TRIGONOMETRY
(त्रिकोणमिति)

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TRIGONOMETRY (त्रिकोणमिति)

Practice Sheet With Solution

LEVEL - 01

1. What is the value of sec(t), if ta n(t) = $\frac{1}{3}$?

यदि tan(t) = $\frac{1}{3}$ है, तो sec(t) का मान कितना है?

SSC CGL 09/09/2024 (Shift-02)

(a) $\frac{2\sqrt{2}}{3}$ (b) $\frac{\sqrt{10}}{9}$

(c) $\frac{\sqrt{10}}{3}$ (d) $\frac{\sqrt{3}}{3}$

2. What is the value of $\left(\frac{5}{\sqrt{3}} - \text{cosec}60°\right)$?

$\left(\frac{5}{\sqrt{3}} - \text{cosec}60°\right)$ का मान क्या होगा?

SSC CGL 25/09/2024 (Shift-03)

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

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

3. At what angle θ, the value of sin (θ) and cos (θ) will have the same value?

किस θ कोण पर, sin (θ) और cos (θ) का मान समान होगा?

SSC CGL 18/09/2024 (Shift-01)

(a) 45° (b) 30°

(c) 60° (d) 75°

4. Simplify. $\frac{\sin A}{1+\cos A}$ + cotA, where A is an acute angle.

निम्न का मान ज्ञात करें। $\frac{\sin A}{1+\cos A}$ + cotA, जहां A एक न्यून कोण है।

SSC CGL 18/09/2024 (Shift-02)

(a) sinA (b) cosA

(c) sinA + cosA (d) cosecA

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

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

(a) 1 (b) – 1

(c) 2 (d) – 2

6. Show that the value of $3\sin 15° - 4\sin^3 15°$ is?

दर्शाइए कि $3\sin 15° - 4\sin^3 15°$ का मान क्या होगा?

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

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

7. What is the value of $\sin 79° \cos 19° - \cos 79° \sin 19°$.

$\sin 79° \cos 19° - \cos 79° \sin 19°$ का मान क्या होगा?

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

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

8. What is the value of $\cos 70° \cos 40° + \sin 70° \sin 40°$?

$\cos 70° \cos 40° + \sin 70° \sin 40°$ का मान क्या है?

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

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

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

यदि $0 < \theta < 90°$, 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

10. If $\frac{\sec\alpha + \tan\alpha}{\sec\alpha - \tan\alpha} = \frac{7}{4}$, then find the value of $\text{cosec}\alpha$.

यदि $\frac{\sec\alpha + \tan\alpha}{\sec\alpha - \tan\alpha} = \frac{7}{4}$, है, तो $\text{cosec}\alpha$ का मान ज्ञात कीजिए।

SSC CGL 09/09/2024 (Shift-03)

(a) $\frac{1}{3}$ (b) $\frac{1}{11}$

(c) $\frac{11}{3}$ (d) $\frac{3}{11}$

11. If $7\sin^2\theta + 3\cos^2\theta = 4$ and $0° \le \theta \le \left(\frac{\pi}{2}\right)$, then the value of tanθ is:

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

(a) $\sqrt{\left(\frac{3}{7}\right)}$ (b) $\sqrt{\left(\frac{2}{7}\right)}$

(c) $\frac{1}{\sqrt{3}}$ (d) $\frac{1}{\sqrt{7}}$

12. $\frac{3\sin 58^\circ}{5\cos 32^\circ} + \frac{2\cos 62^\circ}{5\sin 28^\circ}$ is equal to:

$\frac{3\sin 58^\circ}{5\cos 32^\circ} + \frac{2\cos 62^\circ}{5\sin 28^\circ}$ के बराबर है।

SSC CGL 10/09/2024 (Shift-03)

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

13. 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

14. 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) $\frac{\cos\theta}{2}$
(c) $2\cos\theta$ (d) $\sqrt{2}\cos\theta$

15. 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) $\frac{1}{32}$

16. 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) $\frac{7}{16}$

17. 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) $\frac{1}{16}$

18. 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) $\frac{1}{8}\cot 10^\circ$

19. 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) $\frac{5}{8}$

20. 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) $\frac{1}{8}$

21. In a ΔABC right - angled at C, if $\tan A = \sqrt{3}$ then the value of $\sin A \cos B \cot (A + B)$ is:

ΔABC में, जो C पर समकोण है, यदि $\tan A = \sqrt{3}$ है, तो $\sin A \cos B \cot (A + B)$ का मान ज्ञात कीजिए।

SSC CGL 11/09/2024 (Shift-01)

(a) $\sqrt{3}$ (b) 1
(c) 0 (d) 2

22. 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

23. 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

24. 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

25. 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) cosA (b) sin2A
(c) cos2A (d) sinA

26. If $\sec\alpha = \operatorname{cosec}\beta$ $0^\circ \le (\alpha, \beta) \le 90^\circ$
Then find $\cos^2(\alpha + \beta)$

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

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

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

27. Evaluate the given expression.

दिए गए व्यंजक का मान ज्ञात करें।

$\frac{5}{1+\cot^2\theta} + \frac{3}{1+\tan^2\theta} + 2\cos^2\theta$

SSC CGL 26/09/2024 (Shift-01)

(a) 0 (b) 3
(c) 5 (d) 2

28. The numberical 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

29. If $\sin31^\circ = \alpha$, then the value of $\cot59^\circ$ is:

यदि $\sin31^\circ = \alpha$ है, तो $\cot59^\circ$ का मान ज्ञात कीजिए।

SSC CGL 13/09/2024 (Shift-01)

(a) $\frac{\sqrt{1-\alpha^2}}{2\alpha}$ (b) $\frac{\alpha}{\sqrt{1-\alpha^2}}$
(c) $\frac{\sqrt{1+\alpha^2}}{\alpha}$ (d) $\frac{\alpha}{\sqrt{1+\alpha^2}}$

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

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

(a) 1 (b) –1
(c) 2 (d) 0

31. If $\sec\theta = \frac{29}{20}$ where $0 < \theta < 90^\circ$ then what is the value of $3\operatorname{cosec}\theta + 3\cot\theta$?

यदि $\sec\theta = \frac{29}{20}$ है, जहाँ $0 < \theta < 90^\circ$ है, तो $3\operatorname{cosec}\theta + 3\cot\theta$ का मान ज्ञात कीजिए।

SSC CGL 17/09/2024 (Shift-01)

(a) $\frac{7}{3}$ (b) 7
(c) 14 (d) 49

32. 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

33. 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) $\frac{3}{4}$

34. 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) $\tan\theta - \sec\theta$

35. 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

36. 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

37. 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

38. Find the value of $2\frac{\tan54^\circ}{\cot36^\circ}-\frac{\cot41^\circ}{\tan49^\circ}$.

$2\frac{\tan54^\circ}{\cot36^\circ}-\frac{\cot41^\circ}{\tan49^\circ}$ का मान ज्ञात कीजिए।

SSC CGL 25/09/2024 (Shift-01)

(a) –1 (b) 1
(c) 0 (d) 2

39. 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

40. If $\tan15^\circ = 2 - \sqrt{3}$ then find the value $\tan15^\circ \cot75^\circ + \tan75^\circ \cot15^\circ$.

यदि $\tan15^\circ = 2 - \sqrt{3}$ है, तो $\tan15^\circ \cot75^\circ + \tan75^\circ \cot 15^\circ$ का मान ज्ञात कीजिए।

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

41. If $A = \tan11^\circ \tan29^\circ$ and $B = 2\cot61^\circ \cot79^\circ$ then:

यदि $A = \tan11^\circ \tan29^\circ$ और $B = 2\cot61^\circ \cot79^\circ$ तब:

(a) A = 2B (b) A = – 2B
(c) 2A = B (d) 2A = –B

42. 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) $k^2 + 2$

43. If $0° \le \alpha, \beta \le 90°$ such that $\cos(\alpha - \beta) = 1$, then what is $\sin\alpha - \sin\beta + \cos\alpha - \cos\beta$ equal to?
यदि $0° \le \alpha, \beta \le 90°$ 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

44. What is the expression $(\sin^4 x - \cos^4 x + 1)\operatorname{cosec}^2 x$ equal to, if $0° < x \le 90°$
$(\sin^4 x - \cos^4 x + 1)\operatorname{cosec}^2 x$ अभिव्यक्ति किसके बराबर है यदि $0° < x \le 90°$?
(a) 1 (b) 2
(c) 0 (d) –1

