

Part-IV
Exercise / अभ्यास प्रश्न

1. Find the exact value of $\cos 120^\circ$.
 $\cos 120^\circ$ का सटीक मान ज्ञात कीजिए।
- SSC CGL MAINS 2022**

(A) 0 (B) 0.5
(C) 1 (D) -0.5

2. Value of $\cos(-780^\circ)$ is
 $\cos(-780^\circ)$ का मान है।
- (A) $\frac{\sqrt{3}}{2}$ (B) $-\frac{\sqrt{3}}{2}$ (C) $\frac{1}{2}$ (D) $-\frac{1}{2}$

3. Solve $\operatorname{cosec} 1500^\circ$ is equal to:
 $\operatorname{cosec} 1500^\circ$ का मान ज्ञात करें।
- (A) $-\frac{2}{\sqrt{3}}$ (B) -1 (C) 2 (D) $\frac{2\sqrt{3}}{3}$

4. What is the value of $\tan(1125^\circ)$?
 $\tan(1125^\circ)$ का मान क्या है?
- (A) 1 (B) -1 (C) 0 (D) ∞

5. If $\sec 21\frac{1}{2}^\circ = \frac{q}{p}$ then value of $\sec 68.5^\circ$ is:
यदि $\sec 21\frac{1}{2}^\circ = \frac{q}{p}$ तो $\sec 68.5^\circ$ का मान ज्ञात करें।

(A) $\frac{p}{\sqrt{q^2 + p^2}}$ (B) $\frac{q}{\sqrt{q^2 - p^2}}$
(C) $\frac{q^2 - p^2}{q}$ (D) $\frac{q^2 - p^2}{p}$

6. If $k(\tan 45^\circ \sin 60^\circ) = \cos 60^\circ \cot 30^\circ$, then the value of k is:
यदि $k(\tan 45^\circ \sin 60^\circ) = \cos 60^\circ \cot 30^\circ$ है, तो k का मान क्या है?

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(A) $\sqrt{3}$ (B) 1
(C) $\frac{1}{\sqrt{3}}$ (D) 2

7. Find the value of $\frac{\cos 65^\circ}{\sin 25^\circ} + \frac{5 \sin 19^\circ}{\cos 71^\circ} - \frac{3 \cos 28^\circ}{\sin 62^\circ}$.

$$\frac{\cos 65^\circ}{\sin 25^\circ} + \frac{5 \sin 19^\circ}{\cos 71^\circ} - \frac{3 \cos 28^\circ}{\sin 62^\circ}$$

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(A) 2 (B) 0
(C) 1 (D) 3

8. $2(\sin 1^\circ \times \sec 89^\circ) + 3(\cos 11^\circ \times \operatorname{cosec} 79^\circ) + 5(\tan 21^\circ \times \tan 69^\circ) = ?$
- (A) 11 (B) 12
(C) 20 (D) 10

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9. Find the value of $\frac{\sin^2 39^\circ + \sin^2(90^\circ - 39^\circ)}{\cos^2 35^\circ + \cos^2(90^\circ - 35^\circ)} + 3 \tan 15^\circ \tan 75^\circ$:

$$\frac{\sin^2 39^\circ + \sin^2(90^\circ - 39^\circ)}{\cos^2 35^\circ + \cos^2(90^\circ - 35^\circ)} + 3 \tan 15^\circ \tan 75^\circ$$

मान ज्ञात कीजिए :

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(A) 2 (B) 4
(C) 3 (D) 1

10. What is the value of $\frac{3}{2} \left(\frac{\cos 39^\circ}{\sin 51^\circ} \right) - \sqrt{\sin^2 39^\circ + \sin^2 51^\circ} = ?$

(A) $\frac{1}{2}$ (B) $\frac{5}{2}$ (C) 0 (D) Both (A) & (B)

11. $\frac{\sin 37^\circ}{\cos 53^\circ} + \frac{2 \tan 49^\circ}{\cot 41^\circ} - 5(\cot 11^\circ \cdot \cot 31^\circ \cdot \cot 45^\circ \cdot \cot 59^\circ \cdot \cot 79^\circ) + 3 \left(\sin^2 76.5 + \sin^2 \frac{3\pi}{40} \right)$

$$\frac{\sin 37^\circ}{\cos 53^\circ} + \frac{2 \tan 49^\circ}{\cot 41^\circ} - 5(\cot 11^\circ \cdot \cot 31^\circ \cdot \cot 45^\circ \cdot \cot 59^\circ \cdot \cot 79^\circ) + 3 \left(\sin^2 76.5 + \sin^2 \frac{3\pi}{40} \right)$$

