



## MATHS

### BOOKS - CENGAGE

### STANDARD AND ALLIED ANGLES

#### Worked Examples

1. Find the value of the following:

$$4 \cos^2 60^\circ + 4 \tan^2 45^\circ - \operatorname{cosec}^2 30^\circ$$



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2.  $\sin^2 30^\circ + \tan^2 45^\circ + \tan^2 60^\circ$



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3. Find the numerical values of the following:

$$\begin{aligned}\tan(-120^\circ) &= -\tan 120^\circ \\ &= -\tan(180^\circ - 60^\circ) = -(\tan 60^\circ) \\ &= \tan 60^\circ = \sqrt{3}\end{aligned}$$



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## Test Yourself Level 1

1. Evaluate the following:

$$\sin^2 60^\circ + \cos^2 30^\circ + \cot^2 45^\circ + \sec^2 60^\circ - \operatorname{cosec}^2 30^\circ$$



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2. Evaluate the following:

$$\sin 60^\circ \cos 30^\circ + \cos 60^\circ \sin 30^\circ$$

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3. Evaluate the following:

$$\sin 45^\circ \cos 30^\circ - \cos 45^\circ \sin 30^\circ$$

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4. Using the formula  $\sin(A + B) = \sin A \cos B + \cos A \sin B$ , find the value of  $\sin 75^\circ$

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5. Using the formula  $\cos(A - B) = \cos A \cos B + \sin A \sin B$ , find the value of  $\cos 15^\circ$



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6. Express as a function of A:

$$\cos(270^\circ - A)$$



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7. Express as a function of A:

$$\sin(360^\circ - A)$$



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8. Express as a function of A:

$$\tan(A - 360^\circ)$$



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## Test Yourself Level 2

1. Find the numerical value of the following:

$$\cot^2 30^\circ + 4 \sin^2 45^\circ + 3 \operatorname{cosec}^2 60^\circ$$



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2. Find the numerical value of the following:

$$\frac{1}{3} \cos^2 30^\circ - \frac{1}{2} \operatorname{cosec}^2 30^\circ \cot^2 60^\circ + \frac{4}{3} \sin^2 45^\circ \cot^2 30^\circ$$



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3. Find the numerical value of the following:

$$\text{If } \tan^2 45^\circ - \sin^2 30^\circ = x \cos 45^\circ \sin 45^\circ \cot 30^\circ, \text{ find } x.$$

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4. Find x from the following equationn:

$$x \cos 60^\circ \sin^2 45^\circ = \frac{\tan^2 60^\circ \operatorname{cosec} 30^\circ \cot 45^\circ}{\sec^2 45^\circ \sec 60^\circ}$$

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5. If  $7 \sin^2 \theta + 3 \cos^2 \theta = 4$ , find  $\tan \theta$ .

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6. Find the numerical values of following:  $\sin 135^\circ$

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7. Find the numerical values of following:  $\cos(-120^\circ)$



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8. Find the numerical values of following:  $\tan\left(\frac{3\pi}{4}\right)$



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### Test Yourself Level 3

1. Find the value of A for which each of the following equation is true:

$$\sin 3A = \cos 7A$$



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2. Find the value of A for which each of the following equation is true:

$$\cos 2A = \tan 2A$$

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3. Find the value of A for which each of the following equation is true:

$$\sec 4A = \cos ec 5A$$

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4. Simplify the following

$$\sec(270^\circ - A)\sec(90^\circ - A) - \tan(270^\circ - A)\tan(90^\circ + A)$$

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### 5. Simplify the following

$$\cot A + \tan(180^\circ + A) + \tan(90^\circ + A) - \tan(360^\circ - A)$$



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### 6. Express the following in the simplest form:

$$\frac{\sin(-A)}{\sec(180^\circ - A)} - \frac{\tan(90^\circ + A)}{\cot A} + \frac{\cos A}{\sin(90^\circ + A)}$$



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### 7. Express the following in the simplest form:

$$\frac{\cos(90^\circ + A)\sec(-A)\tan(180^\circ - A)}{\sec(180^\circ + A)\sin(180^\circ + A)\cot(90^\circ - A)}$$