45. If $x + y = 90°$, then what is $\sqrt{\cos x \operatorname{cosec} y - \cos x \sin y}$ equal to?
यदि $x + y = 90°$, 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) $\sqrt{\sin x}$

46. 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) $x - y = 1°$

47. For what value of θ is $(\sin\theta + \operatorname{cosec}\theta) = 2.5$, where $0 < \theta < 90°$?
θ के किस मान के लिए $(\sin\theta + \operatorname{cosec}\theta) = 2.5$, है, जहाँ $0 < \theta < 90°$ है।
(a) 30° (b) 45°
(c) 60° (d) 90°

48. If $\tan\theta = \frac{8}{15}$, and θ is an acute angle, then the value of $\frac{\sqrt{1-\sin\theta}}{\sqrt{1+\sin\theta}}$ is:
यदि $\tan\theta = \frac{8}{15}$ और θ कोई न्यूनकोण हो, तो $\frac{\sqrt{1-\sin\theta}}{\sqrt{1+\sin\theta}}$ का मान ज्ञात कीजिए।

SSC CGL 18/09/2024 (Shift-02)

(a) $\frac{2}{5}$ (b) $\frac{3}{5}$
(c) $\frac{1}{5}$ (d) $\frac{4}{5}$

LEVEL - 02

49. Evaluate : $\cos^2 45° - \sin^2 15°$.
मूल्यांकन करें: $\cos^2 45° - \sin^2 15°$
(a) $\frac{1}{\sqrt{2}}$ (b) $\frac{\sqrt{2}}{3}$
(c) $\frac{\sqrt{3}}{4}$ (d) $\sqrt{4}$

50. The expression $\frac{\tan 57° + \cot 37°}{\tan 33° + \cot 53°}$ is equal to?
$\frac{\tan 57° + \cot 37°}{\tan 33° + \cot 53°}$ व्यंजक के बराबर होगा?
(a) $\tan 33° \cot 57°$ (b) $\tan 57° \cot 37°$
(c) $\tan 33° \cot 53°$ (d) $\tan 53° \cot 37°$

51. Evaluate : $(\operatorname{Cot}^4\theta - \operatorname{Cosec}^4\theta + \operatorname{Cot}^2\theta + \operatorname{Cosec}^2\theta)$
मूल्यांकन करें: $(\operatorname{Cot}^4\theta - \operatorname{Cosec}^4\theta + \operatorname{Cot}^2\theta + \operatorname{Cosec}^2\theta)$
(a) 1 (b) 0
(c) – 1 (d) 2

52. 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

53. Find the value of $\sin^2 10° + \sin^2 20° + \sin^2 30° + \ldots\ldots + \sin^2 80°$?
$\sin^2 10° + \sin^2 20° + \sin^2 30° + \ldots\ldots + \sin^2 80°$ का मान ज्ञात कीजिए?
(a) 2 (b) 3
(c) 1 (d) 4

54. If $\sin 21° = \frac{x}{y}$, then $\sec 21° - \sin 69°$ is equal to
यदि $\sin 21° = \frac{x}{y}$, तो $\sec 21° - \sin 69°$ 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) $\frac{y^2}{x\sqrt{(x^2 - y^2)}}$

55. If $7\cos^2\theta + 5\sin^2\theta - 6 = 0$, $(0° < \theta < 90°)$, then what is the value of $1 + \sqrt{\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}}$?
यदि $7\cos^2\theta + 5\sin^2\theta - 6 = 0$ है, जहां $(0° < \theta < 90°)$, तो $1 + \sqrt{\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}}$ का मान ज्ञात कीजिए।

SSC CGL 10/09/2024 (Shift-03)

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

56. In ΔABC $\angle A$, $\angle B$, $\angle C$ are angles then evaluate: $\sin 2A + \sin 2B + \sin 2C$
ΔABC में $\angle A$, $\angle B$, $\angle C$ कोण हैं तो मूल्यांकन करें: $\sin 2A + \sin 2B + \sin 2C$
(a) 4sin A sin B sin C
(b) 4sin A cos B sin C
(c) 4sin A sin B cos C
(d) 4cos A cos B cos C

57. 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

58. If cosA, sinA, cotA are in geometric progression, then the value of $\tan^6A - \tan^2A$ is:

यदि cosA, sinA, cotA ज्यामितीय प्रगति में हैं, तो $\tan^6A - \tan^2A$ का मान ज्ञात कीजिए।

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

59. The value of expression (1 + sec22° + cot68°) (1 – cosec22° + tan68°) is:

व्यंजक (1 + sec22° + cot68°) (1 – cosec22° + tan68°) का मान है

(a) 0 (b) –1
(c) 1 (d) 2

60. 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

61. 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) $-\sin\alpha\cos\alpha$

62. Find the value of $8\cos10° \cos20° \cos40°$

$8\cos10° \cos20° \cos40°$ का मान ज्ञात कीजिए।

(a) sin10° (b) cos10°
(c) 1 (d) $4\cos10° + \sqrt{3}$

63. For all α_i {i = 1, 2, 3 ..... 20}, $0 \le \alpha \le 90°$. Given that $\sin\alpha_1 + \sin\alpha_2 + ... + \sin\alpha_{20} = 20$ Then value (in degree) of $(\alpha_1 + \alpha_2 + \alpha_3 + ...+ \alpha_{20})$

सभी के लिए α_i {i = 1, 2, 3 ..... 20}, $0 \le \alpha \le 90°$ दिया है तो $\sin\alpha_1 + \sin\alpha_2 + ... + \sin\alpha_{20} = 20$ $(\alpha_1 + \alpha_2 + \alpha_3 + ...+ \alpha_{20})$ का मान डिग्री में ज्ञात कीजिए।

(a) 1800° (b) 900°
(c) 0° (d) 20°

64. If α, β are acute angle and $\cos2\alpha = \frac{3\cos2\beta - 1}{3 - \cos2\beta}$ then the value of $\tan\alpha \cot\beta$ is:

यदि α, β न्यूनकोण है और $\cos2\alpha = \frac{3\cos2\beta - 1}{3 - \cos2\beta}$ तो $\tan\alpha \cot\beta$ का मान ज्ञात कीजिए।

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

65. If $4\tan\theta - 3 = 0$, then the value of $\frac{1-\cos2\theta}{1+\cos2\theta}$ is?

यदि $4\tan\theta - 3 = 0$ है, तो $\frac{1-\cos2\theta}{1+\cos2\theta}$ का मान ज्ञात कीजिए?

SSC CGL 23/09/2024 (Shift-01)

(a) 1 (b) $\frac{7}{15}$
(c) $\frac{4}{3}$ (d) $\frac{9}{16}$

66. 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) $\frac{a^2 - b^2}{a^2}$

67. Find the value/का मान ज्ञात कीजिए।

$$\frac{(1+\sec\theta\,\mathrm{cosec}\theta)^2 . (\sec\theta - \tan\theta)^2 (1+\sin\theta)}{(\sin\theta + \sec\theta)^2 + (\cos\theta + \mathrm{cosec}\theta)^2}$$

(a) $\sec\theta + \tan\theta$ (b) $1 - \sin\theta$
(c) $1 + \sin\theta$ (d) None

68. 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) $\frac{(1+x)}{x}$

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

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

(a) isosceles triangle
(b) Equilateral "
(c) Right angle "
(d) Scalene triangle

70. The given expression is equivalent to:
दिया गया व्यंजक किस विकल्प के तुल्य है?

$$\sqrt{\frac{\sec\theta+1}{\sec\theta-1}}+\sqrt{\frac{\sec\theta-1}{\sec\theta+1}}$$

SSC CGL 18/09/2024 (Shift-03)

(a) $2\sin\theta$ (b) $2\operatorname{cosec}\theta$
(c) $2\tan\theta$ (d) $2\tan\theta\sec\theta$

71. If $0° < x < 45°$ and $45° < y < 90°$, Then which one of the following is correct?
यदि $0° < x < 45°$ और $45° < y < 90°$ तो निम्नलिखित में से कौन-सा सही है?