का मान है।

(A) 1 (B) 0
(C) -1 (D) 2

12. The value of $\frac{\tan 13^\circ \cdot \tan 37^\circ \cdot \tan 45^\circ \cdot \tan 53^\circ \cdot \tan 77^\circ}{2 \operatorname{cosec}^2 60^\circ (\cos^2 60^\circ - 3 \cos 60^\circ + 2)}$
 $\frac{\tan 13^\circ \cdot \tan 37^\circ \cdot \tan 45^\circ \cdot \tan 53^\circ \cdot \tan 77^\circ}{2 \operatorname{cosec}^2 60^\circ (\cos^2 60^\circ - 3 \cos 60^\circ + 2)}$ का मान है।

- (A) 2 (B) 1 (C) $\frac{3}{2}$ (D) $\frac{1}{2}$

13. The value of the expression $[\cot 1^\circ \cdot \cot 2^\circ \cdot \cot 3^\circ \cdot \cot 4^\circ \cdot \cot 5^\circ \dots \cot 178^\circ \cot 179^\circ]$ is :
 व्यंजक $[\cot 1^\circ \cdot \cot 2^\circ \cdot \cot 3^\circ \cdot \cot 4^\circ \cdot \cot 5^\circ \dots \cot 178^\circ \cot 179^\circ]$ का मान क्या है?

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- (A) 1235 (B) $\frac{1}{2}$ (C) 1 (D) 0

14. What is the value of $\frac{4 \tan^2 30 + \sin^2 30 \cos^2 45 + \sec^2 48 - \cot^2 42}{\cos 37 \sin 53 + \sin 37 \cos 53 + \tan 18 \tan 72}$
 $\frac{4 \tan^2 30 + \sin^2 30 \cos^2 45 + \sec^2 48 - \cot^2 42}{\cos 37 \sin 53 + \sin 37 \cos 53 + \tan 18 \tan 72}$ का मान क्या होगा?

- (A) $\frac{35}{24}$ (B) $\frac{35}{48}$ (C) $\frac{59}{72}$ (D) $\frac{49}{24}$

15. What is the value of $\frac{3(\cot^2 47 - \sec^2 43) - 2(\tan^2 23 - \operatorname{cosec}^2 67)}{\operatorname{cosec}^2(68 + \theta) - \tan(\theta + 61) - \tan^2(22 - \theta) + \cot(29 - \theta)}$

$$\frac{3(\cot^2 47 - \sec^2 43) - 2(\tan^2 23 - \operatorname{cosec}^2 67)}{\operatorname{cosec}^2(68 + \theta) - \tan(\theta + 61) - \tan^2(22 - \theta) + \cot(29 - \theta)}$$

का मान क्या होगा?

- (A) 0 (B) 5
(C) 1 (D) -1

16. solve it : $\sin 780^\circ \sin 480^\circ + \cos 120^\circ \sin 30^\circ$
 सरल करें : $\sin 780^\circ \sin 480^\circ + \cos 120^\circ \sin 30^\circ$

- (A) $\frac{2}{3}$ (B) $\frac{1}{3}$
(C) 0 (D) $\frac{1}{2}$

17. $\frac{\sin 1080^\circ - \tan 225^\circ - \cos 120^\circ \sin 150^\circ}{\tan 135^\circ + \cot 270^\circ}$ is equal to:

$$\frac{\sin 1080^\circ - \tan 225^\circ - \cos 120^\circ \sin 150^\circ}{\tan 135^\circ + \cot 270^\circ}$$

का मान ज्ञात करें।

- (A) $-\frac{4}{3}$ (B) $\frac{3}{4}$ (C) $\frac{1}{4}$ (D) 1

18. The value of the expression $\frac{\cot(30^\circ - \theta) - \sec(60^\circ - \theta) + \operatorname{cosec}(30^\circ + \theta) - \tan(60^\circ + \theta)}{\sin 85^\circ \operatorname{cosec} 95^\circ + \cos 35^\circ \operatorname{cosec} 55^\circ}$ is

$$\frac{\cot(30^\circ - \theta) - \sec(60^\circ - \theta) + \operatorname{cosec}(30^\circ + \theta) - \tan(60^\circ + \theta)}{\sin 85^\circ \operatorname{cosec} 95^\circ + \cos 35^\circ \operatorname{cosec} 55^\circ}$$

का मान ज्ञात करें।

- (A) 0 (B) 1
(C) 2 (D) Undifine

19. Find the value of $\frac{\tan 495^\circ}{\cot 855^\circ}$

$\frac{\tan 495^\circ}{\cot 855^\circ}$ का मान ज्ञात करें।

- (A) -1 (B) 1 (C) $\sqrt{3}$ (D) $\frac{1}{\sqrt{3}}$

20. The value of $\frac{\sin^2 52^\circ + 2 + \sin^2 38^\circ}{4 \cos^2 43^\circ - 5 + 4 \cos^2 47^\circ}$ is :

$\frac{\sin^2 52^\circ + 2 + \sin^2 38^\circ}{4 \cos^2 43^\circ - 5 + 4 \cos^2 47^\circ}$ का मान ज्ञात करें।

