



MATHS

BOOKS - S CHAND IIT JEE FOUNDATION

TRIGONOMETRICAL RATIOS

Solved Examples

1. If $\cos \theta = \frac{12}{13}$, find the value of $2 \sin \theta - 4 \tan \theta$, where θ is an acute angle

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2. If $\tan \theta = \frac{1}{\sqrt{3}}$, prove that $7 \sin^2 \theta + 3 \cos^2 \theta = 4$

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3. If $b \tan \theta = a$ find the value of $\frac{\cos \theta + \sin \theta}{\cos \theta - \sin \theta}$

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4. Prove: $(1 + \cot^2 \theta) \sin^2 A = 1$

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5. Prove that $\sec^2 \theta + \cos ec^2 \theta = \sec^2 \theta \cdot \cos ec^2 \theta$

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6. Prove : $(1 + \tan^2 \theta)(1 + \sin \theta)(1 - \sin \theta) = 1$.

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7. Show that $\left(\frac{1 + \cos \theta - \sin^2 \theta}{\sin \theta(1 + \cos \theta)} \right) = \cot \theta$

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8.
$$\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} = 2 \operatorname{cosec} \theta$$

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9. Evaluate : $2 \tan^2 45^\circ + \cos^2 30^\circ - \sin^2 60^\circ$

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10. Prove that :

$$\frac{4}{3} \tan^2 30^\circ + \sin^2 60^\circ - 3 \cos^2 60^\circ + \frac{3}{4} \tan^2 60^\circ - 2 \tan^2 45^\circ = \frac{25}{36}$$

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11. Find the value of x if $\tan 3x = \sin 45^\circ \cos 45^\circ + \sin 30^\circ$

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12. Without using trigonometric tables, show that

$$\frac{\cos 70^\circ}{\sin 20^\circ} + \cos 49^\circ \operatorname{cosec} 41^\circ = 2$$



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13. Evaluate : $\tan 7^\circ \tan 23^\circ \tan 60^\circ \tan 67^\circ \tan 83^\circ$



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14. The value of $(\tan 1^\circ \tan 2^\circ \tan 3^\circ \dots \tan 89^\circ)$ is



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15. If $\sin 3\theta = \cos(\theta - 6^\circ)$, where 3θ and $(\theta - 6^\circ)$ are acute angle then the value of θ is _____.



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16. Show that

$$\frac{1}{1 + \cos(90^\circ - \theta)} + \frac{1}{1 - \cos(90^\circ - \theta)} = 2 \operatorname{cosec}^2(90^\circ - \theta)$$

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Question Bank 32

1. If $\cos \theta = \frac{5}{13}$, θ being an acute angle then the value of $\frac{\cos \theta + 5 \cot \theta}{\operatorname{cosec} \theta - \cos \theta}$ will be

- A. $\frac{169}{109}$
- B. $\frac{155}{109}$
- C. $\frac{385}{109}$
- D. $\frac{395}{109}$

Answer: C

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2. If $p \sin x = q$ and x is acute then $\sqrt{p^2 - q^2} \tan x$ is equal to

A. p

B. q

C. pq

D. $p + q$

Answer: B



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3. If $8 \tan A = 15$, then the value of $\frac{\sin A - \cos A}{\sin A + \cos A}$ is

A. $\frac{7}{23}$

B. $\frac{11}{23}$

C. $\frac{13}{23}$

D. $\frac{17}{23}$

Answer: A

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4. If $\sin \theta : \cos \theta : : a : b$ then the value of $\sec \theta$ is

A. $\frac{\sqrt{a^2 + b^2}}{a}$

B. $\frac{b}{\sqrt{a^2 + b^2}}$

C. $\frac{\sqrt{a^2 + b^2}}{b}$

D. $\frac{a}{\sqrt{a^2 + b^2}}$

Answer: C

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5. If $\tan x = \frac{4}{3}$, then the value of

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

A. $\frac{9}{16}$

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

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

D. $\frac{16}{9}$

Answer: B



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6. If $\cos A = 0.6$ then $5 \sin A - 3 \tan A$ is equal to

A. 0

B. 1

C. 2

D. 8

Answer: A



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7. If $\cos \theta = \frac{3}{5}$, then the value of $\frac{\sin \theta \cdot \tan \theta + 1}{2 \tan^2 \theta}$ is