(a) $\sin x = \sin y$ (b) $\sin x < \sin y$
(c) $\sin x > \sin y$ (d) $\sin x \geq \sin y$

72. 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) $\frac{\sqrt{6}}{2}$

73. If A = 15°, then what is the value of $\frac{11\sqrt{2}\cos 3A+10\sin 2A}{7\sqrt{3}\sin 4A}$?

यदि A = 15° है, तो $\frac{11\sqrt{2}\cos 3A+10\sin 2A}{7\sqrt{3}\sin 4A}$ का क्या मान होगा।

SSC CGL 24/09/2024 (Shift-03)

(a) $\frac{11}{7}$ (b) $\frac{21}{32}$
(c) $\frac{32}{21}$ (d) $\frac{7}{11}$

74. 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

75. 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) $\frac{8}{\sqrt{65}}$

76. 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

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

78. If x, y are acute angles $0 < (x + y) < 90°$ and $\sin(2x - 20) = \cos(2y + 20)$ then the value of $\tan(x + y)$
यदि x, y न्यूनकोण हैं $0 < (x + y) < 90°$ 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

79. If $\frac{2\sin x}{(1+\cos x+\sin x)} = t$ then $\frac{1-\cos x+\sin x}{(1+\sin x)}$ an 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) $\frac{t}{\sin x}$

80. $\sin75° + \sin15°$ can be expressed as.
$\sin75° + \sin15°$ के रूप में व्यक्त किया जा सकता है।

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

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

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

यदि $x = \text{cosec}\theta - \cos\theta$ 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) $y^2 (x^2 + y^2 - 5) = 1$

83. $\tan x = a$ 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

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

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

(a) $\frac{775}{168}$ (b) 2

(c) $\frac{771}{107}$ (d) $\frac{770}{107}$

85. If $\text{cosec}\theta - \sin\theta = m$ 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 $\text{cosec}\theta - \sin\theta = m$ 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) $\frac{1}{4}$

86. 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) $\frac{7}{4}$

87. ABC is a triangle right angled at B and AB : BC = 3 : 4. What is sinA + sinB + sinC equal to?

ABC एक त्रिभुज है जिसका कोण B समकोण है और AB : BC = 3 : 4 है। sinA + sinB + sinC किसके बराबर है?

(a) 2 (b) $\frac{11}{5}$

(c) $\frac{12}{5}$ (d) 3

88. 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) $\sin^2\theta$

89. If θ is an acute angle and $\sin\theta\cos\theta = 2\cos^3\theta - 1.5\cos\theta$, then what is sinθ equal to?

यदि θ एक न्यूनकोण है और $\sin\theta\cos\theta = 2\cos^3\theta - 1.5\cos\theta$, तो sinθ किसके बराबर है?

(a) $\frac{\sqrt{5}-1}{4}$ (b) $\frac{1-\sqrt{5}}{4}$

(c) $\frac{\sqrt{5}+1}{4}$ (d) $-\frac{(\sqrt{5}+1)}{4}$

90. 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) $\text{cosec}x$ (b) $2\text{cosec}x$

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

91. 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

92. If $x + y = 90°$ and $\sin x : \sin y = \sqrt{3} : 1$ then what is $x : y$ equal to?

यदि $x + y = 90°$ 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

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

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

(a) $P \le 2$ (b) $P \ge 2$

(c) $P < 2$ (d) $P > 2$

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

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

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

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

95. If $\tan\theta = \frac{p}{q}$, then what is $\frac{p\sec\theta - q\text{cosec}\theta}{p\sec\theta + q\text{cosec}\theta}$ 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

96. 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

97. If α and β are complimentary angles, then what is $\sqrt{\operatorname{cosec}\alpha.\operatorname{cosec}\beta}\left(\frac{\sin\alpha}{\sin\beta}+\frac{\cos\alpha}{\cos\beta}\right)^{-\frac{1}{2}}$ equal to?

यदि α और β पूरक कोण हैं, तो $\sqrt{\operatorname{cosec}\alpha.\operatorname{cosec}\beta}\left(\frac{\sin\alpha}{\sin\beta}+\frac{\cos\alpha}{\cos\beta}\right)^{-\frac{1}{2}}$ किसके बराबर है?

(a) 0 (b) 1

(c) 2 (d) None of these

98. $(1-\tan A)^2 + (1+\tan A)^2 + (1-\cot A)^2 + (1+\cot A)^2$ is equal to?/किसके बराबर है?

(a) $\sin^2A\cos^2A$ (b) $\sec^2A\operatorname{cosec}^2A$

(c) $2\sec^2A\ \operatorname{cosec}^2A$ (d) None of these

99. If $\sec x.\operatorname{cosec} x = 2$ then what is $\tan^n x + \cot^n x$ equal to?

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

(a) 2 (b) 2^{n+1}

(c) 2n (d) 2^{n-1}

100. 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

101. 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

102. If A is an acute angle, then $\sqrt{\frac{1-\cos A}{1+\cos A}}+\sqrt{\frac{1+\cos A}{1-\cos A}}$ is equal to:

यदि A एक न्यून कोण है, तो $\sqrt{\frac{1-\cos A}{1+\cos A}}+\sqrt{\frac{1+\cos A}{1-\cos A}}$ का मान ज्ञात कीजिए।

SSC CGL 19/09/2024 (Shift-03)

(a) 2cosecA (b) 2cosA

(c) 2secA (d) 2sinA

103. If $\tan\theta = \frac{5}{8}$, then find the value of $\frac{(1+\cos\theta)(1-\cos\theta)}{(1+\sin\theta)(1-\sin\theta)}$

यदि $\tan\theta = \frac{5}{8}$ है, तो $\frac{(1+\cos\theta)(1-\cos\theta)}{(1+\sin\theta)(1-\sin\theta)}$ का मान ज्ञात कीजिए।

SSC CGL 19/09/2024 (Shift-03)

(a) $\frac{5}{64}$ (b) $\frac{2}{25}$

(c) $\frac{25}{64}$ (d) $\frac{64}{25}$

LEVEL - 03

104. If $x = a\sec\theta\cos\Phi$, $y = b\sec\theta\sin\Phi$ and $z = c\tan\theta$, then the value of $\left(\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}\right)$ is equal to:

यदि $x = a\sec\theta\cos\Phi$, $y = b\sec\theta\sin\Phi$ और $z = c\tan\theta$ है तो $\left(\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}\right)$ का मान होगा।

SSC CGL 26/09/2024 (Shift-03)

(a) 2 (b) 1

(c) 3 (d) 0

105. Let $x = r\cos(t)$, $y = r\sin(t)\cos(u)$, $z = r\sin(t)\sin(u)$. Then the value of $x^2 + y^2 + z^2$ is ___.

मान लें कि $x = r\cos(t)$, $y = r\sin(t)\cos(u)$, $z = r\sin(t)\sin(u)$ है तो $x^2 + y^2 + z^2$ का मान ज्ञात करें।

SSC CGL 23/09/2024 (Shift-01)

(a) $r^2\cos(u)$ (b) r^2

(c) 2r (d) $r^2\sin(t)$

106. The value of the expression $\frac{1-\sin(2t)}{1+\sin(2t)} \times \frac{\cos(t)+\sin(t)}{\cos(t)-\sin(t)}$ is:

व्यंजक $\frac{1-\sin(2t)}{1+\sin(2t)} \times \frac{\cos(t)+\sin(t)}{\cos(t)-\sin(t)}$ का मान ..... है।

SSC CGL 19/09/2024 (Shift-02)

(a) $\frac{1-2\tan(t)}{1+2\tan(t)}$ (b) $\frac{1-\tan(t)}{1+\tan(t)}$

(c) $\frac{1+2\tan(t)}{1-2\tan(t)}$ (d) $\frac{1+\tan(t)}{1-\tan(t)}$

107. 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^2q^2

108. 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) $\frac{1+6c^2+3c^4}{4}$

109. $\frac{\cos x}{1+\operatorname{cosec} x}+\frac{\cos x}{\operatorname{cosec} x-1}=2$, 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) $\frac{\pi}{6}$

110. 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

111. If ΔABC 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 tanA + tanB equal to?

यदि ΔABC, 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 tanA + tanB किसके बराबर है?

(a) $\frac{u^2}{uw}$ (b) 1

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

112. 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 tanB

(c) tanB (d) 4 tanB

113. 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) $\tan\theta$

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

यदि sinA + cosA = 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) $p^3 + 3p + 2q = 0$

115. 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) $\frac{1}{3} \le x \le 3$

116. 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) $(m^2-n^2)^2 = m^2n^2$

(d) $(m^2+n^2)^2 = m^2n^2$

117. 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) $2\cos^2\theta$

118. If $p = \cot\theta + \tan\theta$ and $q = \sec\theta - \cos\theta$ then $(p^2q)^{\frac{2}{3}} - (q^2p)^{\frac{2}{3}}$ is equal to?