- (A) 3 (B) $\frac{1}{3}$ (C) $-\frac{1}{3}$ (D) -3

21. What is the value of $\frac{\tan^2 25^\circ}{\operatorname{cosec}^2 65^\circ} + \frac{\cot^2 25^\circ}{\sec^2 65^\circ} + 2 \tan 20^\circ \tan 45^\circ \tan 70^\circ$?

$$\frac{\tan^2 25^\circ}{\operatorname{cosec}^2 65^\circ} + \frac{\cot^2 25^\circ}{\sec^2 65^\circ} + 2 \tan 20^\circ \tan 45^\circ \tan 70^\circ$$

का मान क्या है?

- (A) 1 (B) 2
(C) 3 (D) 4

22. $\frac{\cos 780^\circ + \sin 1950^\circ + \sec 1200^\circ}{\tan 300^\circ + \operatorname{cosec} 510^\circ - \cot 270^\circ}$ is equal to :

$$\frac{\cos 780^\circ + \sin 1950^\circ + \sec 1200^\circ}{\tan 300^\circ + \operatorname{cosec} 510^\circ - \cot 270^\circ}$$

का मान किसके बराबर है?

- (A) $\sqrt{3} + 2$ (B) $\sqrt{3} - 2$
(C) 0 (D) None of these

23. What is the value of $\sec 12^\circ \sin 12^\circ \tan 38^\circ \tan 78^\circ \tan 52^\circ$?

$\sec 12^\circ \sin 12^\circ \tan 38^\circ \tan 78^\circ \tan 52^\circ$ का मान क्या है?

- (A) 1 (B) 3
(C) 1/2 (D) 3/2

24. The value of

$$\left[\frac{\sin^2 24^\circ + \sin^2 66^\circ}{\cos^2 24^\circ + \cos^2 66^\circ} + \sin^2 61^\circ + \cos 61^\circ \sin 29^\circ \right]$$

is equal to:

का मान निम्नलिखित में से किसके बराबर होगा?

- (A) 2 (B) 3
(C) 1 (D) 0

25. What is $\frac{\cos^2(45^\circ + \theta) + \cos^2(45^\circ - \theta)}{\tan(60^\circ + \theta) \tan(30^\circ - \theta)}$ equal to ?

$$\frac{\cos^2(45^\circ + \theta) + \cos^2(45^\circ - \theta)}{\tan(60^\circ + \theta) \tan(30^\circ - \theta)}$$
 किसके तुल्य है?

- (A) -1 (B) 0
(C) 1 (D) 2

26. The value of

$$\frac{\sin(78^\circ + \phi) - \cos(12^\circ - \phi) + (\tan^2 70^\circ - \operatorname{cosec}^2 20^\circ)}{\sin 25^\circ \cos 65^\circ + \cos 25^\circ \sin 65^\circ}$$

is :

$$\frac{\sin(78^\circ + \phi) - \cos(12^\circ - \phi) + (\tan^2 70^\circ - \operatorname{cosec}^2 20^\circ)}{\sin 25^\circ \cos 65^\circ + \cos 25^\circ \sin 65^\circ}$$

का मान है :

- (A) 2 (B) -1
(C) -2 (D) 0

27. If $\operatorname{cosec} 39^\circ = x$, then the value of $\frac{1}{\operatorname{cosec}^2 51^\circ} +$

$$\sin^2 39^\circ + \tan^2 51^\circ - \frac{1}{\sin^2 51^\circ \sec^2 39^\circ}$$
 is :

यदि $\operatorname{cosec} 39^\circ = x$ है, तो $\frac{1}{\operatorname{cosec}^2 51^\circ} + \sin^2 39^\circ +$

$$\tan^2 51^\circ - \frac{1}{\sin^2 51^\circ \sec^2 39^\circ}$$
 का मान ज्ञात कीजिए।

- (A) $\sqrt{x^2 - 1}$ (B) $\sqrt{1 - x^2}$
(C) $1 - x^2$ (D) $x^2 - 1$

28. Find the value of $\sin(50^\circ + A) - \cos(40^\circ - A)$.
 $\sin(50^\circ + A) - \cos(40^\circ - A)$ का मान क्या होगा?

