta - \cos \theta$ तो

$(p^2 q)^{\frac{2}{3}} - (q^2 p)^{\frac{2}{3}}$ किसके बराबर है?

- (a) 0 (b) 1
(c) 2 (d) 3

100. If A, B and C are interior angles of a triangle

ABC then $\sin\left(\frac{B+C}{2}\right)$ will be equal to.

यदि A, B और C एक त्रिभुज ABC के आंतरिक कोण हैं तो $\sin\left(\frac{B+C}{2}\right)$ बराबर होगा।

- (a) $\cos A$ (b) $\cos 2A$
(c) $\cos \frac{3A}{2}$ (d) $\cos \frac{A}{2}$

Answer Key

1.(b)	2.(c)	3.(c)	4.(c)	5.(b)	6.(c)	7.(d)	8.(c)	9.(b)	10.(b)
11.(b)	12.(d)	13.(c)	14.(b)	15.(b)	16.(a)	17.(b)	18.(c)	19.(a)	20.(c)
21.(a)	22.(d)	23.(b)	24.(a)	25.(c)	26.(c)	27.(c)	28.(a)	29.(d)	30.(a)
31.(c)	32.(b)	33.(b)	34.(b)	35.(b)	36.(a)	37.(a)	38.(c)	39.(b)	40.(b)
41.(a)	42.(d)	43.(a)	44.(a)	45.(b)	46.(d)	47.(d)	48.(c)	49.(c)	50.(d)
51.(a)	52.(d)	53.(d)	54.(b)	55.(b)	56.(a)	57.(c)	58.(b)	59.(b)	60.(c)
61.(d)	62.(a)	63.(b)	64.(d)	65.(b)	66.(d)	67.(a)	68.(b)	69.(c)	70.(a)
71.(b)	72.(d)	73.(c)	74.(b)	75.(a)	76.(b)	77.(a)	78.(c)	79.(b)	80.(a)
81.(c)	82.(b)	83.(b)	84.(c)	85.(a)	86.(a)	87.(a)	88.(b)	89.(b)	90.(c)
91.(a)	92.(d)	93.(c)	94.(d)	95.(c)	96.(d)	97.(b)	98.(d)	99.(b)	100.(d)

SOLUTIONS

1. (b)

$$\frac{\tan 69^\circ + \tan 66^\circ}{1 - \tan 69^\circ \tan 66^\circ}$$

$$\begin{aligned}\tan(69^\circ + 66^\circ) &= \tan 135^\circ \\ &= \tan(90^\circ + 45^\circ) = -\cot 45^\circ = -1\end{aligned}$$

2. (c)

$$3 \sin 15^\circ - 4 \sin^3 15^\circ$$

$$\text{Formula:- } \sin 3\theta = 3\sin\theta - 4\sin^3\theta$$

$$\sin(3 \times 15^\circ) = \sin 45^\circ = \frac{1}{\sqrt{2}}$$

3. (a)

$$\sin 79^\circ \cos 19^\circ - \cos 79^\circ \sin 19^\circ$$

$$\text{Formula:- } \sin(A - B) = \sin A \cos B - \cos A \sin B$$

$$\sin(79^\circ - 19^\circ) = \sin 60^\circ = \frac{\sqrt{3}}{2}$$

4. (c)

$$\cos 70^\circ \cos 40^\circ + \sin 70^\circ \sin 40^\circ$$

$$\text{Formula:- } \cos(A - B) = \cos A \cos B + \sin A \sin B$$

$$\cos(70^\circ - 40^\circ) = \cos 30^\circ = \frac{\sqrt{3}}{2}$$

5. (b)

$$2\cos^2\theta + \sin\theta - 2 = 0$$

$$2(1 - \sin^2\theta) + \sin\theta - 2 = 0$$

$$\Rightarrow 2 - 2\sin^2\theta + \sin\theta - 2 = 0$$

$$2\sin^2\theta - \sin\theta = 0$$

$$\sin\theta(2\sin\theta - 1) = 0$$

$$2\sin\theta - 1 = 0$$

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

$$\text{So, } \theta = \frac{\pi}{6}$$

6. (c)

$$7\sin^2\theta + 3\cos^2\theta = 4$$

$$7\sin^2\theta + 3 - 3\sin^2\theta = 4$$

$$4\sin^2\theta = 1$$

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

$$\theta = 30^\circ$$

$$\text{So, } \tan 30^\circ = \frac{1}{\sqrt{3}}$$

7. (d)

$$\frac{\cos 60^\circ}{\sin 30^\circ} + \frac{\cos 65^\circ \operatorname{cosec} 25^\circ}{\tan 10^\circ \tan 30^\circ \tan 45^\circ \tan 60^\circ \tan 80^\circ}$$

$$\frac{\cos 60^\circ}{\sin(90^\circ - 60^\circ)} + \frac{\cos(90^\circ - 25^\circ) \operatorname{cosec} 25^\circ}{\tan 10^\circ \tan(90^\circ - 10^\circ) \tan 45^\circ \tan(90^\circ - 30^\circ) \tan 30^\circ}$$

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

8. (c)

$$\cos^2\theta \left\{ \sqrt{\frac{1+\sin\theta}{1-\sin\theta}} + \sqrt{\frac{1-\sin\theta}{1+\sin\theta}} \right\}$$

$$\cos^2\theta \left\{ \frac{1+\sin\theta+1-\sin\theta}{\sqrt{1-\sin^2\theta}} \right\} = \cos^2\theta \times \frac{2}{\cos\theta}$$

$$= 2\cos\theta$$

9. (b)

$$\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = ?$$

We know,

$$\therefore \sin\theta \sin(60^\circ - \theta) \sin(60^\circ + \theta) = \frac{1}{4} \sin 3\theta$$

Then,

$$\Rightarrow \sin 30^\circ [\sin 10^\circ \sin 50^\circ \sin 70^\circ]$$

$$\Rightarrow \frac{1}{2} \left[\frac{1}{4} \times \sin 3 \times 10^\circ \right]$$

$$\Rightarrow \frac{1}{8} \times \sin 30^\circ = \frac{1}{16}$$

10. (b)

$$\sin 20^\circ \sin 40^\circ \sin 60^\circ \sin 80^\circ$$

We know,

$$\therefore \sin\theta \sin 2\theta \sin 4\theta = \frac{1}{4} \sin 3\theta$$

Then,

$$\sin 60^\circ \sin 20^\circ \sin 40^\circ \sin 80^\circ$$

$$\frac{\sqrt{3}}{2} \times \frac{1}{4} \times \sin(3 \times 20^\circ)$$

$$\frac{\sqrt{3}}{2} \times \frac{1}{4} \times \frac{\sqrt{3}}{2} = \frac{3}{16}$$

11. (b)

$$\tan 20^\circ \tan 40^\circ \tan 80^\circ$$

We know,

$$\therefore \tan \theta \tan 2\theta \tan 4\theta = \tan 3\theta$$

Then,

$$\tan(3 \times 20) = \tan 60^\circ = \sqrt{3}$$

12. (d)

$$\frac{1}{\cos 80^\circ} \left[\cos 10^\circ \cos 20^\circ \cos 40^\circ \cos 80^\circ \right]$$