यदि $p = \cot\theta + \tan\theta$ और $q = \sec\theta - \cos\theta$ तो $(p^2q)^{\frac{2}{3}} - (q^2p)^{\frac{2}{3}}$ किसके बराबर है?

(a) 0 (b) 1

(c) 2 (d) 3

119. 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) cosA (b) cos2A

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

120. If $\frac{\sin^2\theta}{\cos^2\theta - 3\cos\theta + 2} = 1$, θ lies in the first quadrant, then the value of $\frac{\tan^2\frac{\theta}{2} + \sin^2\frac{\theta}{2}}{\tan\theta + \sin\theta}$ is:

यदि $\frac{\sin^2\theta}{\cos^2\theta - 3\cos\theta + 2} = 1$, θ प्रथम चतुर्थांश में स्थित है, तो $\frac{\tan^2\frac{\theta}{2} + \sin^2\frac{\theta}{2}}{\tan\theta + \sin\theta}$ का मान है:

(a) $\frac{2\sqrt{3}}{27}$ (b) $\frac{5\sqrt{3}}{27}$

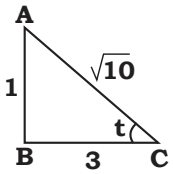
(c) $\frac{2\sqrt{3}}{9}$ (d) $\frac{7\sqrt{3}}{54}$

ANSWER KEY

1. (c)	2. (a)	3. (a)	4. (d)	5. (b)	6. (c)	7. (c)	8. (c)	9. (b)	10. (c)
11. (c)	12. (d)	13. (d)	14. (c)	15. (b)	16. (b)	17. (b)	18. (d)	19. (c)	20. (b)
21. (c)	22. (b)	23. (a)	24. (b)	25. (c)	26. (a)	27. (c)	28. (a)	29. (b)	30. (d)
31. (b)	32. (b)	33. (a)	34. (c)	35. (c)	36. (c)	37. (a)	38. (b)	39. (d)	40. (a)
41. (c)	42. (b)	43. (b)	44. (b)	45. (b)	46. (a)	47. (a)	48. (b)	49. (c)	50. (b)
51. (b)	52. (a)	53. (d)	54. (a)	55. (a)	56. (a)	57. (b)	58. (d)	59. (d)	60. (c)
61. (c)	62. (d)	63. (a)	64. (b)	65. (d)	66. (d)	67. (b)	68. (b)	69. (a)	70. (b)
71. (d)	72. (b)	73. (c)	74. (c)	75. (d)	76. (a)	77. (b)	78. (d)	79. (b)	80. (d)
81. (a)	82. (b)	83. (c)	84. (a)	85. (b)	86. (d)	87. (c)	88. (b)	89. (a)	90. (b)
91. (a)	92. (c)	93. (b)	94. (a)	95. (c)	96. (b)	97. (b)	98. (c)	99. (a)	100. (a)
101. (a)	102. (a)	103. (c)	104. (b)	105. (b)	106. (b)	107. (b)	108. (b)	109. (c)	110. (a)
111. (d)	112. (c)	113. (d)	114. (c)	115. (d)	116. (b)	117. (d)	118. (b)	119. (d)	120. (d)

SOLUTIONS

1. (c)



Given,

$\tan(t) = \frac{1}{3} \rightarrow \frac{P}{B}$

$AC = \sqrt{3^2+1^2} = \sqrt{10}$

$\therefore \text{Sec}(t) = \frac{\sqrt{10}}{3}$

Alternate Method:

$\tan(t) = \frac{1}{3}$

We know that,

$\text{Sec}^2t - \tan^2t = 1$

$\Rightarrow \text{Sec}^2t - \frac{1}{9} = 1 \Rightarrow \text{Sec}^2t = \frac{10}{9}$

$\Rightarrow \text{Sec}(t) = \frac{\sqrt{10}}{3}$

2. (a) $\frac{5}{\sqrt{3}} - \text{cosec}60° = \frac{5}{\sqrt{3}} - \frac{2}{\sqrt{3}} = \frac{3}{\sqrt{3}} = \sqrt{3}$

3. (a) If $\theta = 45°$

Then, $\sin45° = \cos45° = \frac{1}{\sqrt{2}}$

4. (d) $\frac{\sin A}{1+\cos A} + \cot A$

Let, $\theta = 30°$

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

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

From options

(d) $\text{cosec}30° = 2$

Alternate Method:-

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

$= \frac{1+\cos A}{\sin A(1+\cos A)} = \frac{1}{\sin A} = \text{cosec}A.$

5. (b) $\frac{\tan69° + \tan66°}{1 - \tan69°\tan66°}$

$\tan(69° + 66°) = \tan135°$

$= \tan(90° + 45°) = -\cot45° = -1$

6. (c) $3\sin15° - 4\sin^3 15°$

Formula:- $\sin3\theta = 3\sin\theta - 4\sin^3\theta$

$\sin(3 \times 15°) = \sin45° = \frac{1}{\sqrt{2}}$

7. (c) $\sin79°\cos19° - \cos79°\sin19°$

Formula:- $\sin(A - B) = \sin A.\cos B - \cos A.\sin B$

$\sin(79° - 19°) = \sin60° = \frac{\sqrt{3}}{2}$

8. (c) $\cos70°\cos40° + \sin70°\sin40°$

Formula:- $\cos(A - B) = \cos A.\cos B + \sin A.\sin B$

$\cos(70° - 40°) = \cos30° = \frac{\sqrt{3}}{2}$

9. (b) $2\cos^2\theta + \sin\theta - 2 = 0$

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

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

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

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

$2\sin\theta - 1 = 0$

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

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

10. (c) $\frac{\sec\alpha+\tan\alpha}{\sec\alpha-\tan\alpha} = \frac{7}{4}$

$\Rightarrow 4\sec\alpha + 4\tan\alpha = 7\sec\alpha - 7\tan\alpha$

$\Rightarrow 11\tan\alpha = 3\sec\alpha$

$\Rightarrow \frac{\tan\alpha}{\sec\alpha} = \frac{3}{11} \Rightarrow \sin\alpha = \frac{3}{11}$

$\therefore \text{cosec}\alpha = \frac{11}{3}$

Alternate Method:-

By using componendo and dividendo

$\frac{\sec\alpha}{\tan\alpha} = \frac{11}{3}$

$\text{cosec}\alpha = \frac{11}{3}$

11. (c) $7\sin^2\theta + 3\cos^2\theta = 4$

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

$4\sin^2\theta = 1$

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

$\theta = 30°$

So, $\tan30° = \frac{1}{\sqrt{3}}$

12. (d) $\frac{3\sin58°}{5\cos32°} + \frac{2\cos62°}{5\sin28°} = \frac{3}{5} + \frac{2}{5} = 1$

Note: $\sin\alpha = \cos\beta$

When, $\alpha + \beta = 90°$

13. (d)

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

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

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

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

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

$= 2\cos\theta$

15. (b) $\sin10^\circ \sin30^\circ \sin50^\circ \sin70^\circ = ?$

We know,

$$\because \sin\theta \sin(60-\theta) \sin(60+\theta) = \frac{1}{4}\sin3\theta$$

Then,

$$\Rightarrow \sin30^\circ [\sin10^\circ \sin50^\circ \sin70^\circ]$$

$$\Rightarrow \frac{1}{2}\left[\frac{1}{4} \times \sin 3 \times 10^\circ\right] \Rightarrow \frac{1}{8} \times \sin 30^\circ = \frac{1}{16}$$

16. (b) $\sin20^\circ \sin40^\circ \sin60^\circ \sin80^\circ$

We know,

$$\because \sin\theta \sin2\theta \sin4\theta = \frac{1}{4}\sin3\theta$$

Then,

$$\sin60^\circ \sin20^\circ \sin40^\circ \sin80^\circ$$

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

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

17. (b) $\tan20^\circ \tan40^\circ \tan80^\circ$

We know,

$$\because \tan\theta \tan2\theta \tan4\theta = \tan3\theta$$

Then,

$$\tan(3 \times 20) = \tan60^\circ = \sqrt{3}$$

18. (d) $\frac{1}{\cos80^\circ}\left[\cos10^\circ \underline{\cos20^\circ \cos40^\circ \cos80^\circ}\right]$