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8. Express the following in the simplest form:

$$\frac{\sin(180^\circ - \theta)}{\tan(180^\circ + \theta)} \times \frac{\cot(90^\circ - \theta)}{\tan(90^\circ + \theta)} \times \frac{\cos(360^\circ - \theta)}{\sin(-\theta)}$$

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9. Express the following in terms of ratios of a positive angle which is less than  $45^\circ$

$$\cos(-83^\circ)$$

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10. Express the following in terms of ratios of a positive angle which is less than  $45^\circ$

$$\tan 140^\circ$$

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11. Express the following in terms of ratios of a positive angle which is less than  $45^\circ$

$$\tan 1145^\circ$$



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12. Express the following in terms of ratios of a positive angle which is less than  $45^\circ$

$$\cot(-1056^\circ)$$



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13. Express the following in terms of ratios of a positive angle which is less than  $45^\circ$

$$\sec 1326^\circ$$



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14. State the quadrant in which the following radius angles lie.

$$140^\circ$$



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15. State the quadrant in which the following radius angles lie.

$$-150^\circ$$



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16. State the quadrant in which the following radius angles lie.

$$\frac{5\pi}{6}$$



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17. State the quadrant in which the following radius angles lie.

$$\frac{11\pi}{6}$$



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18. State the quadrant in which the following radius angles lie.

$$\frac{-12\pi}{6}$$



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19. Evaluate (without using tables) the following:

$$\sin 10^\circ \cos 80^\circ + \cos 10^\circ \sin 80^\circ$$



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20. Evaluate (without using tables) the following:

$$3\cos 80^\circ \cos 10^\circ + 2\cos 59^\circ \cos 31^\circ$$



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21. In a right angled triangle  $ABC$   $\angle C = 90^\circ$ ,  $\angle A = 30^\circ$  and  $AB = 8\text{cm}$ . Find the length of the other sides of the triangle.



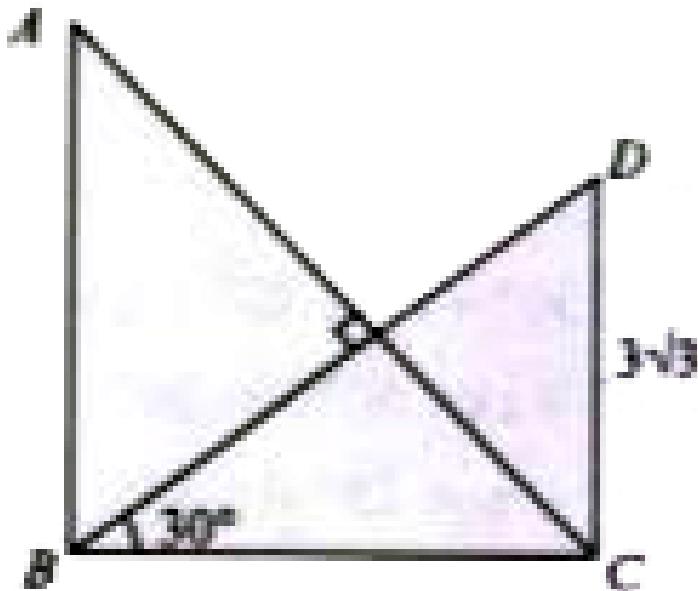
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22. In the  $\Delta ABC$ ,  $\angle A = 60^\circ$ ,  $\angle B = 45^\circ$ , and  $BC = 10\text{cm}$ . Find the altitude  $AD$  of the triangle.



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23.  $ABC$  and  $DCB$  are two right angled triangles in which  $ABC = 90^\circ$ ,  $DCB = 90^\circ$ ,  $DBC = 30^\circ$  and  $AC \perp BD$ . If  $DC = 3\sqrt{3}$  cm, find the length of  $AB$ .