A. $\frac{88}{160}$

B. $\frac{91}{160}$

C. $\frac{92}{160}$

D. $\frac{93}{160}$

Answer: D



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8. If $\tan \theta = \frac{x}{y}$, then $\frac{x \sin \theta + y \cos \theta}{x \sin \theta - y \cos \theta}$ is equal to

A. $\frac{x^2 + y^2}{x^2 - y^2}$

B. $\frac{x^2 - y^2}{x^2 + y^2}$

C. $\frac{x}{\sqrt{x^2 + y^2}}$

D. $\frac{y}{\sqrt{x^2 + y^2}}$

Answer: A



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9. In a $\triangle ABC$ right angled at B, if $\tan A = \frac{1}{\sqrt{3}}$, find the value of $\cos A$

$\cos C - \sin A \sin C$

A. 1

B. 0

C. -1

D. 2

Answer: B



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10. If $7 \sin A = 24 \cos A$ then $14 \tan A + 25 \cos A - 7 \sec A$ equals

A. 0

B. 1

C. 30

D. 32

Answer: C



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11. The value of $\sin^2 \theta \cos^2 \theta (\sec^2 \theta + \csc^2 \theta)$ is

A. 2

B. 4

C. 1

D. 3

Answer: C



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12. Which of the following is not an identity ?

A. $(1 - \sin^2 A) \cdot \sec^2 A = 1$

B. $(\sec^2 \theta - 1)(1 - \cos ec^2 \theta) = 1$

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

D. $\sin^4 \theta - \cos^4 \theta = \sin^2 \theta - \cos^2 \theta$

Answer: B



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13. if $x = a \sec \theta + b \tan \theta$

$$y = b \sec \theta + a \tan \theta$$

then $x^2 - y^2$ is equal to

A. $4ab \sec \theta \tan \theta$

B. $a^2 - b^2$

C. $b^2 - a^2$

D. $a^2 + b^2$

Answer: B



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14. If $x = a \cos^3 \theta$ and $y = b \sin^3 \theta$, then the value of

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

A. 1

B. -2

C. 2

D. -1

Answer: A



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15. What is the value of $(\operatorname{cosec} A - \sin A)(\sec A - \cos A)(\tan A + \cot A)$?

A. 0

B. 1

C. 2

D. 3

Answer: B



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16. What is the value of $\frac{\sin^3 x + \cos^3 x}{\sin x + \cos x} + \sin x \cos x$?

A. 0

B. $\sin x$

C. $\cos x$

D. 1

Answer: D



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17. $\frac{\cos \theta}{1 - \sin \theta} + \frac{\cos \theta}{1 + \sin \theta}$ equals

A. $2 \tan \theta$

B. $2 \operatorname{cosec} \theta$

C. $2 \cot \theta$

D. $2 \sec \theta$

Answer: D



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18. Consider the following :

1. $\tan^2 \theta - \sin^2 \theta = \tan^2 \theta \sin^2 \theta$

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

Which of the statements given below is correct

- A. 1 only is the identity
- B. 2 only is the identity
- C. Both 1 and 2 are identity
- D. Neither 1 nor 2 is the identity

Answer: C



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

A. 1

B. 2

C. $\sqrt{2}$

D. 0

Answer: A



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20. If $\sin \theta + \sin^2 \theta = 1$, then $\cos^2 \theta + \cos^4 \theta$

A. 1

B. $\sqrt{2}$

C. 0

D. 2

Answer: A



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Self Assessment Sheet 31

1. If $\sec \theta = \frac{13}{5}$, then what is the value of $\frac{2 \sin \theta - 3 \cos \theta}{4 \sin \theta - 9 \cos \theta}$

A. 1

B. 2

C. 3

D. 4

Answer: C



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Self Assessment Sheet 32

1. If $\tan X = \frac{x}{y}$, where x and y are whole numbers, then $\sin X$ is :

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

B. $\frac{x}{\sqrt{x^2 + y^2}}$

C. $\frac{y}{\sqrt{x^2 + y^2}}$

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

Answer: B



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2. Which of the following is not defined ?