We know,

$$\frac{1}{4}\cos3\theta = \theta.2\theta.4\theta$$

$$\frac{\cos10^\circ}{\cos80^\circ} \times \frac{1}{4}\cos(3 \times 20^\circ)$$

$$\cot10^\circ \times \frac{1}{4}\cos60^\circ$$

Where: $\cos80^\circ = \sin10^\circ$

$$\frac{1}{8}\cot10^\circ$$

19. (c) $1 - \sin10^\circ \sin50^\circ \sin70^\circ$

Formula:- $\frac{1}{4}\sin3\theta = \sin\theta.\sin(60-\theta).\sin(60+\theta)$

$$1 - \sin(60^\circ - 10^\circ)\sin10^\circ \sin(60^\circ + 10^\circ)$$

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

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

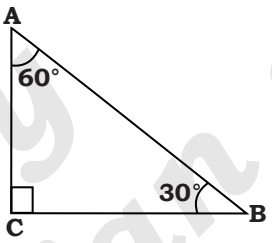
20. (b) $\cos15^\circ \cos45^\circ \cos75^\circ$

Formula :- $\frac{1}{4}\cos3\theta = \cos\theta.\cos(60-\theta).\cos(60+\theta)$

$$\cos(60^\circ - 15^\circ)\cos15^\circ \cos(60^\circ + 15^\circ)$$

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

21. (c)



$$\tan A = \sqrt{3} \Rightarrow A = 60^\circ$$

$$\because \cot(A+B) = \cot 90^\circ = 0$$

$$\therefore \sin A \cos B \cot(A+B) = 0$$

22. (b) $\cos10^\circ \cos30^\circ \cos50^\circ \cos70^\circ \cos90^\circ$

Where,

$\cos90^\circ = 0$

$\cos10^\circ \cos30^\circ \cos50^\circ \cos70^\circ \times 0 = 0$

23. (a) ATQ,

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

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

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

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

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

24. (b) $\tan4^\circ \tan43^\circ \tan47^\circ \tan86^\circ$

$\tan4^\circ \tan86^\circ \tan43^\circ \tan47^\circ$

$\tan4^\circ \tan(90^\circ - 4)^\circ \tan43^\circ \tan(90^\circ - 43^\circ)$

$\tan4^\circ \times \cot4^\circ \times \tan43^\circ \times \cot43^\circ$

$1 \times 1 = 1$

SMART APPROACH:-

If A + B = 90

Then,

$\Rightarrow$ TanA.TanB = 1

$\Rightarrow$ CotA.CotB = 1

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

$\Rightarrow$ Using,

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

$\Rightarrow \cos^236^\circ - \sin^2A + \cos^254^\circ - \sin^2A$

$\Rightarrow \cos^236^\circ - \sin^2A + \sin^236^\circ - \sin^2A$

$\Rightarrow 1 - 2\sin^2A \Rightarrow \cos2A$

Where: $\cos2\theta = 1 - 2\sin^2A$

26. (a) ATQ,

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

If we take $\alpha = \beta = 45°$

Then, $\sec 45° = \operatorname{cosec} 45° \rightarrow \sqrt{2} = \sqrt{2}$ verify

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

27. (c) Put $\theta = 45°$

Now, $\frac{5}{1+\cot^2 45°} + \frac{3}{1+\tan^2 45°} + 2\cos^2 45°$

$= \frac{5}{2} + \frac{3}{2} + 2 \times \frac{1}{2} = 4 + 1 = 5$

<u>Alternate Method:</u>

$\frac{5}{1+\cot^2 45°} + \frac{3}{1+\tan^2 45°} +$

$2\cos^2 45° = \frac{5}{\operatorname{cosec}^2\theta} + \frac{3}{\sec^2\theta} + 2\cos^2\theta$

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

$5(\sin^2\theta + \cos^2\theta) = 5$

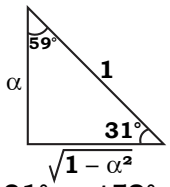
28. (a) $\frac{5}{\sec^2\theta} + \frac{2}{1+\cot^2\theta} + 3\sin^2\theta$

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

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

$5 \times 1 = 5$

29. (b)



$\sin 31°$, $\cot 59° = ?$

$\sin 31° = \frac{\alpha \rightarrow p}{1 \rightarrow h}$

$\therefore b = \sqrt{1-\alpha^2}$

$\cot 59° = \frac{b}{p} = \frac{\alpha}{\sqrt{1-\alpha^2}}$

30. (d) ATQ,

$A + B = 90°$

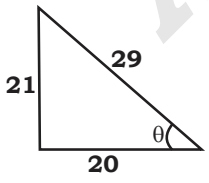
Put $A = 45°$ & $B = 45°$

Then,

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

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

31. (b)



$\sec\theta = \frac{29}{20}$

By triplet of 20, 21, 29

perpendicular = 21

$\therefore 3\operatorname{Cosec}\theta + 3\cot\theta = 3(\operatorname{Cosec}\theta + \cot\theta)$

$= 3\left(\frac{29}{21} + \frac{20}{21}\right) = 3 \times \frac{49}{21} = 7$

32. (b) $0° < \theta < 90°$ $(\sin\theta + \cos\theta)$

Put $\theta = 45°$

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

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

greater than 1

33. (a) $\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta} = \frac{5}{3}$

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

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

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

<u>Alternate Method:-</u>

By using componendo and dividendo

$\frac{\operatorname{Sec}\theta}{\tan\theta} = \frac{8}{2} = \frac{4 \rightarrow h}{1 \rightarrow p}$

$\operatorname{Sin}\theta = \frac{p}{h} = \frac{1}{4}$

34. (c) Rationalization

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

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

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

35. (c) $\frac{\cos^2\theta}{\left(\cot^2\theta - \cos^2\theta\right)} = 3$

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

$\theta = 60°$

<u>Alternate Method:-</u>

$\cos^2\theta = 3\cot^2\theta - 3\cos^2\theta$

$4\cos^2\theta = 3\cot^2\theta$

$4\cos^2\theta = 3 \times \frac{\cos^2\theta}{\sin^2\theta}$

$\sin^2\theta = \frac{3}{4}$

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

$\therefore \theta = 60°$

36. (c) $8\cos A + 15\sin A + 15$

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

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

37. (a) $\cos x + \cos y = 2$

Put $x = y = 0$

$1 + 1 = 2$ verify

So, $\sin x + \sin y$

$0 + 0 = 0$

38. (b) $2\frac{\tan 54^\circ}{\cot 36^\circ} - \frac{\cot 41^\circ}{\tan 49^\circ}$

$= 2 \times 1 - 1 = 1$

Note: $\tan\alpha = \cot\beta$

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

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

Put $x = 0$

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

$3 + 4 + 6 = 13$

40. (a) $\tan 15^\circ = 2 - \sqrt{3}$

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

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

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

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

$2(4 + 3) = 14$

41. (c) ATQ,

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

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

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

Then, we get

$B = 2A$

42. (b) $\cos\theta + \sec\theta = k$

Square both sides,

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

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

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

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

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

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

$\alpha = \beta$

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

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

44. (b) Put $x = 90^\circ$

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

$= (1 - 0 + 1) \times 1 = 2 \times 1 = 2$

45. (b) $+\sqrt{\cos x \operatorname{cosec} y - \cos x \sin y}$

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

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

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

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

46. (a) $\tan^2 y \operatorname{cosec}^2 x - 1 = \tan^2 y$

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

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

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

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

$x = y$

$x - y = 0$

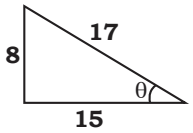
47. (a) $\sin\theta + \operatorname{cosec}\theta = 2.5$

use option (a)

$\theta = 30^\circ$

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

48. (b) $\tan\theta = \frac{8}{15}$



(8, 15, 17 are triplet)

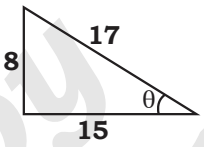
Consider,

$\frac{\sqrt{1-\sin\theta}}{\sqrt{1+\sin\theta}} = \sqrt{\frac{1-\sin\theta}{1+\sin\theta} \times \frac{1-\sin\theta}{1-\sin\theta}}$

$= \frac{1-\sin\theta}{\cos\theta} = \sec\theta - \tan\theta = \frac{17}{15} - \frac{8}{15} = \frac{9}{15} = \frac{3}{5}$

<u>Alternate Method:-</u>

$\tan\theta = \frac{8}{15} \begin{matrix} \to P \\ \to B \end{matrix}$ H = 17



$\Rightarrow \sin\theta = \frac{8}{17}$

$\therefore \frac{\sqrt{1-\sin\theta}}{\sqrt{1+\sin\theta}} = \sqrt{\frac{1-\frac{8}{17}}{1+\frac{8}{17}}} = \sqrt{\frac{9}{25}} = \frac{3}{5}$

49. (c) $\cos^2 45^\circ - \sin^2 15^\circ$

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

$\left(\frac{1}{\sqrt{2}}\right)^2 - \left(\frac{\sqrt{3}-1}{2\sqrt{2}}\right)^2 \Rightarrow \frac{1}{2} - \frac{3+1-2\sqrt{3}}{8}$

$\Rightarrow \frac{1}{2} - \frac{2(2-\sqrt{3})}{8} \Rightarrow \frac{2-2+\sqrt{3}}{4} = \frac{\sqrt{3}}{4}$

50. (b)

$\frac{\tan 57 + \cot 37}{\tan(90-57) + \cot(90-37)} = \frac{\tan 57 + \cot 37}{\cot 57 + \tan 37}$

$= \frac{\tan 57 + \cot 37}{\frac{1}{\tan 57} + \frac{1}{\cot 37}}$

$\frac{(\tan 57 + \cot 37)}{(\cot 37 + \tan 57)} = \tan 57 \times \cot 37$

51. (b) $\cot^4\theta - \operatorname{cosec}^4\theta + \cot^2\theta + \operatorname{cosec}^2\theta$.