We know,

$$\frac{1}{3} \cos 3\theta = 0.20.40$$

$$\frac{\cos 10^\circ}{\cos 80^\circ} \times \frac{1}{4} \cos(3 \times 20^\circ)$$

$$\cot 10^\circ \times \frac{1}{4} \cos 60^\circ$$

$$\text{Where: } \cos 80^\circ = \sin 10^\circ$$

$$\frac{1}{8} \cot 10^\circ$$

13. (c)

$$1 - \sin 10^\circ \sin 50^\circ \sin 70^\circ$$

$$\text{Formula: } -\frac{1}{4} \sin 3\theta = \sin \theta \cdot \sin(60 - \theta) \cdot \sin(60 + \theta)$$

$$1 - \sin(60^\circ - 10^\circ) \sin 10^\circ \sin(60^\circ + 10^\circ)$$

$$1 - \frac{1}{4} \sin(3 \times 10^\circ)$$

$$1 - \frac{1}{8} = \frac{7}{8}$$

14. (b)

$$\cos 15^\circ \cos 45^\circ \cos 75^\circ$$

$$\text{Formula: } -\frac{1}{4} \cos 3\theta = \cos \theta \cdot \cos(60 - \theta) \cdot \cos(60 + \theta)$$

$$\cos(60^\circ - 15^\circ) \cos 15^\circ \cos(60^\circ + 15^\circ)$$

$$\frac{1}{4} \cos(3 \times 15^\circ) = \frac{1}{4} \times \frac{1}{\sqrt{2}} = \frac{1}{4\sqrt{2}}$$

15. (b)

$$\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ \cos 90^\circ$$

Where,

$$\cos 90^\circ = 0$$

$$\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ \times 0 = 0$$

16. (a)

ATQ,

$$\alpha + \beta = 90^\circ$$

$$(1 - \sin^2 \alpha)(1 - \cos^2 \alpha)(1 + \cot^2 \beta)(1 + \tan^2 \beta)$$

$$\cos^2 \alpha \sin^2 \alpha \operatorname{cosec}^2 \beta \sec^2 \beta$$

$$\cos^2 \alpha \sin^2 \alpha \operatorname{cosec}^2 (90^\circ - \alpha) \cdot \sec^2 (90^\circ - \alpha)$$

$$\cos^2 \alpha \sin^2 \alpha \sec^2 \alpha \operatorname{cosec}^2 \alpha = 1$$

17. (b)

$$\tan 4^\circ \tan 43^\circ \tan 47^\circ \tan 86^\circ$$

$$\tan 4^\circ \tan 86^\circ \tan 43^\circ \tan 47^\circ$$

$$\tan 4^\circ \tan(90^\circ - 4^\circ) \tan 43^\circ \tan(90^\circ - 43^\circ)$$

$$\tan 4^\circ \times \cot 4^\circ \times \tan 43^\circ \times \cot 43^\circ$$

$$1 \times 1 = 1$$



SMART APPROACH:-

$$\text{If } A + B = 90$$

Then,

$$\Rightarrow \tan A \cdot \tan B = 1$$

$$\Rightarrow \cot A \cdot \cot B = 1$$

18. (c)

$$\cos(36^\circ - A) \cos(36^\circ + A) + \cos(54^\circ - A) \cos(54^\circ + A)$$

 $\Rightarrow$ Using,

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

$$\Rightarrow \cos^2 36^\circ - \sin^2 A + \cos^2 54^\circ - \sin^2 A$$

$$\Rightarrow \cos^2 36^\circ - \sin^2 A + \sin^2 36^\circ - \sin^2 A$$

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

$$\Rightarrow \cos 2A$$

$$\text{Where: } \cos 2\theta = 1 - 2\sin^2 A$$

19. (a)

ATQ,

$$\sec \alpha = \operatorname{cosec} \beta$$

$$\text{If we take } \alpha = \beta = 45^\circ$$

Then,

$$\sec 45^\circ = \operatorname{cosec} 45^\circ \rightarrow \sqrt{2} = \sqrt{2} \text{ verify}$$

$$\cos^2 (\alpha + \beta) = \cos^2 90^\circ = 0$$

20. (c)

ATQ,

$$7\sin^2 \theta + 3\cos^2 \theta = 4$$

Use option (c)

$$\text{Where: } \theta = \frac{\pi}{6}$$

$$7 \times \frac{1}{4} + 3 \times \frac{3}{4} = 4 \text{ verify}$$

So, option (c)

21. (a)

$$\frac{5}{\sec^2\theta} + \frac{2}{1+\cot^2\theta} + 3\sin^2\theta$$

$$5\cos^2\theta + 2\sin^2\theta + 3\sin^2\theta$$

$$5\cos^2\theta + 5\sin^2\theta$$

$$5 \times 1 = 5$$

22. (d)

ATQ,

$$A + B = 90^\circ$$

$$\text{Put } A = 45^\circ \text{ \& } B = 45^\circ$$

Then,

$$\sec^2 A + \sec^2 B - \sec^2 A \sec^2 B$$

$$2 + 2 - 2 \times 2 = 4 - 4 = 0$$

23. (b)

$$0^\circ < \theta < 90^\circ \text{ (}\sin\theta + \cos\theta\text{)}$$

$$\text{Put } \theta = 45^\circ$$

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

$$\frac{2}{\sqrt{2}} = \sqrt{2} = 1.414$$

greater than 1

24. (a)

$$\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = \frac{5}{3}$$

$$\Rightarrow 3\sec\theta + 3\tan\theta = 5\sec\theta - 5\tan\theta$$

$$2\sec\theta = 8\tan\theta$$

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

25. (c)

Rationalization

$$\frac{\sqrt{(\sec\theta - 1)} \times \sqrt{(\sec\theta - 1)}}{\sqrt{(\sec\theta + 1)} \times \sqrt{(\sec\theta - 1)}}$$

$$\frac{\sqrt{(\sec\theta - 1)^2}}{\sec^2\theta - 1} = \frac{(\sec\theta - 1)}{\tan\theta} = \frac{(1 - \cos\theta)}{\sin\theta}$$

$$= \operatorname{cosec}\theta - \cot\theta$$

26. (c)

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

$$\Rightarrow \frac{\cos^2\theta}{\cos^2\theta(\operatorname{cosec}^2\theta - 1)} = 3$$

$$\Rightarrow \tan\theta = \sqrt{3}$$

$$\theta = 60^\circ$$

27. (c)

$$8 \cos A + 15 \sin A + 15$$

$$\text{Max.} = +\sqrt{8^2 + 15^2} + 15 = 32$$

$$\text{Min.} = -\sqrt{8^2 + 15^2} + 15 = -2$$

28. (a)

$$\cos x + \cos y = 2$$

$$\text{Put } x = y = 0$$

$$1 + 1 = 2 \text{ verify}$$

$$\text{So, } \sin x + \sin y$$

$$0 + 0 = 0$$

29. (d)

$$3(\sin x - \cos x)^4 + 4(\sin^6 x + \cos^6 x) + 6(\sin x + \cos x)^2$$

$$\text{Put } x = 0$$

$$3(-1)^4 + 4(1) + 6(1)^2$$

$$3 + 4 + 6 = 13$$

30. (a)

$$\tan 15^\circ = 2 - \sqrt{3}$$

$$\text{then } \cot 15^\circ = 2 + \sqrt{3}$$

$$\tan 15^\circ \cot 75^\circ + \tan 75^\circ \cot 15^\circ$$

$$\tan^2 15^\circ + \cot^2 15^\circ$$

$$(2 - \sqrt{3})^2 + (2 + \sqrt{3})^2$$

$$2(4 + 3) = 14$$

31. (c)