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- (A) 2 (B) 0
(C) -1 (D) 1

29. If $x = \sec 57^\circ$, then $\cot^2 33^\circ + \sin^2 57^\circ + \sin^2 33^\circ + \operatorname{cosec}^2 57^\circ \cos^2 33^\circ + \sec^2 33^\circ \sin^2 57^\circ$ is equal to:

यदि $x = \sec 57^\circ$ है, तो $\cot^2 33^\circ + \sin^2 57^\circ + \sin^2 33^\circ + \operatorname{cosec}^2 57^\circ \cos^2 33^\circ + \sec^2 33^\circ \sin^2 57^\circ \dots$ के बराबर है।

(A) $x^2 + 2$ (B) $2x^2 + 1$

(C) $x^2 + 1$ (D) $\frac{1}{x^2 + 1}$

30. The value of $(\tan 51^\circ \cot 39^\circ - \sec 51^\circ \operatorname{cosec} 39^\circ) + \cot^2 54^\circ + (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ \dots + \sin^2 89^\circ) - \sec^2 36^\circ$ is :

$(\tan 51^\circ \cot 39^\circ - \sec 51^\circ \operatorname{cosec} 39^\circ) + \cot^2 54^\circ + (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ \dots + \sin^2 89^\circ) - \sec^2 36^\circ$ का मान ज्ञात करो-

- (A) $20\frac{1}{2}$ (B) 21 (C) $22\frac{1}{2}$ (D) 22

31. What is the value of $\tan 1^\circ \tan 2^\circ \tan 3^\circ \dots \tan 89^\circ$?

$\tan 1^\circ \tan 2^\circ \tan 3^\circ \dots \tan 89^\circ$ का मान क्या है?

- (A) 0 (B) 1
(C) 2 (D) ∞

32. The value of $\sin^2 30^\circ + \sin^2 40^\circ + \sin^2 45^\circ + \sin^2 55^\circ + \sin^2 35^\circ + \sin^2 45^\circ + \sin^2 50^\circ + \sin^2 60^\circ$ is :
 $\sin^2 30^\circ + \sin^2 40^\circ + \sin^2 45^\circ + \sin^2 55^\circ + \sin^2 35^\circ + \sin^2 45^\circ + \sin^2 50^\circ + \sin^2 60^\circ$ का मान ज्ञात कीजिए।

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- (A) 2 (B) 4
(C) 1 (D) 3

33. What is the value of $\sin^2 15^\circ + \sin^2 20^\circ + \sin^2 25^\circ + \dots + \sin^2 75^\circ$?

$\sin^2 15^\circ + \sin^2 20^\circ + \sin^2 25^\circ + \dots + \sin^2 75^\circ$ का मान क्या है?

- (A) $\tan^2 15^\circ + \tan^2 20^\circ + \tan^2 25^\circ + \dots + \tan^2 75^\circ$
(B) $\cos^2 15^\circ + \cos^2 20^\circ + \cos^2 25^\circ + \dots + \cos^2 75^\circ$
(C) $\cot^2 15^\circ + \cot^2 20^\circ + \cot^2 25^\circ + \dots + \cot^2 75^\circ$
(D) $\sec^2 15^\circ + \sec^2 20^\circ + \sec^2 25^\circ + \dots + \sec^2 75^\circ$

34. Find the value of $\frac{\cos^2 25^\circ - \sin^2 65^\circ}{\cos^2 25^\circ + \sin^2 65^\circ}$:

$$\frac{\cos^2 25^\circ - \sin^2 65^\circ}{\cos^2 25^\circ + \sin^2 65^\circ}$$
 का मान ज्ञात कीजिए।

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- (A) $\frac{1}{2}$ (B) 1
(C) -1 (D) 0

35. The value of $\sin^2 5^\circ + \sin^2 10^\circ + \sin^2 15^\circ + \dots + \sin^2 90^\circ$ is :
 $\sin^2 5^\circ + \sin^2 10^\circ + \sin^2 15^\circ + \dots + \sin^2 90^\circ$ का मान है ?
 (A) 9 (B) $\frac{19}{2}$ (C) 8 (D) $\frac{17}{2}$
36. The value of $\operatorname{cosec}^2 67^\circ + \sec^2 57^\circ - \cot^2 33^\circ - \tan^2 23^\circ$ is :
 $\operatorname{cosec}^2 67^\circ + \sec^2 57^\circ - \cot^2 33^\circ - \tan^2 23^\circ$ का मान क्या है ?
 (A) $2\sqrt{2}$ (B) 2 (C) $\sqrt{2}$ (D) 0
37. What is the value of $\tan 24^\circ \cdot \tan 48^\circ \cdot \tan 42^\circ \cdot \tan 66^\circ$
 $\tan 24^\circ \cdot \tan 48^\circ \cdot \tan 42^\circ \cdot \tan 66^\circ$ का मान है -
 (A) 0 (B) 1
 (C) $\frac{1}{2}$ (D) 2
38. What is the value of expression
 $(\tan 0^\circ \cdot \tan 1^\circ \cdot \tan 2^\circ \cdot \tan 3^\circ \cdot \tan 3^\circ \dots \tan 89^\circ)$
 निम्नलिखित व्यंजक (expression) का मान क्या है ?
 $(\tan 0^\circ \cdot \tan 1^\circ \cdot \tan 2^\circ \cdot \tan 3^\circ \cdot \tan 3^\circ \dots \tan 89^\circ)$
 (A) 0 (B) 1
 (C) 2 (D) $\frac{1}{2}$