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

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

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

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

52. (a) $x = a\cos^3\theta$, $y = b\sin^3\theta$

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

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

$\left(\cos^3\theta\right)^{\frac{2}{3}} + \left(\sin^3\theta\right)^{\frac{2}{3}}$

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

53. (d) $\sin^2 10° + \sin^2 20° + \sin^2 30° + \text{---------} + \sin^2 80°$

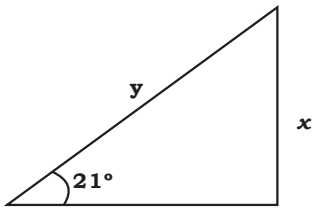
$\underbrace{\sin^2 10° + \sin^2(90° - 10°)} + \underbrace{\sin^2 20° + \sin^2(90° - 20°)} + \ldots.$

Total terms = 8

$1 + 1 + 1 + 1 = 4$

54. (a) Given,

$\sin 21° = \frac{x}{y}$



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

$\sec 21° - \sin 69°$

$\sec 21° - \cos 21°$

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

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

55. (a) $7\cos^2\theta + 5\sin^2\theta - 6 = 0$

$5(\sin^2\theta + \cos^2\theta) + 2\cos^2\theta - 6 = 0$

$C = \frac{1}{\sqrt{2}} \Rightarrow \theta = 45°$

$\therefore 1 + \sqrt{\frac{\sec\theta + \tan\theta}{\sec\theta - \tan\theta}}$

<u>Rationalization</u>

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

$= 1 + \sec\theta + \tan\theta = 1 + \sec 45° + \tan 45°$

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

<u>Alternate Method:</u>

Let, $\theta = 45°$

$7\cos^2\theta + 5\sin^2\theta - 6 = 0$

$\Rightarrow 7 \times \frac{1}{2} + 5 \times \frac{1}{2} - 6 = 0 \Rightarrow 0 = 0$ (verified)

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

$= 1 + \sec\theta + \tan\theta = 1 + \sec 45° + \tan 45°$

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

56. (a) $\sin 2A + \sin 2B + \sin 2C$

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

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

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

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

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

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

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

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

57. (b) Given

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

Put $x = 1$

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

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

So, $x = 1$

58. (d) Given, cosA , sinA & cotA are in G.P.

So, $\sin^2 A = \cos A.\cot A$

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

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

ATQ,

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

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

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

59. (d) $\Rightarrow (1 + \sec 22° + \cot 68°)(1 - \operatorname{cosec} 22° + \tan 68°)$

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

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

Formula:- $(A + B)(A - B) = A^2 - B^2$

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

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

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

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

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

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

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

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

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

Alternate Method:-

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

Let, A = 135

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

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

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

61. (c) $\sec(\theta+\alpha)+\sec(\theta-\alpha)=2\sec\theta$

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

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

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

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

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

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

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

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

62. (d) $8\cos10^\circ\cos20^\circ\cos40^\circ$

$4[2\cos40^\circ\cos20^\circ]\cos10^\circ$

$4[\cos60^\circ+\cos20^\circ]\cos10^\circ$

$$4\left[\frac{1}{2}+\cos20^\circ\right]\cos10^\circ$$

$$4\left[\frac{1}{2}\cos10^\circ+\cos20^\circ\cos10^\circ\right]$$

$=2[\cos10^\circ+\cos30^\circ+\cos10^\circ]$

$$=2\left[2\cos10^\circ+\frac{\sqrt{3}}{2}\right]=4\cos10^\circ+\sqrt{3}$$

63. (a) $\sin\alpha_1+\sin\alpha_2+\ldots\ldots\sin\alpha_{20}=20$

Here $\alpha_1=\alpha_2=\alpha_3\ldots\ldots\ldots=90^\circ$

So, $\alpha_1+\alpha_2+\alpha_3+\ldots\ldots\ldots+\alpha_{20}=20\times90=1800$

64. (d) $\cos2\alpha=\frac{3\cos2\beta-1}{3-\cos2\beta}$

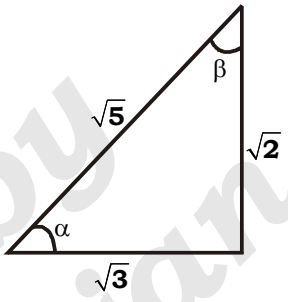
Put $\beta=30^\circ$

$$\cos2\alpha=\frac{\left(\frac{3}{2}-1\right)}{\left(3-\frac{1}{2}\right)}=\frac{\frac{1}{2}}{\frac{5}{2}}=\frac{1}{5}$$

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

$$2\cos^2\alpha=\frac{6}{5}\Rightarrow\cos^2\alpha=\frac{3}{5}$$

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



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

65. (d) $4\tan\theta-3=0$

$$\tan\theta=\frac{3}{4}$$

$$\therefore\ \frac{1-\cos2\theta}{1+\cos2\theta}=\frac{1-(\cos^2\theta-\sin^2\theta)}{1+(\cos^2\theta-\sin^2\theta)}$$

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

$$\tan^2\theta=\left(\frac{3}{4}\right)^2=\frac{9}{16}$$

66. (d) ATQ,

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

Put $\theta=\phi=30^\circ$

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

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

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

$$\left(\frac{a^2-b^2}{\tan^2\theta}\right)=\left(\frac{a^2-b^2}{\left(\frac{1}{\sqrt{3}}\right)^2}\right)=\frac{a^2-b^2}{a^2}$$

67. (b) $$\frac{(1+\sec\theta\,\mathrm{cosec}\theta)^2.(\sec\theta-\tan\theta)^2(1+\sin\theta)}{(\sin\theta+\sec\theta)^2+(\cos\theta+\mathrm{cosec}\theta)^2}$$

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

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

Put $\theta = 45°$

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

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

Use option (b)

$(1 - \sin45°) = 1-\frac{1}{\sqrt{2}}$ (verify)

68. (b)

Put $\theta = 45°$

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

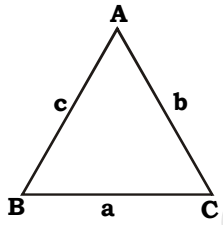
$$x=\frac{2}{2+\sqrt{2}}=\frac{\sqrt{2}}{\sqrt{2}+1}$$

Now,

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

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

69. (a)



Given,

$\cos B = \frac{\sin A}{2\sin C}$ 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, isoscales triangle

70. (b) $\sqrt{\frac{\sec\theta+1}{\sec\theta-1}}+\sqrt{\frac{\sec\theta-1}{\sec\theta+1}}$

Rationalize the denominator

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

$$=\frac{2}{\frac{\cos\theta}{\sin\theta}}=2\operatorname{cosec}\theta$$

Alternate Method:

put, $\theta = 60°$

$$\sqrt{\frac{\sec\theta+1}{\sec\theta-1}}+\sqrt{\frac{\sec\theta-1}{\sec\theta+1}}=\sqrt{\frac{2+1}{2-1}}+\sqrt{\frac{2-1}{2+1}}$$

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

By options,

$2\operatorname{cosec}\theta = 2\operatorname{cosec}60° = 2\times\frac{2}{\sqrt{3}}=\frac{4}{\sqrt{3}}$