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24. The value of  $\cot(-135^\circ)$  is

A. 1

B.  $\sqrt{3}$

C.  $\frac{1}{\sqrt{3}}$

D.  $-1$

**Answer: A**



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**25. Find the value of  $\cos ec(-1410)^\circ$**

A.  $\frac{1}{2}$

B. 2

C.  $\sqrt{3}$

D. 1

**Answer: B**





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26. The value of

$\cos \theta + \sin(270^\circ + \theta) - \sin(270^\circ - \theta) + \cos(180^\circ + \theta)$  is

A. 1

B. 0

C. 2

D. -1

Answer: B



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27. The value of  $\frac{\cos(90^\circ + \theta)\sec(270^\circ + \theta)\sin(180^\circ + \theta)}{\cos(-\theta)\cos(270^\circ - \theta)\tan(180^\circ + \theta)}$  is

A.  $\cos \theta$

B.  $\sin \theta$

C.  $\tan \theta$

D.  $\cot \theta$

**Answer: A**



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28. What is the value of

$$\cos\left(\frac{3\pi}{2} + \theta\right) \cos(2\pi + \theta) \left[ \cot\left(\frac{3\pi}{2} - \theta\right) + \cot(2\pi \div \theta) \right] ?$$

A.  $-1$

B.  $2$

C.  $1$

D.  $-2$

**Answer: C**



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29. What is the value of  $\sin^2 60^\circ + \tan 45^\circ - \cos 60^\circ + \operatorname{cosec}^2 45^\circ$ ?

A.  $\frac{5}{2}$

B.  $\frac{13}{4}$

C.  $\frac{7}{2}$

D.  $\frac{13}{2}$

Answer: B



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30. The value of  $\sin^2 30^\circ + \sin^2 45^\circ + \sin^2 60^\circ + \tan 45^\circ$  is

A.  $\frac{3}{2}$

B.  $\frac{7}{2}$

C.  $\frac{5}{2}$

D. 2

Answer: C

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31. If  $A + B + C = 180^\circ$  then the value of  $\tan\left(\frac{A+B}{2}\right) =$

A.  $\sin\frac{C}{2}$

B.  $\cos\frac{C}{2}$

C.  $\cot\frac{C}{2}$

D. None of these

Answer: C

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32. The value of  $\frac{\cos(\pi + \theta)\cos(-\theta)}{\cos(\pi - \theta)\cos\left(\frac{\pi}{2} + \theta\right)}$  is

- A.  $\tan \theta$
- B.  $-\tan \theta$
- C.  $\cot \theta$
- D.  $-\cot \theta$

Answer: D



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33. The value of

$$\frac{\sin(180^\circ + \theta)\cos(90^\circ + \theta)\tan(270^\circ - \theta)\cot(360^\circ - \theta)}{\sin(360^\circ - \theta)\cos(360^\circ + \theta)\operatorname{cosec}(-\theta)\sin(270^\circ + \theta)}$$

- A. 1
- B. 2

C. 3

D. 4

Answer: A



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34. The value of  $\frac{\cos 135^\circ - \cos 120^\circ}{\cos 135^\circ + \cos 120^\circ}$  is

A.  $2 + 2\sqrt{2}$

B.  $3 - \sqrt{2}$

C.  $3 + 2\sqrt{2}$

D.  $2 - 2\sqrt{2}$

Answer: B



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35. The value of  $3 \tan^2 45^\circ - \sin^2 60^\circ - \frac{1}{2} \cot^2 30^\circ + \frac{1}{8} \sec^2 45^\circ$  is

A. 1

B.  $\frac{1}{2}$

C.  $\sqrt{3}$

D.  $\frac{1}{\sqrt{3}}$

Answer: A



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36. The value of

$\tan 1^\circ \tan 2^\circ \tan 3^\circ \dots \tan 87^\circ \tan 88^\circ \tan 89^\circ$  is

A. 0

B. 2

C. 1

D.  $-1$

**Answer: C**



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37. Find the value of

$$\sin^2 5^\circ + \sin^2 10^\circ + \sin^2 15^\circ + \dots + \sin^2 90^\circ.$$