A. $\sin 90^\circ$

B. $\tan 0^\circ$

C. $\cos 90^\circ$

D. $\cos ec 0^\circ$

Answer: D



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3. What is the value of $\frac{\sin 60^\circ}{\cos^2 45^\circ} - 3\tan 30^\circ + 5\cos 90^\circ$

A. 1

B. -1

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

D. 0

Answer: D



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4. The value of $2\sqrt{2}\cos 45^\circ \cdot \cos 60^\circ + 2\sqrt{3}\sin 30^\circ \tan 60^\circ - \cos 0^\circ$ is

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

B. 3

C. -3

D. 0

Answer: B



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5. If $2 \cos \theta = \sqrt{3}$ evaluate $3 \sin \theta - 4 \sin^3 \theta$

A. 3

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

C. 1

D. 2

Answer: C



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6. What is the value of

$$\frac{\sin 2^\circ \sin 4^\circ \sin 6^\circ \dots \sin 88^\circ}{\cos 88^\circ \cos 86^\circ \cos 84^\circ \dots \cos 2^\circ}$$

(Do not use trigonometric tables)

A. 0

B. 1

C. 2

D. 4

Answer: B



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7. If $x + y = 90^\circ$, then what is the value of $\left(1 + \frac{\tan x}{\tan y}\right) \sin^2 y$?

A. 0

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

C. 1

D. 2

Answer: C



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8. If $\sin A = \cos A$ and A is acute, $\tan A - \cot A$ is equal to :

A. 2

B. 1

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

D. 0

Answer: D



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9. Without using trigonometric tables, find the value of :

$$\frac{2}{3} \left(\frac{\sec 56^\circ}{\cos 34^\circ} \right) - 2 \cos^2 20^\circ + \frac{1}{2} \cot 28^\circ \cot 35^\circ \cot 45^\circ \cot 62^\circ \cot 55^\circ - 2$$

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

B. $-\frac{3}{4}$

C. $-\frac{5}{6}$

D. 1

Answer: C



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10. If $11x$ is an acute angle and $\tan 11x = \cot 7x$, then what is the value of x ?

A. 5°

B. 6°

C. 7°

D. 8°

Answer: A



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11.

Evaluate

$$\sin(50^\circ + \theta) - \cos(40^\circ - \theta) + \tan 1^\circ \tan 15^\circ \tan 20^\circ \tan 70^\circ \tan 65^\circ \tan 89^\circ$$

A. 0

B. 1

C. 2

D. 3

Answer: C



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1. If $4 \sin \theta = 3 \cos \theta$, then $\frac{\sec^2 \theta}{4(1 - \tan^2 \theta)}$ is

A. $\frac{25}{16}$

B. $\frac{25}{28}$

C. $\frac{1}{4}$

D. $\frac{16}{25}$

Answer: B



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Self Assessment Sheet 34

1. If $\cos x = \frac{12}{13}$ and x is an acute angle, then

$$\sqrt{\left(1 + \frac{\sin x}{\cos x}\right)}(1 - \tan x) \text{ is}$$

A. $\frac{\sqrt{115}}{12}$

B. $\frac{\sqrt{116}}{12}$

C. $\frac{\sqrt{119}}{12}$

D. $\frac{\sqrt{117}}{12}$

Answer: C



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Self Assessment Sheet 35

1. If $\frac{1}{\cos \theta} = a + \frac{1}{4a}$, then the value of $\left(\tan \theta + \frac{1}{\cos \theta} \right)$ is

A. a

B. 2a

C. 3a

D. 4a

Answer: B



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Self Assessment Sheet 36

1. If $p = \cos x - \sin x$, $q = \frac{1 - \sin^3 x}{1 - \sin x}$, $r = \frac{1 + \cos^3 x}{1 + \cos x}$ what is the value of $p + q + r$?

A. 0

B. 1

C. 2

D. 3

Answer: D



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Self Assessment Sheet 37

1. $\frac{\cos \alpha + \cos \beta}{\sin \alpha - \sin \beta} + \frac{\sin \alpha + \sin \beta}{\cos \alpha - \cos \beta} =$