ATQ,

$$A = \tan 11^\circ \tan 29^\circ \text{ \& } B = 2 \cot 61^\circ \cot 79^\circ$$

$$B = 2 \cot (90^\circ - 29^\circ) \cot (90^\circ - 11^\circ)$$

$$B = 2 \tan 29^\circ \tan 11^\circ$$

Then, we get

$$B = 2A$$

32. (b)

$$\cos\theta + \sec\theta = k$$

Square both sides,

$$\cos^2\theta + \sec^2\theta + 2\cos\theta \sec\theta = k^2$$

$$1 - \sin^2\theta + 1 + \tan^2\theta + 2 = k^2$$

$$\tan^2\theta - \sin^2\theta = k^2 - 4$$

$$\sin^2\theta - \tan^2\theta = 4 - k^2$$

33. (b)

$$\cos(\alpha - \beta) = 1 = \cos 0^\circ$$

$$\alpha - \beta = 0^\circ$$

$$\alpha = \beta$$

$$\sin\alpha - \sin\beta + \cos\alpha - \cos\beta$$

$$= \sin\alpha - \sin\alpha + \cos\alpha - \cos\alpha = 0$$

34. (b)

Put $x = 90^\circ$

$$\begin{aligned}
 &(\sin^4 x - \cos^4 x + 1) \operatorname{cosec}^2 x \\
 &= (1 - 0 + 1) \times 1 \\
 &= 2 \times 1 = 2
 \end{aligned}$$

35. (b)

$$+ \sqrt{\cos x \operatorname{cosec} y - \cos x \sin y}$$

$$x + y = 90^\circ \Rightarrow y = 90^\circ - x$$

$$\sqrt{\cos x \operatorname{cosec} (90^\circ - x) - \cos x \sin (90^\circ - x)}$$

$$= \sqrt{\cos x \sec x - \cos x \cos x}$$

$$= \sqrt{1 - \cos^2 x}$$

$$= \sqrt{\sin^2 x}$$

$$= \sin x$$

36. (a)

$$\tan^2 y \operatorname{cosec}^2 x - 1 = \tan^2 y$$

$$\tan^2 y \operatorname{cosec}^2 x - \tan^2 y = 1$$

$$\tan^2 y [\operatorname{cosec}^2 x - 1] = 1$$

$$\tan^2 y \cot^2 x = 1$$

$$\tan^2 y = \tan^2 x$$

$$x = y$$

$$x - y = 0$$

37. (a)

$$\sin \theta + \operatorname{cosec} \theta = 2.5$$

use option (a)

$$\theta = 30$$

$$\sin \theta + \frac{1}{\sin \theta} = \frac{1}{2} + 2 \text{ verify}$$

38. (c)

$$\cos^2 45^\circ - \sin^2 15^\circ$$

$$\therefore \sin 15^\circ = \frac{\sqrt{3}-1}{2\sqrt{2}}, \sin 75^\circ = \frac{\sqrt{3}+1}{2\sqrt{2}}$$

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

$$\rightarrow \frac{1}{2} - \frac{3+1-2\sqrt{3}}{8}$$

$$\rightarrow \frac{1}{2} - \frac{2(2-\sqrt{3})}{8}$$

$$\rightarrow \frac{2-2+\sqrt{3}}{4} = \frac{\sqrt{3}}{4}$$

39. (b)

$$\frac{\tan 57^\circ + \cot 37^\circ}{\tan 33^\circ + \cot 53^\circ} = \frac{\frac{\sin 57^\circ}{\cos 57^\circ} + \frac{\cos 37^\circ}{\sin 37^\circ}}{\frac{\sin 33^\circ}{\cos 33^\circ} + \frac{\cos 53^\circ}{\sin 53^\circ}} = \frac{\cos(57^\circ - 37^\circ)}{\cos(53^\circ - 33^\circ)} = \frac{\cos 20^\circ}{\cos 20^\circ} = 1$$

$$\text{Where: } \cos(A+B) = \cos A \cos B - \sin A \sin B$$

$$= \frac{\cos 20^\circ}{\cos 57^\circ \sin 37^\circ} \times \frac{\cos 33^\circ \sin 53^\circ}{\cos 20^\circ} = \tan 57^\circ \cot 37^\circ$$

40. (b)

$$\cot^4 \theta - \operatorname{cosec}^4 \theta + \cot^2 \theta + \operatorname{cosec}^2 \theta.$$

$$\rightarrow (\cot^2 \theta + \operatorname{cosec}^2 \theta)(\cot^2 \theta - \operatorname{cosec}^2 \theta) + (\cot^2 \theta + \operatorname{cosec}^2 \theta)$$

$$\rightarrow (\cot^2 \theta + \operatorname{cosec}^2 \theta)(-1) + (\cot^2 \theta + \operatorname{cosec}^2 \theta)$$

$$\text{Where: } \operatorname{cosec}^2 \theta - \cot^2 \theta = 1$$

$$\rightarrow -(\cot^2 \theta + \operatorname{cosec}^2 \theta) + (\cot^2 \theta + \operatorname{cosec}^2 \theta) = 0$$

41. (a)

$$x = a \cos^3 \theta, y = b \sin^3 \theta$$

$$\frac{x}{a} = \cos^3 \theta, \frac{y}{b} = \sin^3 \theta.$$

$$\left(\frac{x}{a}\right)^{2/3} + \left(\frac{y}{b}\right)^{2/3}$$

$$(\cos^3 \theta)^{2/3} + (\sin^3 \theta)^{2/3}$$

$$\cos^2 \theta + \sin^2 \theta = 1$$

42. (d)

$$\sin^2 10^\circ + \sin^2 20^\circ + \sin^2 30^\circ + \dots + \sin^2 80^\circ$$

$$\sin^2 10^\circ + \sin^2 (90^\circ - 10^\circ) + \sin^2 20^\circ + \sin^2 (90^\circ - 20^\circ) + \dots$$

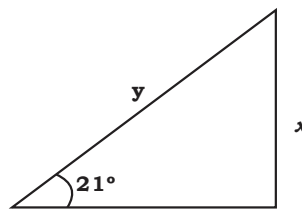
$$\text{Total terms} = 8$$

$$1 + 1 + 1 + 1 = 4$$

43. (a)

Given,

$$\sin 21^\circ = \frac{x}{y}$$



$$\sqrt{y^2 - x^2}$$

$$\sec 21^\circ - \sin 69^\circ$$

$$\sec 21^\circ - \cos 21^\circ$$

$$\frac{y}{\sqrt{y^2 - x^2}} - \frac{\sqrt{y^2 - x^2}}{y}$$

$$\frac{y^2 - (y^2 - x^2)}{y\sqrt{y^2 - x^2}} = \frac{x^2}{y\sqrt{y^2 - x^2}}$$

44. (a)

$$\sin 2A + \sin 2B + \sin 2C$$

$$\text{Formula:- } \sin X + \sin Y = 2 \sin \frac{X+Y}{2} \cdot \cos \frac{X-Y}{2}$$

$$\Rightarrow 2 \sin \frac{(2A+2B)}{2} \cos \frac{(2A-2B)}{2} + \sin 2C$$

$$\Rightarrow 2 \sin(A+B) \cos(A-B) + \sin 2C$$

$$\Rightarrow 2 \sin(180^\circ - C) \cos(A-B) + 2 \sin C \cos C$$

$$\Rightarrow 2 \sin C [\cos(A-B) - \cos(A+B)]$$

$$\Rightarrow 2 \sin C [(\cos A \cos B + \sin A \sin B) - (\cos A \cos B - \sin A \sin B)]$$

$$\Rightarrow 2 \sin C [2 \sin A \sin B]$$

$$\Rightarrow 4 \sin A \sin B \sin C$$

45. (b)