39. If $\tan (3A) = \cot (A - 22^\circ)$, where $3A$ is an acute angle, then what is the value of A ?
 यदि $\tan (3A) = \cot (A - 22^\circ)$ जहाँ $3A$ एक न्यूनकोण है। तो A का मान ज्ञात कीजिए।

(CDS-I 2024)

- (A) 25° (B) 27°
 (C) 28° (D) 30°

40. What is the value of $\frac{\cos^2 32^\circ + \cos^2 58^\circ}{\sec^2 50^\circ - \cot^2 40^\circ} + 4 \tan 13^\circ \tan 37^\circ \tan 53^\circ \tan 77^\circ$?
 $\frac{\cos^2 32^\circ + \cos^2 58^\circ}{\sec^2 50^\circ - \cot^2 40^\circ} + 4 \tan 13^\circ \tan 37^\circ \tan 53^\circ \tan 77^\circ$ का मान क्या है ?

(CDS 2023)

- (A) 2 (B) 3
 (C) 4 (D) 5

Solution

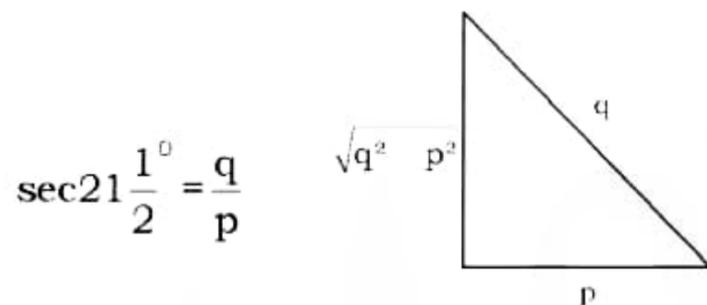
1. (D) $\cos 120^\circ = \cos(90^\circ + 30^\circ)$
 $= -\sin 30^\circ$
 $= -\frac{1}{2} = -0.5$

2. (C) $\cos(-780^\circ) = \cos 780^\circ$ [$\because \cos(-\theta) = \cos \theta$]
 $= \cos(2 \times 360^\circ + 60^\circ)$
 $= \cos 60^\circ = \frac{1}{2}$

3. (D) $\Rightarrow \operatorname{cosec}(1500^\circ)$
 $= \operatorname{cosec}(4 \times 360^\circ + 60^\circ)$
 $= \operatorname{cosec} 60^\circ = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

4. (A) Given, $\tan(1125^\circ)$
 $= \tan(3 \times 360^\circ + 45^\circ)$
 $= \tan 45^\circ$ [$\because \tan(n \times 360^\circ + \theta) = \tan \theta$]
 $= 1$

5. (B) Given that



$$\sec 68.5^\circ = \frac{q}{\sqrt{q^2 - p^2}}$$

6. (B) $K(\tan 45^\circ \sin 60^\circ) = \cos 60^\circ \cot 30^\circ$

$$K \left(1 \times \frac{\sqrt{3}}{2} \right) = \frac{1}{2} \times \sqrt{3}$$

$$K = 1$$

7. (D) $\frac{\cos 65^\circ}{\sin 25^\circ} + \frac{5 \sin 19^\circ}{\cos 71^\circ} - \frac{3 \cos 28^\circ}{\sin 62^\circ}$

We know $\cos 65 = \sin(90 - 25)$

$$\frac{\cos 65^\circ}{\cos 65^\circ} + \frac{5 \cos 71^\circ}{\cos 71^\circ} - \frac{3 \cos 28^\circ}{\cos 28^\circ}$$

$$1 + 5 - 3 = 3$$

8. (D) $2(\sin 1^\circ \times \sec 89^\circ) + 3(\cos 11^\circ \times \operatorname{cosec} 79^\circ)$
 $+ 5(\tan 21^\circ \times \tan 69^\circ) = ?$

We know $\sec \theta = \frac{1}{\cos \theta}$

$$\operatorname{cosec} \theta = \frac{1}{\sin \theta}$$

$$\tan \theta = \frac{1}{\cot \theta}$$

$$2(\sin 1^\circ \times \operatorname{cosec} 1^\circ) + 3(\cos 11^\circ \times \sec 11^\circ) + 5(\tan 21^\circ \times \cot 21^\circ)$$

$$= 2(1) + 3(1) + 5(1)$$

$$= 2 + 3 + 5$$

$$= 10$$

9. (B) $\frac{\sin^2 39^\circ + \sin^2(90^\circ - 39^\circ)}{\cos^2 35^\circ + \cos^2(90^\circ - 35^\circ)} + 3 \tan 15^\circ \tan 75^\circ$