A. 1

B. 2

C. $\sqrt{2}$

D. 0

Answer: D



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Self Assessment Sheet 38

1. $\frac{1 + \tan^2 A}{1 + \cot^2 A}$ equals

A. $\sec^2 A$

B. -1

C. $\cot^2 A$

$$D. \tan^2 A$$

Answer: D

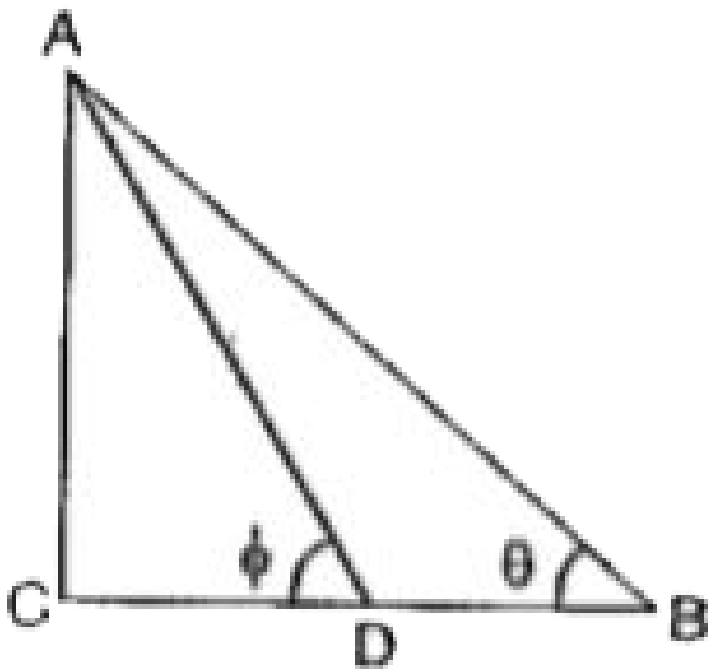


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Self Assessment Sheet 39

1. ABC is right angled triangle, right angled at C . D is the midpoint of BC.

Then , $\frac{\tan \theta}{\tan \phi} =$



A. 1

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

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

D. 2

Answer: C

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1. Which of the following is not an identity ?

A. $\frac{1}{\sec A - 1} + \frac{1}{\sec A + 1} = 2 \operatorname{cosec} A \cot A$

B. $\cos^2 A + \frac{1}{1 + \cot^2 A} = 1$

C. $\tan \theta - \cot \theta = \frac{2 \sin^2 \theta - 1}{\sin \theta \cos \theta}$

D. $\cot \theta + \tan \theta = \operatorname{cosec} \theta \cdot \cos \theta$

Answer: D



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Question Bank 33

1. v20

A. $\tan 90^\circ$

B. 1

C. $\sin 45^\circ$

D. 0

Answer: D



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2. If $x \tan 30^\circ = \frac{\sin 30^\circ + \cos 60^\circ}{\tan 60^\circ + \sin 60^\circ}$, then the value of x is :

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

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

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

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

Answer: A



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3. The value of $\sin 0^\circ + \cos 30^\circ - \tan 45^\circ + \operatorname{cosec} 60^\circ + \cot 90^\circ$ is equal to

A. $\frac{5\sqrt{3} - 6}{6}$

B. $\frac{-6 + 7\sqrt{3}}{6}$

C. 0

D. 2

Answer: B



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4. If $2\sin^2 x + \cos^2 45^\circ = \tan 45^\circ$ and x is an acute angle, then the value of $\tan x$ is :

A. 1

B. $\sqrt{3}$

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

D. 3

Answer: C



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5. The value of $a \sin 0^\circ + b \cos 90^\circ + c \tan 45^\circ$ is

A. $a + b + c$

B. $b + c$

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

D. c

Answer: D



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6. The value of $\frac{\sin 30^\circ - \cos 60^\circ + \tan 45^\circ}{\cos 90^\circ + \tan 45^\circ + \sin 90^\circ}$ is

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

B. 1

C. $\sqrt{3}$

D. ∞

Answer: D



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7. The value of

$\frac{1}{2}\sin^2 90^\circ \sin^2 30^\circ \cos^2 45^\circ + 4\tan^2 30^\circ + \frac{1}{2}\sin^2 90^\circ - 2\cos^2 90^\circ$ is :

A. $\frac{45}{24}$

B. $\frac{46}{24}$

C. $\frac{47}{24}$

D. $\frac{49}{24}$

Answer: C



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8. The value of

$$(\cos 0^\circ + \sin 45^\circ + \sin 30^\circ)(\sin 90^\circ - \cos 45^\circ + \cos 60^\circ) \text{ is}$$