Given

$$\sin \frac{\pi x}{2} = x^2 - 2x + 2$$

$$\text{Put } x = 1$$

$$\text{Then } \sin \frac{\pi}{2} = 1 - 2 + 2$$

$$\sin \frac{\pi}{2} = 1 \text{ (verify)}$$

$$\text{So, } x = 1$$

46. (d)

Given, $\cos A$, $\sin A$ & $\cot A$ are in G.P.

$$\text{So, } \sin^2 A = \cos A \cdot \cot A$$

$$\sin^2 A = \frac{\cos^2 A}{\sin A}$$

$$\sin^3 A = \cos^2 A \Rightarrow \tan^2 A = \operatorname{cosec} A$$

At Q,

$$\tan^6 A - \tan^2 A = \tan^2 A (\tan^4 A - 1)$$

$$= \tan^2 A \times (\operatorname{cosec}^2 A - 1)$$

$$= \tan^2 A \times \cot^2 A = 1$$

47. (d)

$$\Rightarrow (1 + \sec 22^\circ + \cot 68^\circ) (1 - \operatorname{cosec} 22^\circ + \tan 68^\circ)$$

$$\Rightarrow (1 + \sec 22^\circ + \tan 22^\circ) (1 - \operatorname{cosec} 22^\circ + \cot 22^\circ)$$

$$\frac{(\cos 22^\circ + \sin 22^\circ + 1)}{\cos 22^\circ} \times \frac{(\sin 22^\circ + \cos 22^\circ - 1)}{\sin 22^\circ}$$

$$\text{Formula:- } (A+B)(A-B) = A^2 - B^2$$

$$\Rightarrow \frac{(\cos 22^\circ + \sin 22^\circ)^2 - 1}{\cos 22^\circ \sin 22^\circ}$$

$$\Rightarrow \frac{(\cos^2 22^\circ + \sin^2 22^\circ + 2 \cos 22^\circ \times \sin 22^\circ) - 1}{\cos 22^\circ \sin 22^\circ}$$

$$\Rightarrow \frac{2 \times \cos 22^\circ \times \sin 22^\circ}{\cos 22^\circ \times \sin 22^\circ} = 2$$

48. (c)

$$\frac{\tan A}{(1 - \cot A)} + \frac{\cot A}{(1 - \tan A)} - \frac{2}{\sin 2A}$$

$$\frac{\frac{\sin A}{\cos A}}{1 - \frac{\cos A}{\sin A}} + \frac{\frac{\cos A}{\sin A}}{1 - \frac{\sin A}{\cos A}} - \frac{2}{\sin 2A}$$

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

$$\frac{1}{(\sin A - \cos A)} \left[\frac{\sin^3 A - \cos^3 A}{\cos A \cdot \sin A} \right] - \frac{2}{\sin 2A}$$

$$\frac{1}{(\sin A - \cos A)} \left[\frac{(\sin A - \cos A)(\sin^2 A + \cos^2 A + \sin A \cos A)}{(\cos A \sin A)} \right] - \frac{2}{\sin 2A}$$

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

'OR'

$$\frac{\tan A}{(1 - \cot A)} + \frac{\cot A}{(1 - \tan A)} - \frac{2}{\sin 2A}$$

$$\text{Let, } A = 135^\circ$$

$$\Rightarrow \frac{-1}{-(-1)} + \frac{-1}{-(-1)} - \frac{2}{\sin 270^\circ}$$

$$\Rightarrow -\frac{1}{2} - \frac{1}{2} - \frac{2}{\sin(180^\circ + 90^\circ)}$$

$$\Rightarrow -1 - \frac{2}{(-1)} = 1$$

49. (c)

$$\sec(\theta + \alpha) + \sec(\theta - \alpha) = 2 \sec \theta$$

$$\frac{1}{\cos(\theta + \alpha)} + \frac{1}{\cos(\theta - \alpha)} = 2 \sec \theta$$

$$\frac{\cos(\theta - \alpha) + \cos(\theta + \alpha)}{\cos(\theta + \alpha) \cos(\theta - \alpha)} = 2 \sec \theta$$

$$= \frac{2 \cos \theta \cdot \cos \alpha}{\cos^2 \theta - \sin^2 \alpha} = 2 \sec \theta$$

$$\cos^2 \theta \cdot \cos \alpha = \cos^2 \theta - \sin^2 \alpha$$

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

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

$$1 - \sin^2 \theta = 1 + \cos \alpha$$

$$\sin^2 \theta = -\cos \alpha$$

50. (d)

$$\begin{aligned}
 & 8\cos 10^\circ \cos 20^\circ \cos 40^\circ \\
 & 4[2\cos 40^\circ \cos 20^\circ] \cos 10^\circ \\
 & 4[\cos 60^\circ + \cos 20^\circ] \cos 10^\circ \\
 & 4\left[\frac{1}{2} + \cos 20^\circ\right] \cos 10^\circ \\
 & 4\left[\frac{1}{2}\cos 10^\circ + \cos 20^\circ \cos 10^\circ\right] \\
 & = 2[\cos 10^\circ + \cos 30^\circ + \cos 10^\circ] \\
 & = 2\left[2\cos 10^\circ + \frac{\sqrt{3}}{2}\right] \\
 & = 4\cos 10^\circ + \sqrt{3}
 \end{aligned}$$

51. (a)

$$\begin{aligned}
 & \sin \alpha_1 + \sin \alpha_2 + \dots + \sin \alpha_{20} = 20 \\
 & \text{Here } \alpha_1 = \alpha_2 = \alpha_3 = \dots = 90^\circ \\
 & \text{So, } \alpha_1 + \alpha_2 + \alpha_3 + \dots + \alpha_{20} = 20 \times 90 \\
 & \quad \quad \quad = 1800
 \end{aligned}$$

52. (d)

$$\cos 2\alpha = \frac{3\cos 2\beta - 1}{3 - \cos 2\beta}$$

$$\text{Put } \beta = 30^\circ$$

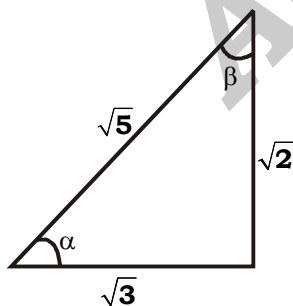
$$\cos 2\alpha = \frac{\left(\frac{3}{2} - 1\right)}{\left(3 - \frac{1}{2}\right)} = \frac{\frac{1}{2}}{\frac{5}{2}} = \frac{1}{5}$$

$$2\cos^2 \alpha - 1 = \frac{1}{5}$$

$$2\cos^2 \alpha = \frac{6}{5}$$

$$\Rightarrow \cos^2 \alpha = \frac{3}{5}$$

$$\Rightarrow \cos \alpha = \sqrt{\frac{3}{5}}$$



$$\tan \alpha \cot \beta = \frac{\sqrt{2}}{\sqrt{3}} \times \frac{\sqrt{2}}{\sqrt{3}} = \frac{2}{3}$$

53. (d)