71. (d) $0 < x < 45°$ & $45° < y < 90°$

We know $\sin\theta$ increase when angle increase

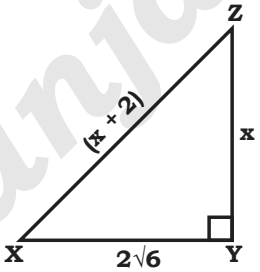
Here $y > x$

So, $\sin y > \sin x$

because, $\sin y > \sin x$

72. (b) Let, YZ = X, XZ = X + 2

XZ – YZ = 2



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

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

$4x = 20$

$x = 5$

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

73. (c) $\frac{11\sqrt{2}\cos3A+10\sin2A}{7\sqrt{3}\sin4A}$

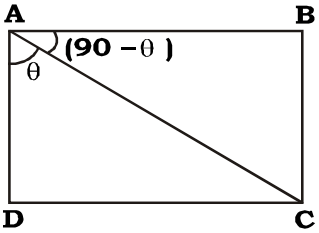
$A = 15°$

Now,

$$=\frac{11\sqrt{2}\cos45°+10°\sin30°}{7\sqrt{3}\sin60°}$$

$$=\frac{11\sqrt{2}\times\frac{1}{\sqrt{2}}+10\times\frac{1}{2}}{7\sqrt{3}\times\frac{\sqrt{3}}{2}}=\frac{11+5}{\frac{21}{2}}=\frac{32}{21}$$

74. (c)



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

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

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

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

75. (d) If $\sin\alpha = \frac{4}{5}$ & $\cos\beta = \frac{5}{13}$

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

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

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

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

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

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

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

76. (a) $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$ .....(1)

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

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

from (i) & (ii)

$xy^3 + yx^3 = xy$

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

So, $x^2 + y^2 = 1$

77. (b) 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,

$\sin\theta.\sin\theta + \cos\theta.\cos\theta = 1$

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

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

78. (d) $\sin(2x - 20°) = \cos(2y + 20°)$

$(2x - 20°) + (2y + 20°) = 90°$

$2(x + y) = 90°$

$x + y = 45°$

$\tan(x + y) = \tan 45° = 1$

79. (b) $\frac{2\sin x}{1 + \cos x + \sin x} = t$

Put $q = 45°$

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

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

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

Now,

$$\frac{1 - \cos x + \sin x}{(1+\sin x)} = \frac{1 - \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}}{1 + \frac{1}{\sqrt{2}}}$$

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

80. (d) $\sin75° + \sin15°$

$\sin(45° + 30°) + \sin(45° - 30°)$

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

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

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

81. (a) $\underbrace{3\sin x + 4\cos x}_{\text{(p) Let}} + r \geq 10$

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

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

So, Min. of r = 5

82. (b) If $x = \text{cosec}\theta - \cos\theta$ & $y = \sec\theta - \cos\theta$

Put $\theta = 45°$

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

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

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

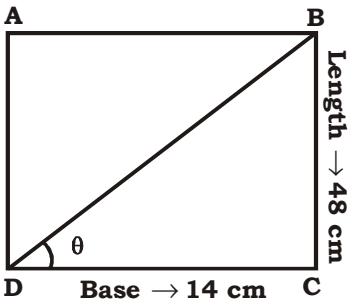
83. (c) Let, $\tan x = a$ and $\tan y = b$

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

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

$= (a+b)\left[\frac{ab-1+1-ab}{ab}\right] = (a+b) \times 0 = 0$

84. (a)



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

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

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

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

85. (b) Put $\theta = 45°$

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

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

$m = n$

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

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

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

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

86. (d) Put $\theta = 45°$,

LHS $= \sin\theta + \cos\theta = \sin 45° + \cos 45°$

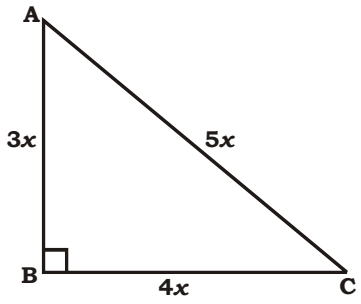
$= \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}} = \sqrt{2} = RHS$

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

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

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

87. (c)



sinA + sinB + sinC

$= \frac{4x}{5x} + 1 + \frac{3x}{5x} = \frac{4}{5} + \frac{3}{5} + 1 = \frac{7}{5} + 1 = \frac{12}{5}$

88. (b) $(ax^{-1} - by^{-1})(ax^{-1} + by^{-1})$

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

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

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

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

89. (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.

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

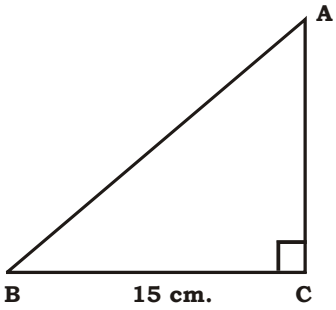
90. (b) $\frac{\tan x}{1+\sec x} - \frac{\tan x}{1-\sec x}$

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

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

$\Rightarrow \frac{2}{\frac{\cos\theta}{\sin\theta}\cos\theta} = 2\operatorname{cosec} x$

91. (a)



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

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

Let $AC = 4x$ and $AB = 5x$

Then $BC = 3x$ (Using Pythagorean triplet)

$3x = 15$

$x = 5$

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

92. (c) $\frac{\sin x}{\sin y} = \frac{\sqrt{3}}{1}$

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

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

$\tan x = \sqrt{3}$

$\tan x = \tan 60°$

$x = 60°$

$x + y = 90°$

$y = 90° - 60° = 30°$

$x : y = 60° : 30° = 2 : 1$

93. (b) Let $a = \tan^2 x$ and $b = \cot^2 x$

We know,

Am $\geq$ Gm

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

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

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

$P \geq 2$

<u>Alternate Method:-</u>

Put $x = 45°$

then,

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

Put $x = 30°$

then,

$\tan^2 x + \cot^2 x = \frac{10}{3} = 3.33$

Hence, $P \geq 2$

94. (a) $\text{cosec}^4\alpha = 17 + \cot^4\alpha$

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

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

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

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

$2\,\text{cosec}^2\alpha = 18$

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

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

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

95. (c) $\frac{p\sec\theta - q\,\text{cosec}\theta}{p\sec\theta + q\text{cosec}\theta}$

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

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

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

96. (b) $N = \text{cosec}^2\theta - 2 + \sin^2\theta$

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

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

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

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

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

97. (b) $\alpha + \beta = 90°$

Let,

$\alpha = 45°$ and $\beta = 45°$

Put the value in this equ.

$\sqrt{\text{cosec } 45° \text{ cosec } 45°}\left(\frac{\sin 45°}{\sin 45°} + \frac{\cos 45°}{\cos 45°}\right)^{-\frac{1}{2}}$

$= \text{cosec}45° \times (1+1)^{-\frac{1}{2}} = \sqrt{2} \times (2)^{-\frac{1}{2}} = \sqrt{2} \times \frac{1}{\sqrt{2}} = 1$

98. (c) $2[1 + \tan^2 A] + 2[1 + \cot^2 A]$

$= 2\sec^2 A + 2\,\text{cosec}^2 A$

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

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

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

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

99. (a) $\sec x \times \text{cosec}\, x = 2$

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

$2\sin x \cos x = 1$

$\sin 2x = 1$

$\sin 2x = \sin 90°$

$2x = 90°$

$x = 45°$

$\tan^n x + \cot^n x = \tan^n 45° + \cot^n 45° = 1^n + 1^n = 2$

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

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

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

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

101. (a) $A = \frac{\sin 45° - \sin 30°}{\cos 45° + \cos 60°}$

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

$B = \frac{\sec 45° - \tan 45°}{\text{cosec } 45° + \cot 45°}$

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

$A = B$

102. (a) $\sqrt{\frac{1-\cos A}{1+\cos A}}+\sqrt{\frac{1+\cos A}{1-\cos A}}$

$= \sqrt{\frac{1-\cos^2 A}{(1+\cos A)^2}}+\sqrt{\frac{(1+\cos A)^2}{1-\cos^2 A}}$

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

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

$= \frac{2(1+\cos A)}{\sin A(1+\cos A)} = 2\ \text{cosec}A$

Alternate Method:

Put $A = 60°$

$\sqrt{\frac{1-\cos A}{1+\cos A}}+\sqrt{\frac{1+\cos A}{1-\cos A}}$

$= \sqrt{\frac{1-\frac{1}{2}}{1+\frac{1}{2}}}+\sqrt{\frac{1+\frac{1}{2}}{1-\frac{1}{2}}} = \sqrt{\frac{1}{2}\times\frac{2}{3}}+\sqrt{\frac{3}{2}\times 2}$