A.  $8\frac{1}{2}$

B.  $9\frac{1}{2}$

C.  $10\frac{1}{2}$

D.  $11\frac{1}{2}$

**Answer: B**



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**38. The value of**

$$\cos^2 \frac{\pi}{16} + \cos^2 \frac{3\pi}{16} + \cos^2 \frac{5\pi}{16} + \cos^2 \frac{7\pi}{16} \text{ is}$$

**A. 1**

**B. 0**

**C. -1**

**D. 2**

**Answer: D**



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**39. The value of**

$$\cot^2 30^\circ - 2 \cos^2 60^\circ - \frac{3}{4} \sin^2 45^\circ - 4 \sin^2 30^\circ \text{ is}$$

**A.  $\frac{1}{8}$**

**B.  $\frac{7}{8}$**

C.  $\frac{5}{8}$

D.  $\frac{9}{8}$

Answer: D



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40. The value of  $\frac{\sec 480^\circ \cdot \cos 570^\circ \cdot \tan 330^\circ}{\sin 600^\circ \cdot \cos 660^\circ \cdot \cot 405^\circ}$  is

A.  $\frac{14}{3}$

B.  $\frac{16}{3}$

C.  $\frac{13}{3}$

D.  $\frac{17}{3}$

Answer: B



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41. What is the value of the

$$\sin^2 6^\circ + \sin^2 12^\circ + \sin^2 18^\circ + \dots + \sin^2 84^\circ + \sin^2 90^\circ ?$$

A. 1

B. 2

C. 8

D. 4

Answer: C



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42. The value of  $\tan 9^\circ \cdot \tan 27^\circ \cdot \tan 45^\circ \cdot \tan 63^\circ \tan 81^\circ$  is

A. 1

B. 2

C. 3

D. 4

Answer: A



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43. If  $4n\alpha = \pi$ , then find the value of  $\tan \alpha \cdot \tan 2\alpha \cdot \tan 3\alpha \dots \dots \dots \tan(2n - 2)\alpha \cdot \tan(2n - 1)\alpha$ .

A. 3

B. 1

C. 13

D. 7

Answer: B



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44. The value for  $2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta) + 1$  is

A. 0

B. 1

C.  $\frac{3}{2}$

D. 2

Answer: A



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45. The value of  $\tan^2 \frac{\pi}{3} + 2\cos^2 \frac{\pi}{4} + 3\sec^2 \frac{\pi}{6} + 4\cos^2 \frac{\pi}{2}$  is

A. 2

B. 4

C. 6

D. 8

Answer: D



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46. The value

$$\sin \frac{\pi}{6} \cos 0 + \sin \frac{\pi}{4} + \sin \frac{\pi}{3} \cos \frac{\pi}{6} \text{ is}$$

A.  $\frac{3}{4}$

B.  $\frac{7}{4}$

C.  $\frac{5}{4}$

D.  $\frac{9}{4}$

Answer: B



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**47. The value of**

$$\frac{\sin(-1)}{\sec(180^\circ + A)} - \frac{\tan(90^\circ + A)}{\cot A} + \frac{\cos(360^\circ - A)}{\sin A} + \frac{\cos A}{\sin(90^\circ + A)}$$

is

**A.**  $\sin A \cos A - \cot A + 2$

**B.**  $\sin A \cos A + \cot A + 2$

**C.**  $\sin A \cos A + 2$

**D.**  $\sin A \cos A - \cot A$

**Answer: B**



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**48. The value of**

$$\frac{\cos(90^\circ + A)\sec(-A)\tan(180^\circ - A)}{\sec(180^\circ + A)\sin(180^\circ + A)\cot(90^\circ - A)} \text{ is}$$

**A.** 1

B. 0

C.  $-1$

D.  $\cos A$

Answer: A



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49. The value of  $\sin 10^\circ \cos 80^\circ + \cos 10^\circ \sin 80^\circ$  is

A. 0

B. 1

C.  $-1$

D. 2

Answer: B



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50. The value of  $x$  if  $\tan^2 45^\circ - \sin^2 30^\circ = x \sin^2 45^\circ \tan 60^\circ$  is