ATQ,

$$\sin \theta = a \cos \phi \quad \& \quad \cos \theta = b \sin \phi$$

$$\text{Put } \theta = \phi = 30^\circ$$

$$a = \frac{1}{\sqrt{3}} \quad \& \quad b = \sqrt{3}$$

$$(a^2 - 1) \cot^2 \phi + (1 - b^2) \cot^2 \theta$$

$$\text{Then } \left(\frac{1}{3} - 1\right) \times 3 + (1 - 3) \times 3$$

$$-\frac{2}{3} \times 3 - 6 = -8$$

Now, put the value on option (d)

$$\left(\frac{1}{3} - 3\right) \frac{1}{3} = (-8) \text{ verify}$$

54. (b)

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

$$\frac{(1 + \sec \theta \cdot \operatorname{cosec} \theta)^2 \cdot \left(\frac{1 - \sin \theta}{\cos \theta}\right)^2 \cdot (1 + \sin \theta)}{(\sin \theta + \sec \theta)^2 + (\cos \theta + \operatorname{cosec} \theta)^2}$$

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

$$\text{Put } \theta = 45^\circ$$

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

$$\frac{9 \times \left(1 - \frac{1}{\sqrt{2}}\right)}{\frac{9}{2} + \frac{9}{2}} = \frac{9 \times \left(1 - \frac{1}{\sqrt{2}}\right)}{9} = 1 - \frac{1}{\sqrt{2}}$$

Use option (b)

$$(1 - \sin 45^\circ) = 1 - \frac{1}{\sqrt{2}} \text{ (verify)}$$

55. (b)

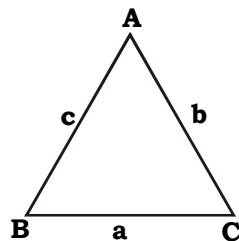
$$x = \frac{2\sin\theta}{1+\cos\theta+\sin\theta} \text{ find } \frac{1-\cos\theta+\sin\theta}{(1+\sin\theta)}$$

Put $\theta = 90^\circ$

$$x = \frac{2 \times 1}{1+0+1} = 1$$

$$\text{Now } \frac{1-\cos 90^\circ + \sin 90^\circ}{1+\sin 90^\circ} = \frac{2}{2} = 1 = x$$

56. (a)



Given,

$$\cos B = \frac{\sin A}{2\sin C} \text{ Where, } \frac{a}{\sin A} = \frac{c}{\sin C}$$

$$\frac{a^2 + c^2 - b^2}{2ac} = \frac{a}{2c}$$

$$\frac{\sin A}{\sin C} = \frac{a}{c}$$

$$a^2 + c^2 - b^2 = a^2$$

$$c^2 = b^2 \Rightarrow c = b$$

So, isosceles triangle

57. (b)

ATQ,

$$\sin x + \sin y = a \text{ \& } \cos x + \cos y = b$$

$$\text{put } x = y = 45^\circ$$

$$a = \sqrt{2}$$

$$b = \sqrt{2}$$

$$\tan\left(\frac{x+y}{2}\right) = \tan 45^\circ = 1$$

By putting the value of (a) and (b) in option (a), (b) and (c) we get the same result.

For other angle value

$$\text{Put } x = 0^\circ, y = 60^\circ$$

$$a = \frac{\sqrt{3}}{2}, b = \frac{3}{2}$$

$$\tan\left(\frac{x+y}{2}\right) = \frac{1}{\sqrt{3}}$$

option (c)

58. (b)

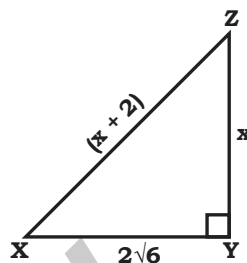
$$0 < x < 45^\circ \text{ \& } 45^\circ < y < 90^\circ$$

We know $\sin\theta$ increase when angle increaseHere $y > x$ So, $\sin y > \sin x$

59. (b)

$$\text{Let, } YZ = X, XZ = X + 2$$

$$XZ - YZ = 2$$



$$(x+2)^2 = x^2 + (2\sqrt{6})^2$$

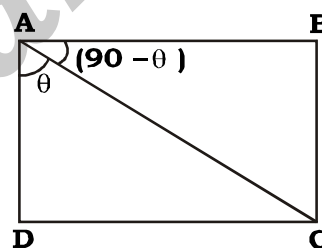
$$x^2 + 4 + 4x = x^2 + 24$$

$$4x = 20$$

$$x = 5$$

$$\sec X + \tan X = \frac{7}{2\sqrt{6}} + \frac{5}{2\sqrt{6}} = \frac{12}{2\sqrt{6}} = \sqrt{6}$$

60. (c)



$$(\tan^2 \angle CAD + 1) \sin^2 \angle BAC$$

$$(\tan^2 \theta + 1) \sin^2 (90^\circ - \theta)$$

$$(\tan^2 \theta + 1) \cos^2 \theta$$

$$\sec^2 \theta \times \cos^2 \theta = 1$$

61. (d)

$$\text{If } \sin \alpha = \frac{4}{5} \text{ \& } \cos \beta = \frac{5}{13}$$

$$\text{then, } \cos \alpha = \frac{3}{5} \text{ \& } \sin \beta = \frac{12}{13}$$

$$\cos(\alpha - \beta) = 2 \cos^2\left(\frac{\alpha - \beta}{2}\right) - 1$$

$$\cos \alpha \cos \beta + \sin \alpha \sin \beta = 2 \cos^2\left(\frac{\alpha - \beta}{2}\right) - 1$$

$$\frac{3}{5} \times \frac{5}{13} + \frac{4}{5} \times \frac{12}{13} = 2 \cos^2\left(\frac{\alpha - \beta}{2}\right) - 1$$

$$2 \cos^2 \left(\frac{\alpha - \beta}{2} \right) = \frac{63}{65} + 1$$

$$\cos^2 \left(\frac{\alpha - \beta}{2} \right) = \frac{128}{130} = \frac{64}{65}$$

$$\cos \left(\frac{\alpha - \beta}{2} \right) = \frac{8}{\sqrt{65}}$$

62. (a)

$$x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cos \theta \quad \dots\dots\dots(1)$$

$$x \sin \theta - y \cos \theta = 0$$

$$\frac{\sin \theta}{\cos \theta} = \frac{y}{x} \quad \dots\dots\dots(2)$$

from (i) & (ii)

$$xy^3 + yx^3 = xy$$

$$xy(x^2 + y^2) = xy$$

$$\text{So, } x^2 + y^2 = 1$$

63. (b)

$$\text{If } (a^2 - b^2) \sin \theta + 2ab \cos \theta = a^2 + b^2$$

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

According to theory,

$$\sin \theta = \frac{a^2 - b^2}{a^2 + b^2} \quad \& \quad \cos \theta = \frac{2ab}{a^2 + b^2}$$

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

64. (d)

$$\sin(2x - 20^\circ) = \cos(2y + 20^\circ)$$

$$(2x - 20^\circ) + (2y + 20^\circ) = 90^\circ$$

$$2(x + y) = 90^\circ$$

$$x + y = 45^\circ$$

$$\tan(x + y) = \tan 45^\circ = 1$$

65. (b)

$$\text{Given } \frac{2 \sin x}{1 + \cos x + \sin x} = t$$

$$\text{put } x = 0$$

$$\text{then } t = \frac{2 \times 0}{1 + 1 + 0} = 0$$

$$\text{Now } \frac{1 - \cos x + \sin x}{1 + \sin x} = \frac{1 - 1 + 0}{1 + 0} = \frac{0}{1} = 0 = t$$