$$\sin(90 - \theta) = \cos \theta \text{ \& \ } \cos(90 - \theta) = \sin \theta$$

$$\Rightarrow \frac{\sin^2 39^\circ + \cos^2 39^\circ}{\cos^2 35^\circ + \sin^2 35^\circ} + 3 \tan(90 - 75) \tan 75^\circ$$

$$= 1 + 3 = 4$$

10. (A) $\frac{3 \cos 39^\circ}{2 \sin 51^\circ} - \sqrt{\sin^2 39^\circ + \sin^2 51^\circ}$

$$\Rightarrow \frac{3 \cos 39^\circ}{2 \sin 39^\circ} - \sqrt{\sin^2 39^\circ + \cos^2 39^\circ}$$

$$\Rightarrow \frac{3}{2} - 1 = \frac{1}{2}$$

11. (A) $1 + 2 - 5 + 3 = 1$
 $5(\cot 11^\circ \cdot \cot 31^\circ \cdot \cot 45^\circ \cdot \cot 59^\circ \cdot \cot 79^\circ) + 3(\sin^2 76.5^\circ + \sin^2 13.5^\circ)$
 $= 1 + 2 - 5 + 3 = 1$

12. (D) $\frac{\tan 13^\circ \cdot \tan 37^\circ \cdot \tan 45^\circ \cdot \tan 53^\circ \cdot \tan 77^\circ}{2 \operatorname{cosec}^2 60^\circ (\cos^2 60^\circ - 3 \cos 60^\circ + 2)}$

$$\Rightarrow \frac{1}{2 \times \frac{4}{3} \left[\frac{1}{4} - \frac{3}{2} + 2 \right]} = \frac{1}{\frac{8}{3} \times \frac{3}{4}} = \frac{1}{2}$$

13. (D) In this expression $\cot 90^\circ = 0$
 and 0 multiply to this expression the expression become 0

14. (C) $\frac{4 \times \frac{1}{3} + \frac{1}{4} \times \frac{1}{2} + 1}{1 + 1 + 1}$

$$[\because \cos \theta \sin(90 - \theta) = \cos^2 \theta]$$

$$[\because \sec^2 \theta = \operatorname{cosec}^2(90 - \theta)]$$

$$\tan \theta \cdot \tan(90 - \theta) = 1]$$

$$\frac{\frac{4}{3} + \frac{1}{8} + 1}{3} = \frac{32 + 3 + 24}{72} \Rightarrow \frac{59}{72}$$

$$15.(D) \frac{3 \times (-1) - 2(-1)}{\sec^2(22 - \theta) - \tan^2(22 - \theta)} \Rightarrow \frac{-1}{1} = -1$$

$$-\tan(\theta + 61) + \tan(61 + \theta)$$

$$16.(D) \sin 780^\circ \sin 480^\circ + \cos 120^\circ \sin 30^\circ$$

$$= \sin(2 \times 360^\circ + 60^\circ) \sin(360^\circ + 120^\circ) + \cos 120^\circ \sin 30^\circ$$

$$= \sin 60^\circ \sin(120^\circ) + \cos 120^\circ \sin 30^\circ$$

$$= \sin 60^\circ \sin(90^\circ + 30^\circ) + \cos(90^\circ + 30^\circ) \sin 30^\circ$$

$$= \sin 60^\circ \cos 30^\circ - \sin 30^\circ \sin 30^\circ$$

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

17. (B)

$$\frac{\sin(90^\circ \times 12) - \tan(180^\circ + 45^\circ) - \cos(90^\circ + 30^\circ) \sin(90^\circ + 60^\circ)}{\tan(180^\circ - 45^\circ) + \cot(180^\circ + 90^\circ)}$$

$$= \frac{0 - 1 - \left(-\frac{1}{2}\right)\left(\frac{1}{2}\right)}{-1 + 0} = \frac{-1 + \frac{1}{4}}{-1} = \frac{3}{4}$$

18. (A)

$$\frac{\tan(60^\circ + \theta) - \operatorname{cosec}(30^\circ + \theta) + \operatorname{cosec}(30^\circ + \theta) - \tan(60^\circ + \theta)}{\cos 5^\circ \sec 5^\circ + \cos 35^\circ \sec 35^\circ}$$

$$= \frac{0}{2} = 0$$

$$19. (B) \Rightarrow \tan 495^\circ = \tan(360^\circ + 135^\circ) = -1$$

$$\text{and } \cot 855^\circ = \cot(720^\circ + 135^\circ) = -1$$

$$\Rightarrow \frac{\tan 495^\circ}{\cot 855^\circ} = \frac{-1}{-1} = 1$$

$$20. (D) \frac{\sin^2 52 + 2 + \sin^2 38^\circ}{4 \cos^2 43^\circ - 5 + 4 \cos^2 47^\circ}$$