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

$\therefore 2\ \text{cosec}A = 2 \times \text{cosec}60°$

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

103. (c) $\tan\theta = \frac{5}{8}$

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

$= \frac{\sin^2\theta}{\cos^2\theta} = \tan^2\theta = \left(\frac{5}{8}\right)^2 = \frac{25}{64}$

104. (b) $x = a\sec\theta\cos\phi$, $y = b\sec\theta\sin\phi$

and $z = c\tan\theta$

Let, $\theta = 45° = \phi$

then, $x = a$, $\frac{x^2}{a^2} = 1$,

$\frac{y}{b} = \tan\theta$, $\frac{y^2}{b^2} = \tan^2\theta$

$\frac{z}{c} = \tan\theta$, $\frac{z^2}{c^2} = \tan^2\theta$

ATQ,

$\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2} = 1 + \tan^2\theta - \tan^2\theta = 1$

$\Rightarrow x = a\times\sqrt{2}\times\frac{\sqrt{3}}{2}$

$= \frac{a\sqrt{6}}{2} = a\frac{\sqrt{3}}{\sqrt{2}} \Rightarrow y = b\times\sqrt{2}\times\frac{1}{2} = \frac{b}{\sqrt{2}}$

and $z = c$

Consider,

$\frac{x^2}{a^2}+\frac{y^2}{b^2}-\frac{z^2}{c^2}$

$= \frac{a^2\times\frac{3}{2}}{a^2}+\frac{\frac{b^2}{2}}{b^2}-\frac{c^2}{c^2} = \frac{3}{2}+\frac{1}{2}-1 = 1$

105. (b) $x^2 + y^2 + z^2 = r^2\cos^2 t + r^2\sin^2 t\cos^2 u + r^2\sin^2 t\sin^2 u$

$= r^2[\cos^2 t + \sin^2 t\cos^2 u + \sin^2 t\sin^2 u]$

$= r^2[\cos^2 t + \sin^2 t(\cos^2 u + \sin^2 u)]$

$= r^2[\cos^2 t + \sin^2 t] = r^2$

106. (b) $\frac{1-\sin 2t}{1+\sin 2t}\times\frac{\cos t-\sin t}{\cos t-\sin t}$

Put, $t = 30°$

$= \frac{1-\sin 60°}{1+\sin 60°}\times\frac{\cos 30°+\sin 30°}{\cos 30°-\sin 30°} = \frac{1-\frac{\sqrt{3}}{2}}{1+\frac{\sqrt{3}}{2}}\times\frac{\frac{\sqrt{3}}{2}+\frac{1}{2}}{\frac{\sqrt{3}}{2}-\frac{1}{2}}$

$= \frac{2-\sqrt{3}}{2+\sqrt{3}}\times\frac{\sqrt{3}+1}{\sqrt{3}-1}$

Rationalize the denominators,

$= (7-4\sqrt{3})\times\frac{(4+2\sqrt{3})}{2} = (7-4\sqrt{3})\times(2+\sqrt{3})$

$= 14 + 7\sqrt{3} - 8\sqrt{3} - 12 = 2 - \sqrt{3}$

From options (b)

$\frac{1-\tan 30°}{1+\tan 30°} = \frac{1-\frac{1}{\sqrt{3}}}{1+\frac{1}{\sqrt{3}}} = \frac{\sqrt{3}-1}{\sqrt{3}+1} = 2-\sqrt{3}$

Hence, satisfies.

Alternate Method:-

$\frac{1-\sin 2t}{1+\sin 2t}\times\frac{(\cos t+\sin t)}{(\cos t-\sin t)}$

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

$= \frac{(\cos t-\sin t)^2}{(\cos t+\sin t)^2}\times\frac{\cos t+\sin t}{\cos t-\sin t}$

$= \frac{\cos t-\sin t}{\cos t+\sin t} = \frac{1-\tan t}{1+\tan t}$

107. (b) $\text{cosec}\theta - \sin\theta = p^3$

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

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

$\frac{\cos^2\theta}{\sin\theta} = p^3$ .....(i)

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

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

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

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

(ii) ÷ (i)

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

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

108. (b) Put $x = 0°$, $\sin x + \cos x = C$

$C = \sin 0° + \cos 0°$

$C = 0 + 1$

$C = 1$

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

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

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

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

109. (c) $\frac{\cos x}{\operatorname{cosec} x + 1} + \frac{\cos x}{\operatorname{cosec} x - 1} = 2$

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

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

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

$2\tan x = 2$

$\tan x = 1$

$x = 45° = \frac{\pi}{4}$

110. (a) Let angles (circular measurement) be x and y

$x + y = 1$ .....(i)

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

$x - y = \frac{\pi}{180°}$ .....(ii)

From equ. (i) to (ii)

Put the value, $y = 1 - x$

$2x = 1 + \frac{\pi}{180°}$

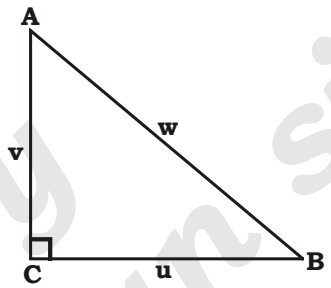
$x = \left(\frac{1}{2} + \frac{\pi}{360°}\right)$

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

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

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

111. (d)



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

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

112. (c) $\frac{2\tan A}{1-\tan^2 A} = 2 \times \frac{(1-\cos B)}{\sin B} \Big/ 1 - \left(\frac{1-\cos B}{\sin B}\right)^2$

$= \frac{2(1-\cos B)}{\sin B} \div \frac{\sin^2 B - (1-\cos B)^2}{\sin^2 B}$

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

$= \frac{2(1-\cos B)\sin B}{(1-\cos B)[1+\cos B - 1 + \cos B]} = \frac{2\sin B}{2\cos B} = \tan B$

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

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

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

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

By Comp. & Div.

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

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

114. (c) $\sin A + \cos A = P$

Cube both side.

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

$q + 3 \sin A \cos A (p) = p^3$ .....(1)

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

Square both side.

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

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

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

Put this value in equ. (1) we get

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

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

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

115. (d) $$\frac{1}{x} = \frac{\sec^2\theta + \tan\theta}{\sec^2\theta - \tan\theta}$$

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

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

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

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

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

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

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

$$-1 \le \frac{2-2x}{1+x} \qquad \frac{2-2x}{1+x} \le 1$$

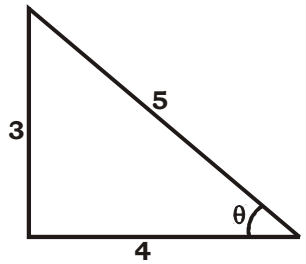
$-1 - x \le 2 - 2x$ $\qquad$ $2 - 2x \le 1 + x$

$x \le 3$ $\qquad$ $1 \le 3x$

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

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

116. (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,

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

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

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

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

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

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

117. (d) $$\frac{x}{a} - \frac{y\tan\theta}{b} = 1$$

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

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

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

(1) + (2), we get

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

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

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

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

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

118. (b) $p = \cot\theta + \tan\theta$

Put $\theta = 45°$

$p = 1 + 1 = 2$

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

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

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

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

119. (d) $\angle A + \angle B + \angle C = 180°$

$\angle B + \angle C = 180° - \angle A$

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

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

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

120. (d)

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

$\Rightarrow 1 - \cos^2\theta = \cos^2\theta - 3\cos\theta + 2$

$\Rightarrow 2\cos^2\theta - 3\cos\theta + 1 = 0$

$\Rightarrow 2\cos^2\theta - 2\cos\theta - \cos\theta + 1 = 0$

$\Rightarrow \cos\theta = 1$ and $\frac{1}{2}$

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

$\therefore \theta$ lies in the first quadrant

$$\frac{\tan^2\frac{\theta}{2} + \sin^2\frac{\theta}{2}}{\tan\theta - \sin\theta} = \frac{\tan^2 30° + \sin^2 30°}{\tan 60° + \sin 60°}$$

$$= \frac{\left(\frac{1}{\sqrt{3}}\right)^2 + \left(\frac{1}{2}\right)^2}{\sqrt{3} + \frac{\sqrt{3}}{2}} = \frac{\frac{1}{3} + \frac{1}{4}}{\frac{3\sqrt{3}}{2}} = \frac{\frac{7}{12}}{\frac{3\sqrt{3}}{2}}$$

$$= \frac{7}{18\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{7\sqrt{3}}{54}$$