66. (d)

$$\sin 75^\circ + \sin 15^\circ$$

$$\sin(45^\circ + 30^\circ) + \sin(45^\circ - 30^\circ)$$

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

$$\frac{(\sqrt{3} + 1)}{2\sqrt{2}} + \frac{(\sqrt{3} - 1)}{2\sqrt{2}}$$

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

67. (a)

$$3 \sin x + 4 \cos x + r \geq 10$$

(p) Let

Theory:- max value in $\sin \theta$ and $\cos \theta$ is

$$a \sin \theta + b \cos \theta = \sqrt{a^2 + b^2}$$

For minimum value of r we have to make maximum value of P

$$\text{Maximum } (3 \sin x + 4 \cos x) = \sqrt{3^2 + 4^2} = 5$$

$$\text{So, Min. of } r = 5$$

68. (b)

$$\text{If } x = \operatorname{cosec} \theta - \cos \theta \quad \& \quad y = \sec \theta - \cos \theta$$

$$\text{Put } \theta = 45^\circ$$

$$x = \sqrt{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}} \quad \& \quad y = \sqrt{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$$

Now, put the value $\theta = 45^\circ$ in option (b)

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

69. (c)

$$\text{Let, } \tan x = a \text{ and } \tan y = b$$

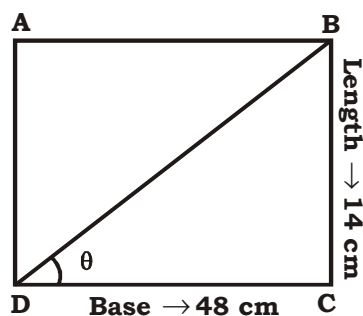
$$(a + b) \left[1 - \frac{1}{ab} \right] + \left[\frac{1}{a} + \frac{1}{b} \right] (1 - ab)$$

$$= (a + b) \left[\frac{ab - 1}{ab} \right] + \left[\frac{a + b}{ab} \right] (1 - ab)$$

$$= (a + b) \left[\frac{ab - 1 + 1 - ab}{ab} \right]$$

$$= (a + b) \times 0 = 0$$

70. (a)



$$\text{Diagonal (BD)} = \sqrt{(48)^2 + (14)^2} = 50$$

$$\sec\theta + \operatorname{cosec}\theta$$

$$= \frac{50}{48} + \frac{50}{14} = \frac{25}{24} + \frac{25}{7} = 25 \left(\frac{24+7}{24 \times 7} \right)$$

$$= \frac{25 \times 31}{168} = \frac{775}{168}$$

71. (b)

$$\text{Put } \theta = 45^\circ$$

$$m = \sqrt{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$$

$$n = \sqrt{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$$

$$m = n$$

$$m^{\frac{4}{3}} n^{\frac{2}{3}} + m^{\frac{2}{3}} n^{\frac{4}{3}}$$

Put the value in this equ. $m = n$

$$= m^{\frac{4}{3}} m^{\frac{2}{3}} + m^{\frac{2}{3}} m^{\frac{4}{3}}$$

$$= m^2 + m^2 = 2m^2$$

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

72. (d)

$$\text{Put } \theta = 45^\circ,$$

$$\text{LHS} = \sin\theta + \cos\theta = \sin 45^\circ + \cos 45^\circ$$

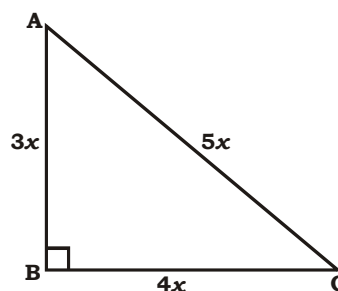
$$= \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \sqrt{2} = \text{RHS}$$

$$\sin^6\theta + \cos^6\theta + 6 \sin^2\theta \cos^2\theta$$

$$= \left(\frac{1}{\sqrt{2}} \right)^6 + \left(\frac{1}{\sqrt{2}} \right)^6 + 6 \times \frac{1}{2} \times \frac{1}{2}$$

$$= \frac{1}{8} + \frac{1}{8} + \frac{6}{4} = \frac{1+1+12}{8} = \frac{14}{8} = \frac{7}{4}$$

73. (c)



$$\sin A + \sin B + \sin C$$

$$= \frac{4x}{5x} + 1 + \frac{3x}{5x} = \frac{4}{5} + \frac{3}{5} + 1$$

$$= \frac{7}{5} + 1 = \frac{12}{5}$$

74. (b)

$$(ax^{-1} - by^{-1})(ax^{-1} + by^{-1})$$

$$= \left(\frac{a}{x} - \frac{b}{y} \right) \left(\frac{a}{x} + \frac{b}{y} \right)$$

$$\left(\frac{a}{x} = \frac{1}{\cos\theta} \text{ and } \frac{b}{y} = \frac{1}{\cot\theta} \right)$$

$$(\sec\theta - \tan\theta)(\sec\theta + \tan\theta)$$

$$= \sec^2\theta - \tan^2\theta = 1$$

75. (a)

$$\sin\theta \cos\theta = 2 \cos^3\theta - 1.5 \cos\theta$$

Divide by $\cos\theta$

$$\sin\theta = 2 \cos^2\theta - 1.5$$

$$\sin\theta = 2(1 - \sin^2\theta) - 1.5$$

$$\sin\theta = 2 - 2 \sin^2\theta - 1.5$$

$$2 \sin^2\theta + \sin\theta - 0.5 = 0$$

Discriminant of quadratic equ.

$$\sin\theta = \frac{-1 \pm \sqrt{1+4}}{2 \times 2} = \frac{-1 \pm \sqrt{5}}{4}$$

76. (b)

$$\frac{\tan x}{1 + \sec x} - \frac{\tan x}{1 - \sec x}$$

$$\tan x \left[\frac{1 - \sec x - 1 - \sec x}{(1 + \sec x)(1 - \sec x)} \right]$$

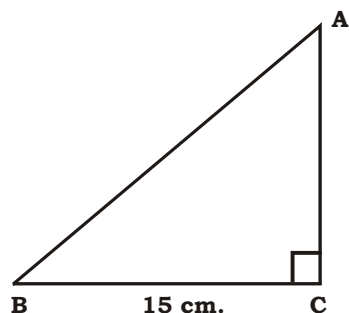
$$= \tan x \left[\frac{-2 \sec x}{1 - \sec^2 x} \right]$$

$$= \tan x \left[\frac{-2 \sec x}{-\tan^2 x} \right]$$

$$\Rightarrow \frac{2}{\frac{\cos \theta}{\sin \theta} \cdot \frac{\sin \theta}{\cos \theta}}$$

$$= 2 \operatorname{cosec} x$$

77. (a)



$$\sin B = \frac{4}{5}$$

$$\frac{4}{5} = \frac{AC}{AB}$$

Let $AC = 4x$ and $AB = 5x$ Then $BC = 3x$ (Using Pythagorean triplet)

$$3x = 15$$

$$x = 5$$

$$AB = 5x = 5 \times 5 = 25$$

78. (c)

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

$$\frac{\sin x}{\sin(90^\circ - x)} = \frac{\sqrt{3}}{1}$$

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

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

$$\tan x = \tan 60^\circ$$

$$x = 60^\circ$$

$$x + y = 90^\circ$$

$$y = 90^\circ - 60^\circ = 30^\circ$$

$$x : y = 60^\circ : 30^\circ$$

$$= 2 : 1$$

79. (b)