$$= \frac{\sin^2 52 + \cos^2 52 + 2}{4(\cos^2 43 + \sin^2 43) - 5} \Rightarrow \frac{1 + 2}{4 - 5} = -3$$

$$21. (C) \frac{\tan^2 25}{\operatorname{cosec}^2 65^\circ} + \frac{\cot^2 25}{\sec^2 65^\circ} + 2 \tan 20^\circ \tan 45^\circ$$

$$\frac{\tan^2 25}{\sec^2 25^\circ} + \frac{\tan^2 65}{\sec^2 65^\circ} + 2$$

$$\frac{\sin^2 25}{\cos^2 25} + \frac{\sin^2 65}{\cos^2 65} + 2$$

$$\sin^2 25 + \cos^2 25 + 2 = 3$$

22. (A)

$$23.(A) \sec 12 \sin 12 \tan 38 \tan 78 \tan 52$$

$$\frac{\sin 12}{\cos 12} \cot(90 - 38) \tan 78 \tan 52$$

$$\tan 12 \cot 52 \tan 78 \tan 52$$

$$\cot(90 - 12) \cot 52 \tan 78 \tan 52$$

$$\cot 78 \cot 52 \tan 78 \tan 52 = 1$$

$$24.(A) \frac{\sin^2 24 + \cos^2 24}{\sin^2 66 + \cos^2 66} + \sin^2 61 + \cos^2 61$$

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

$$25. (C) \frac{\cos^2(45^\circ + \theta) + \cos^2(45^\circ - \theta)}{\tan(60^\circ + \theta) \tan(30^\circ - \theta)}$$

$$\Rightarrow \frac{\cos^2(45 + \theta) + \sin^2(45 + \theta)}{\tan(60 + \theta) \cot(60 + \theta)} \Rightarrow \frac{1}{1} = 1$$

$$26.(B) \frac{\sin(78^\circ + \phi) - \sin(78^\circ + \phi) + \tan^2 70^\circ - \sec^2 70^\circ}{\sin^2 25^\circ + \cos^2 25^\circ}$$

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

$$27.(D) \frac{1}{\operatorname{cosec}^2 51^\circ} + \sin^2 39^\circ + \tan^2 51^\circ -$$

$$\frac{1}{\sin^2 51^\circ \cdot \sec^2 39^\circ}$$

$$= \sin^2 51^\circ + \cos^2 51^\circ + \tan^2 51^\circ -$$

$$\frac{1}{\sin^2 51^\circ \cdot \operatorname{cosec}^2 51^\circ}$$

$$1 + \tan^2 51^\circ - 1$$

$$= \tan^2 51^\circ$$

$$= \operatorname{cosec}^2 39^\circ = x, \quad \sec 51^\circ = x$$

$$\tan 51^\circ = \sqrt{x^2 - 1} \Rightarrow \tan^2 51^\circ = (\sqrt{x^2 - 1})^2 = (x^2 - 1)$$

$$28.(B) \sin(50^\circ + A) - \cos(40^\circ - A)$$

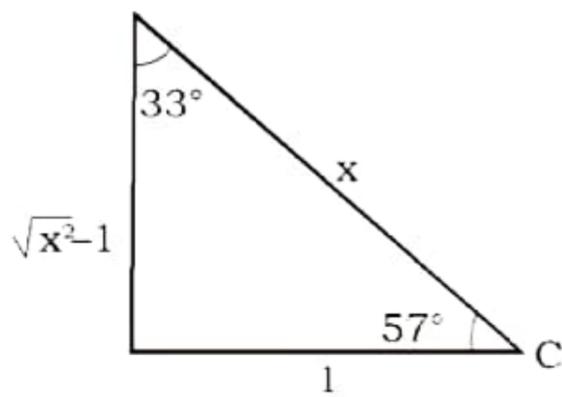
$$\cos[90 - (50^\circ + A)] - \cos(40^\circ - A)$$

$$\cos(40^\circ - A) - \cos(40^\circ - A) = 0$$

$$29.(A) x = \sec 57^\circ$$

$$\cot^2 33^\circ + \sin^2 57 + \sin^2 33 + \operatorname{cosec}^2 57 \cdot \cos^2 33$$

$$+ \sec^2 33 \cdot \sin^2 57$$



$$x^2 - 1 + \frac{x^2 - 1}{x^2} + \frac{1}{x^2} + \frac{x^2}{x^2 - 1} \times \frac{x^2 - 1}{x^2} + \frac{x^2}{x^2 - 1} \times \frac{x^2 - 1}{x^2}$$

$$= x^2 + 2$$

$$30.(A) (\tan^2 51^\circ - \sec^2 51^\circ) + \tan^2 36^\circ - \sec^2 36^\circ + 22 \frac{1}{2}$$