A. 0

B. 1

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

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

Answer: C



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9. $\frac{\tan 60^\circ - \tan 30^\circ}{1 + \tan 60^\circ \tan 30^\circ}$ equal

A. $\tan 60^\circ$

B. $\tan 0^\circ$

C. $\tan 30^\circ$

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

Answer: C



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10. Find the value of x , if

$$\sin 2x = \sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ$$

A. 20°

B. 15°

C. 30°

D. 45°

Answer: B



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11. $\tan 26^\circ - \cot 64^\circ$ equals

A. -1

B. 1

C. 0

D. 2

Answer: C



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12. $\frac{\sin 19^\circ}{\cos 71^\circ} + \frac{\cos 73^\circ}{\sin 17^\circ}$

A. 0

B. 1

C. 2

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

Answer: C



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13. Consider the following equations :

$$1. \frac{\cos 75^\circ}{\sin 15^\circ} + \frac{\sin 12^\circ}{\cos 78^\circ} - \frac{\cos ec 18^\circ}{\sec 72^\circ} = 1$$

$$2. \frac{\tan 50^\circ + \sec 50^\circ}{\cot 40^\circ + \cos ec 40^\circ} + \cos 40^\circ \cos ec 50^\circ = + 2$$

$$3. \frac{\sin 80^\circ}{\cos 10^\circ} - \sin 59^\circ \sec 31^\circ = 0$$

Which of these statements given below is correct

A. 1 only is correct

B. 3 only is correct

C. All 1, 2 and 3 are correct

D. 2 and 3 are correct

Answer: C



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14. $\sin^2 25^\circ + \sin^2 65^\circ$ is equal to

A. 0

B. $2 \sin^2 25^\circ$

C. $\cos^2 65^\circ$

D. 1

Answer: C



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15. If $\sin(30^\circ - \theta) = \cos(60^\circ + \phi)$, then

A. $\phi - \theta = 30^\circ$

B. $\phi - \theta = 0^\circ$

C. $\phi + \theta = 60^\circ$

D. $\phi - \theta = 60^\circ$

Answer: D



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16. The value of $\cot 15^\circ \cot 16^\circ \cot 17^\circ \dots \cot 73^\circ \cot 74^\circ \cot 75^\circ$ is :

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

B. 0

C. 1

D. -1

Answer: B



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17. If $\sin \theta = \cos \theta$, then value of θ is :

A. 60°

B. 0°

C. 45°

D. 90°

Answer: C

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18. Value of $\cos^2 5^\circ + \cos^2 10^\circ + \cos^2 80^\circ + \cos^2 85^\circ$ is

A. 1

B. 0

C. 2

D. 3

Answer: C

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19. If $\sin 3\theta = \cos(\theta - 2^\circ)$ where 3θ and $(\theta - 2^\circ)$ are acute angles, what is the value of θ ?

A. 22°

B. 23°

C. 24°

D. 25°

Answer: C



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20. If $\tan \theta = 1$ and $\sin \phi = \frac{1}{\sqrt{2}}$, then the value of $\cos(\theta + \phi)$ is

A. -1

B. 0

C. 1

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

Answer: B



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21. If $x \cos 60^\circ + y \cos 0^\circ = 3$ and $4x \sin 30^\circ - y \cot 45^\circ = 2$, then what is the value of x ?

A. -1

B. 0

C. 1

D. 2

Answer: D



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22. Which one of the following is true?

A. $\tan x > 1, 45^\circ < x < 90^\circ$

B. $\sin x > \frac{1}{2}, 0^\circ < x < 30^\circ$

C. $\cos x > \frac{1}{2}, 60^\circ < x < 90^\circ$

D. $\sin x = \cos x$ for some value of $x, 30^\circ < x < 45^\circ$

Answer: A

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

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

A. $\cos x$

B. $\sin x$

C. $\sqrt{\cos x}$

D. $\sqrt{\sin x}$

Answer: B

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24. If $0^\circ < \theta < 90^\circ$ and $\cos^2 \theta - \sin^2 \theta = \frac{1}{2}$, then what is the value of θ ?

A. 30°

B. 45°

C. 60°

D. 90°

Answer: A

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25. The value of $\sin^2(90^\circ - \theta)[1 + \cot^2(90^\circ - \theta)]$ is

A. -1

B. 0

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

D. 1

Answer: D



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