Let $a = \tan^2 x$ and $b = \cot^2 x$

We know,

 $Am \geq Gm$

$$\frac{a+b}{2} \geq \sqrt{ab}$$

$$\frac{\tan^2 x + \cot^2 x}{2} \geq \sqrt{\tan^2 x \cot^2 x}$$

$$\tan^2 x + \cot^2 x \geq 2$$

$$P \geq 2$$

80. (a)

$$\operatorname{cosec}^4 \alpha = 17 + \cot^4 \alpha$$

$$\operatorname{cosec}^4 \alpha - \cot^4 \alpha = 17$$

$$(\operatorname{cosec}^2 \alpha)^2 - (\cot^2 \alpha)^2 = 17$$

$$(\operatorname{cosec}^2 \alpha + \cot^2 \alpha)(\operatorname{cosec}^2 \alpha - \cot^2 \alpha) = 17$$

$$\operatorname{cosec}^2 \alpha + \operatorname{cosec}^2 \alpha - 1 = 17$$

$$2 \operatorname{cosec}^2 \alpha = 18$$

 $\operatorname{cosec}^2 \alpha = 9$ in first quadrant all functions are positive

$$\operatorname{cosec} \alpha = +3$$

$$\sin \alpha = \frac{1}{3}$$

81. (c)

$$\frac{p \sec \theta - q \operatorname{cosec} \theta}{p \sec \theta + q \operatorname{cosec} \theta}$$

Divide by $\operatorname{cosec} \theta$ in this equ.

$$\frac{p \tan \theta - q}{p \tan \theta + q} = \frac{p \left(\frac{p}{q} \right) - q}{p \left(\frac{p}{q} \right) + q} = \frac{\frac{p^2}{q} - q}{\frac{p^2}{q} + q} = \frac{\frac{p^2 - q^2}{q}}{\frac{p^2 + q^2}{q}}$$

$$= \frac{p^2 - q^2}{p^2 + q^2}$$

82. (b)

$$N = \operatorname{cosec}^2 \theta - 2 + \sin^2 \theta$$

$$N = \sin^2 \theta + \operatorname{cosec}^2 \theta - 2$$

$$N = \sin^2 \theta + \operatorname{cosec}^2 \theta - 2 \sin \theta \operatorname{cosec} \theta$$

$$N = (\sin \theta - \operatorname{cosec} \theta)^2$$

Square of a number is always greater than or equal to zero

 $\therefore N \geq 0$ ie Non-Negative

83. (b)

$$\alpha + \beta = 90^\circ$$

Let,

$$\alpha = 45^\circ \text{ and } \beta = 45^\circ$$

Put the value in this equ.

$$\begin{aligned} & \sqrt{\operatorname{cosec} 45^\circ \operatorname{cosec} 45^\circ \left(\frac{\sin 45^\circ}{\sin 45^\circ} + \frac{\cos 45^\circ}{\cos 45^\circ} \right)^{\frac{1}{2}}} \\ &= \operatorname{cosec} 45^\circ \times (1+1)^{\frac{1}{2}} = \sqrt{2} \times (2)^{\frac{1}{2}} = \sqrt{2} \times \frac{1}{\sqrt{2}} = 1 \end{aligned}$$

84. (c)

$$2 [1 + \tan^2 A] + 2 [1 + \cot^2 A]$$

$$= 2 \sec^2 A + 2 \operatorname{cosec}^2 A$$

$$[\because (a+b)^2 + (a-b)^2 = 2(a^2 + b^2)]$$

$$= 2 [\sec^2 A + \operatorname{cosec}^2 A]$$

$$= 2 \left[\frac{1}{\cos^2 A} + \frac{1}{\sin^2 A} \right] = 2 \left[\frac{\sin^2 A + \cos^2 A}{\sin^2 A \cos^2 A} \right]$$

$$= 2 \times \frac{1}{\cos^2 A \sin^2 A} = 2 \sec^2 A \operatorname{cosec}^2 A$$

85. (a)

$$\sec x \times \operatorname{cosec} x = 2$$

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

$$2 \sin x \cos x = 1$$

$$\sin 2x = 1$$

$$\sin 2x = \sin 90^\circ$$

$$2x = 90^\circ$$

$$x = 45^\circ$$

$$\tan^n x + \cot^n x = \tan^n 45^\circ + \cot^n 45^\circ$$

$$= 1^n + 1^n = 2$$

86. (a)

$$\sin x \sqrt{\frac{1}{1+\cos x} + \frac{1}{1-\cos x}}$$

$$\sin x \sqrt{\frac{1-\cos x + 1+\cos x}{(1+\cos x)(1-\cos x)}}$$

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

$$= \sin x \frac{\sqrt{2}}{\sqrt{\sin^2 x}}$$

$$= \sin x \times \frac{\sqrt{2}}{\sin x} = \sqrt{2}$$

87. (a)

$$A = \frac{\sin 45^\circ - \sin 30^\circ}{\cos 45^\circ + \cos 60^\circ}$$

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

$$B = \frac{\sec 45^\circ - \tan 45^\circ}{\operatorname{cosec} 45^\circ + \cot 45^\circ}$$

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

$$A = B$$

88. (b)

$$\operatorname{cosec} \theta - \sin \theta = p^3$$

$$\frac{1}{\sin \theta} - \sin \theta = p^3$$

$$\frac{1 - \sin^2 \theta}{\sin \theta} = p^3$$

$$\frac{\cos^2 \theta}{\sin \theta} = p^3 \quad \dots\dots\dots(1)$$

$$\sec \theta - \cos \theta = q^3$$

$$\frac{1}{\cos \theta} - \cos \theta = q^3$$

$$\frac{1 - \cos^2 \theta}{\cos \theta} = q^3$$

$$\frac{\sin^2 \theta}{\cos \theta} = q^3 \quad \dots\dots\dots(ii)$$

$$(ii) \div (i)$$

$$\frac{q^3}{p^3} - \frac{\sin^2 \theta}{\cos \theta} = \frac{\sin^3 \theta}{\cos^3 \theta} = \tan^3 \theta$$

$$\frac{q}{p} = \tan \theta$$

89. (b)

$$\text{Put } x = 0^\circ, \sin x + \cos x = C$$

$$C = \sin 0^\circ + \cos 0^\circ$$

$$C = 0 + 1$$

$$C = 1$$

$$\sin^6 x + \cos^6 x$$

$$= \sin^6 0^\circ + \cos^6 0^\circ = 0^6 + 1^6 = 1$$

Check options by putting the value of $C = 1$, option (b) is the right answer.

$$(b) \frac{1+6C^2-3C^4}{4} = \frac{1+6-3}{4} = \frac{7-3}{4} = \frac{4}{4} = 1$$

90. (c)

$$\frac{\cos x}{\operatorname{cosec} x + 1} + \frac{\cos x}{\operatorname{cosec} x - 1} = 2$$

$$\cos x \left[\frac{\operatorname{cosec} x - 1 + \operatorname{cosec} x + 1}{(\operatorname{cosec} x + 1)(\operatorname{cosec} x - 1)} \right] = 2$$

$$\cos x \left[\frac{2 \operatorname{cosec} x}{\cot^2 x} \right] = 2$$

$$\cos x \times \frac{2}{\sin x} \times \frac{\sin^2 x}{\cos^2 x} = 2$$

$$2 \tan x = 2$$

$$\tan x = 1$$

$$x = 45^\circ = \frac{\pi}{4}$$

91. (a)