$$= -1 - 1 + 22 \frac{1}{2} = 20 \frac{1}{2}$$

$$31.(B) \tan 1^\circ \cdot \tan 89^\circ = \tan 1^\circ \cdot \cot 1^\circ = 1$$

similarly,

$$\tan 2^\circ \cdot \tan 88^\circ = \tan 2^\circ \cdot \cot 2^\circ = 1$$

$$\tan 3^\circ \cdot \tan 87^\circ = \tan 3^\circ \cdot \cot 3^\circ = 1$$

hence the equation will reduce to $\tan 45^\circ = 1$

$$32.(B) \sin^2 30^\circ + \sin^2 40^\circ + \sin^2 45^\circ + \sin^2 55^\circ + \sin^2 35^\circ + \sin^2 45^\circ + \sin^2 50^\circ + \sin^2 60^\circ$$

$$= \sin^2(90 - 60^\circ) + \sin^2(90 - 50^\circ) + \sin^2(90 - 45^\circ) + \sin^2(90 - 35^\circ) + \sin^2 35^\circ + \sin^2 45^\circ + \sin^2 50^\circ + \sin^2 60^\circ$$

$$= \cos^2 60^\circ + \cos^2 50^\circ + \cos^2 45^\circ + \cos^2 35^\circ + \sin^2 35^\circ + \sin^2 45^\circ + \sin^2 50^\circ + \sin^2 60^\circ$$

$$= (\sin^2 60^\circ + \cos^2 60^\circ) + (\sin^2 50^\circ + \cos^2 50^\circ) + (\sin^2 45^\circ + \cos^2 45^\circ) + (\sin^2 35^\circ + \cos^2 35^\circ)$$

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

$$33.(B) \sin^2 15^\circ + \sin^2 20^\circ + \sin^2 25^\circ + \dots + \sin^2 75^\circ$$

$$= \sin^2(90^\circ - 75^\circ) + \sin^2(90^\circ - 70^\circ) + \dots + \sin^2(90^\circ - 15^\circ)$$

$$= \cos^2 75^\circ + \cos^2 70^\circ + \dots + \cos^2 15^\circ$$

$$34.(D) \frac{\cos^2 25^\circ - \sin^2 65^\circ}{\cos^2 25^\circ + \sin^2 65^\circ}$$

$$= \frac{\cos^2(90 - 65) - \sin^2 65^\circ}{\cos^2 25^\circ + \sin^2 65^\circ}$$

$$= \frac{\sin^2 65^\circ - \sin^2 65^\circ}{\cos^2 25^\circ + \sin^2 65^\circ}$$

$$= \frac{0}{\cos^2 25^\circ + \sin^2 65^\circ}$$

$$= 0$$

$$35.(B)$$

$$36.(B) \operatorname{cosec}^2 67^\circ + \sec^2 57^\circ - \cot^2 33^\circ - \tan^2 23^\circ$$

$$= \operatorname{cosec}^2(90^\circ - 23^\circ) + \sec^2(90^\circ - 33^\circ) - \cot^2 33^\circ - \tan^2 23^\circ$$

$$= \sec^2 23^\circ + \operatorname{cosec}^2 33^\circ - \cot^2 33^\circ - \tan^2 23^\circ$$

$$= 1 + \tan^2 23^\circ + 1 + \cot^2 33^\circ - \cot^2 33^\circ - \tan^2 23^\circ$$

$$[\because 1 + \tan^2 \theta = \sec^2 \theta \text{ and } 1 + \cot^2 \theta = \operatorname{cosec}^2 \theta]$$

$$= 2$$

$$37.(B) \tan 24^\circ \cdot \tan 48^\circ \cdot \tan 42^\circ \cdot \tan 66^\circ$$

$$= \tan 24^\circ \cdot \tan 48^\circ \cdot \tan(90^\circ - 48^\circ) \cdot \tan(90^\circ - 24^\circ)$$

$$= \tan 24^\circ \cdot \tan 48^\circ \cdot \cot 48^\circ \cdot \cot 24^\circ$$

$$\{\because \tan(90^\circ - \theta) = \cot \theta\}$$

$$= 1$$

$$38.(A) \because \tan 0^\circ = 0$$

$$\therefore \tan 0^\circ \cdot \tan 1^\circ \cdot \tan 2^\circ \cdot \tan 3^\circ \cdot \tan 3^\circ \dots \tan 89^\circ = 0$$

$$39.(C) \tan(3A) = \cot(A - 22^\circ)$$

\tan & \cot are complimentary so

$$(3A) + (A - 22^\circ) = 90^\circ$$

$$4A - 22^\circ = 90^\circ$$

$$4A = 112^\circ$$

$$A = \frac{112}{4}$$

$$A = 28^\circ$$

$$40.(D) \frac{\sin^2 58^\circ + \cos^2 58^\circ}{\sec^2 50^\circ - \tan^2 50^\circ} + 4$$

$$= 1 + 4 = 5$$