A.  $\sin 60^\circ$

B.  $\sin 30^\circ$

C.  $\tan 30^\circ$

D.  $\sin 45^\circ$

Answer: A



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51. The value of  $x$  which satisfies the equation

$$x \sin 60^\circ \cos^2 45^\circ = \frac{\tan^2 45^\circ \operatorname{cosec} 30^\circ \cot 45^\circ}{\sec 45^\circ \sec^2 60^\circ} \text{ is}$$

A.  $\frac{2}{\sqrt{3}}$

B.  $\frac{\sqrt{3}}{2}$

C.  $\sqrt{\frac{2}{3}}$

D.  $\sqrt{\frac{3}{2}}$

Answer: C

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52. In  $\triangle ABC$ ,  $\angle ABC = 60^\circ$ ,  $\angle ACB = 45^\circ$  and  $BC = 10\text{cm}$ .

Find the altitude AD of the triangle

A.  $\frac{10\sqrt{3}}{7}$

B.  $\frac{10\sqrt{3}}{\sqrt{3} + 1}$

C.  $\frac{7\sqrt{3}}{5}$

D. None of these

Answer: B

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## Olympiad And Ntse Level Exercises

1. The value of  $\cos 105^\circ + \sin 105^\circ$  is

A.  $\frac{1}{2}$

B. 1

C.  $\sqrt{2}$

D.  $\frac{1}{\sqrt{2}}$

Answer: D



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2.  $\tan\left(\frac{\pi}{4} + \theta\right) - \tan\left(\frac{\pi}{4} - \theta\right) =$

A.  $2 \tan 2\theta$

B.  $2 \cot 2\theta$

C.  $\tan 2\theta$

D.  $\cot 2\theta$

**Answer: A**



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3.  $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ = ?$

A. 1

B. 0

C.  $1/2$

D. 2

**Answer: B**



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4.  $\tan 20^\circ + \tan 40^\circ + \sqrt{3} + \sqrt{3}\tan 20^\circ \tan 40^\circ =$

A.  $\frac{1}{\sqrt{3}}$

B.  $\sqrt{3}$

C.  $-\frac{1}{\sqrt{3}}$

D.  $-\sqrt{3}$

Answer: B



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5. If  $\tan x + \tan\left(\frac{\pi}{3} + x\right) + \tan\left(\frac{2\pi}{3} + x\right) = 3$ , then

A.  $\tan x = 1$

B.  $\tan 2x = 1$

C.  $\tan 3x=1$

D. None of these

Answer: C



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6. The expression  $2\cos\frac{\pi}{13}\cos\frac{9\pi}{13} + \cos\frac{3\pi}{13} + \cos\frac{5\pi}{13}$  is equal to

A.  $-1$

B.  $0$

C.  $1$

D. None of these

Answer: B



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7. The value of  $2\cos 10^\circ + \sin 100^\circ + \sin 1000^\circ + \sin 10000^\circ$  is

A. 0

B.  $\sin 10^\circ$

C.  $\cos 10^\circ$

D.  $-1$

Answer: C



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8. The value of  $\sec 11^\circ \cdot \sec 19^\circ - 2\cot 71^\circ$  is equal to

A.  $2\cot 11^\circ$

B.  $\tan 19^\circ$

C.  $2\tan 11^\circ$

D.  $\frac{1}{9}\tan 19^\circ$

Answer: C



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9. The value of  $\frac{\cot 84^\circ \cot 48^\circ}{\cot 66^\circ \cot 78^\circ}$  is equal to

A. 1

B. 0

C.  $\sqrt{3}$

D. None of these

Answer: A



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10.  $\sin \frac{9\pi}{14} \sin \frac{11\pi}{14} \sin \frac{13\pi}{14}$  is equal to



A.  $\frac{1}{64}$

B.  $-\frac{1}{64}$

C.  $\frac{1}{8}$

D.  $-\frac{1}{8}$

**Answer: C**



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