Let angles (circular measurement) be x and y

$$x + y = 1 \quad \dots\dots(i)$$

$$\frac{180x}{\pi} - \frac{180y}{\pi} = 1$$

$$x - y = \frac{\pi}{180^\circ} \quad \dots\dots(ii)$$

From equ. (i) to (ii)

Put the value, $y = 1 - x$

$$2x = 1 + \frac{\pi}{180^\circ}$$

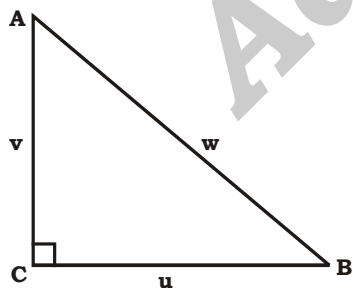
$$x = \left(\frac{1}{2} + \frac{\pi}{360^\circ} \right)$$

Again put the value, $x = 1 - y$

$$y = 1 - \left(\frac{1}{2} + \frac{\pi}{360^\circ} \right)$$

$$y = \left(\frac{1}{2} - \frac{\pi}{360^\circ} \right)$$

92. (d)



$$w^2 = u^2 + v^2$$

$$\tan A + \tan B = \frac{u}{v} + \frac{v}{u} = \frac{u^2 + v^2}{uv} = \frac{w^2}{uv}$$

93. (c)

$$\begin{aligned} \frac{2 \tan A}{1 - \tan^2 A} &= 2 \times \frac{(1 - \cos B)}{\sin B} \\ &= \frac{2(1 - \cos B)}{\sin B} \div \frac{1 - \left(\frac{1 - \cos B}{\sin B} \right)^2}{\sin^2 B} \\ &= \frac{2(1 - \cos B) \sin B}{(1 - \cos^2 B) - (1 - \cos B)^2} \\ &= \frac{2(1 - \cos B) \sin B}{(1 - \cos B)[1 + \cos B - 1 + \cos B]} \\ &= \frac{2 \sin B}{2 \cos B} = \tan B \end{aligned}$$

94. (d)

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

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

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

$$\frac{a}{1} = \frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta}$$

By Comp. & Div.

$$\frac{a+1}{a-1} = \frac{\sin \theta + \cos \theta + \sin \theta - \cos \theta}{\sin \theta + \cos \theta - \sin \theta + \cos \theta}$$

$$\frac{a+1}{a-1} = \frac{2 \sin \theta}{2 \cos \theta} = \tan \theta$$

95. (c)

$$\sin A + \cos A = P$$

Cube both side.

$$\sin^3 A + \cos^3 A + 3 \sin A \cos A (\sin A + \cos A) = p^3$$

$$q + 3 \sin A \cos A (p) = p^3$$

$$\dots\dots(1)$$

$$\text{Also, } \sin A + \cos A = P$$

Square both side.

$$\sin^2 A + \cos^2 A + 2 \sin A \cos A = p^2$$

$$1 + 2 \sin A \cos A = p^2$$

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

Put this value in equ. (1) we get

$$q + 3 \frac{(p^2 - 1)}{2} p = p^3$$

$$2q + 3p^3 - 3p = 2p^3$$

$$p^3 - 3p + 2q = 0$$

96. (d)

$$\frac{1}{x} = \frac{\sec^2 \theta + \tan \theta}{\sec^2 \theta - \tan \theta}$$

$$\frac{1+x}{1-x} = \frac{2\sec^2 \theta}{2\tan \theta}$$

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

$$\frac{1+x}{1-x} = \frac{1}{\sin \theta \cos \theta}$$

$$\frac{1-x}{1+x} = \sin \theta \cos \theta$$

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

$$\sin 2\theta = \frac{2-2x}{1+x}$$

$$-1 \leq \sin 2\theta \leq +1$$

$$-1 \leq \frac{2-2x}{1+x}$$

$$-1 - x \leq 2 - 2x$$

$$x \leq 3$$

$$\frac{2-2x}{1+x} \leq 1$$

$$2 - 2x \leq 1 + x$$

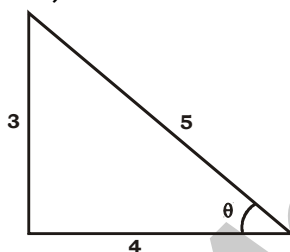
$$1 \leq 3x$$

$$\frac{1}{3} \leq x$$

$$\frac{1}{3} \leq x \leq 3$$

97. (b)

Let,



ATQ,

$$4m = \cot \theta (1 + \sin \theta)$$

$$4m = \frac{4}{3} \times \left(1 + \frac{3}{5}\right) = \frac{32}{15}$$

$$m = \frac{8}{15}$$

Again,

$$4n = \cot \theta (1 - \sin \theta)$$

$$4n = \frac{4}{3} \times \left(1 - \frac{3}{5}\right) = \frac{8}{15}$$

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

$$mn = \frac{8}{15} \times \frac{2}{15} = \frac{16}{225}$$

$$(m^2 - n^2)^2 = \left(\frac{64}{225} - \frac{4}{225}\right)^2 = \left(\frac{60}{225}\right)^2 = \left(\frac{4}{15}\right)^2 = \frac{16}{225}$$

$$(m^2 - n^2)^2 = mn$$

98. (d)

$$\frac{x}{a} - \frac{y \tan \theta}{b} = 1$$

$$\frac{x^2}{a^2} + \frac{y^2 \tan^2 \theta}{b^2} - 2 \times \frac{x}{a} \times \frac{y \tan \theta}{b} = 1 \quad \dots\dots(1)$$

$$\frac{x \tan \theta}{a} + \frac{y}{b} = 1$$

$$\frac{x^2 \tan^2 \theta}{a^2} + \frac{y^2}{b^2} + 2 \times \frac{x \tan \theta}{a} \times \frac{y}{b} = 1 \quad \dots\dots(2)$$

(1) + (2), we get

$$\frac{x^2}{a^2} (1 + \tan^2 \theta) + \frac{y^2}{b^2} (\tan^2 \theta + 1) = 2$$

$$\left(\frac{x^2}{a^2} + \frac{y^2}{b^2}\right) (1 + \tan^2 \theta) = 2$$

$$\left(\frac{x^2}{a^2} + \frac{y^2}{b^2}\right) \sec^2 \theta = 2$$

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = \frac{2}{\sec^2 \theta}$$

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 2 \cos^2 \theta$$

99. (b)

$$p = \cot \theta + \tan \theta$$

$$\text{Put } \theta = 45^\circ$$

$$p = 1 + 1 = 2$$

$$q = \sec \theta - \cos \theta$$

$$q = \sqrt{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$$

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

$$= (2\sqrt{2})^{\frac{2}{3}} - (1)^{\frac{2}{3}}$$

$$= (\sqrt{2}^3)^{\frac{2}{3}} - 1 = 2 - 1 = 1$$

100. (d)

$$\angle A + \angle B + \angle C = 180^\circ$$

$$\angle B + \angle C = 180^\circ - \angle A$$

$$\frac{\angle B + \angle C}{2} = 90^\circ - \frac{\angle A}{2}$$

$$\sin\left(\frac{B+C}{2}\right) = \sin\left(90^\circ - \frac{A}{2}\right)$$

$$\sin\left(\frac{B+C}{2}\right) = \cos \frac{A}{2}$$