

Chapter 03

Trigonometric Ratios



TOPIC WISE QUESTIONS



TRIGONOMETRIC RATIOS OR FUNCTIONS

Q.1 In a circle of diameter 40 cm the length of a chord is 20 cm. Then the length of minor arc corresponding to the chord is.....

- (1) $\frac{20\pi}{3}$ cm (2) $\frac{10\pi}{3}$ cm
(3) $\frac{40\pi}{3}$ cm (4) $\frac{5\pi}{3}$ cm

Q.2 A regular hexagon & a regular dodecagon are inscribed in the same circle. If the side of the dodecagon is $(\sqrt{3}-1)$, then the side of the hexagon is

- (1) $\sqrt{2}+1$ (2) $\frac{\sqrt{3}+1}{2}$
(3) $\sqrt{2}$ ★ (4) 2

Q.3 If $5 \tan \theta = 4$, then $\frac{5 \sin \theta - 3 \cos \theta}{\sin \theta + 2 \cos \theta} =$

- (1) 5/9 (2) 14/5 (3) 9/5 (4) 5/14

Q.4 $\tan^2 \theta \sec^2 \theta (\cot^2 \theta - \cos^2 \theta) =$

- (1) 0 (2) -1 (3) 1 (4) 2

Q.5 If $\sin^6 \theta + \cos^6 \theta - 1 = \lambda \sin^2 \theta \cos^2 \theta$, then the value of λ is

- (1) 1 (2) 2
(3) 3 (4) None of these

Q.6 If $\frac{\sin^4 \alpha}{a} + \frac{\cos^4 \alpha}{b} = \frac{1}{a+b}$, Find $\frac{\sin^8 \alpha}{a^3} + \frac{\cos^8 \alpha}{b^3} =$

- (1) $\frac{1}{(a-b)^3}$ (2) $\frac{1}{(a+b)^3}$
(3) $\frac{1}{a^3} + \frac{1}{b^3}$ (4) None of these

Q.7 The value of $\cot x + \cot(60^\circ + x) + \cot(120^\circ + x)$ is equal to

- (1) $\cos 3x$ (2) $\tan 3x$

(3) $3 \tan 3x$ (4) $\frac{3-9 \tan^2 x}{3 \tan x - \tan^3 x}$

Q.8 If $\sin \theta + \operatorname{cosec} \theta = 2$ then the value of $\sin^8 \theta + \operatorname{cosec}^8 \theta$ is equal to-

- (1) 2 (2) 2^8
(3) 2^4 (4) None of these

Q.9 If $\sin x + \sin^2 x = 1$, then $\cos^8 x + 2 \cos^6 x + \cos^4 x = \dots$

- (1) 0 (2) -1 (3) 2 (4) 1

Q.10 $x = y \cos \frac{2\pi}{3} = z \cos \frac{4\pi}{3}$, then $xy + yz + zx =$

- (1) -1 (2) 0 (3) 1 (4) 2

Q.11 If $\tan \theta = -\frac{1}{\sqrt{10}}$ and θ lies in the fourth quadrant, then $\cos \theta =$

- (1) $1/\sqrt{11}$ (2) $-1/\sqrt{11}$
(3) $\sqrt{10}/\sqrt{11}$ (4) $-\sqrt{10}/\sqrt{11}$

Q.12 If $\alpha \cos^2 3\theta + \beta \cos^4 \theta = 16 \cos^6 \theta + 9 \cos^2 \theta$ is an identity then-

- (1) $\alpha = 1, \beta = 18$ (2) $\alpha = 1, \beta = 24$
(3) $\alpha = 3, \beta = 24$ (4) $\alpha = 4, \beta = 2$

Q.13 If $\cos \alpha + \cos \beta = a$, $\sin \alpha + \sin \beta = b$, then $\cos(\alpha - \beta)$ is equal to -

- (1) $\frac{2ab}{a^2 + b^2}$ (2) $\frac{a^2 + b^2}{a^2 - b^2}$
(3) $\frac{a^2 + b^2 - 2}{2}$ (4) $\frac{b^2 - a^2}{a^2 + b^2}$

Q.14 If $p = \frac{2 \sin \theta}{1 + \cos \theta + \sin \theta}$ and $q = \frac{\cos \theta}{1 + \sin \theta}$ then

- (1) $pq = 1$ (2) $q/p = 1$
(3) $q - p = 1$ (4) $p + q = 1$

- Q.15** $3(\sin x - \cos x)^4 + 6(\sin x + \cos x)^2 + 4(\sin^6 x + \cos^6 x) =$
 (1) 11 (2) 12 (3) 13 (4) 14

SIGN & ALLIED ANGLE OF TRIGONOMETRIC RATIOS

- Q.16** $\sin^2 5^\circ + \sin^2 10^\circ + \sin^2 15^\circ + \dots + \sin^2 85^\circ + \sin^2 90^\circ =$
 (1) 7 (2) 8 (3) $9\frac{1}{2}$ (4) 10

- Q.17** $\cos A + \sin(270^\circ + A) - \sin(270^\circ - A) + \cos(180^\circ + A) =$
 (1) -1 (2) 0
 (3) 1 (4) None of these

- Q.18** If $\sin \theta = -\frac{1}{\sqrt{2}}$ and $\tan \theta = 1$, then θ lies in which quadrant-
 (1) First (2) Second
 (3) Third (4) Fourth

- Q.19** If A lies in the second quadrant and $3 \tan A + 4 = 0$, the value $2 \cot A - 5 \cos A + \sin A$ is equals to-
 (1) 23/11 (2) 22/10
 (3) 23/10 (4) None of these

- Q.20** $\cos 24^\circ + \cos 5^\circ + \cos 175^\circ + \cos 204^\circ + \cos 300^\circ =$
 (1) 1/2 (2) -1/2 (3) $\frac{\sqrt{3}}{2}$ (4) 1

- Q.21** The equation $\sec^2 \theta = \frac{4xy}{(x+y)^2}$ is only possible when -
 (1) $x = y$ (2) $x < y$
 (3) $x > y$ (4) none of these

SUM AND DIFFERENCE FORMULAE

- Q.22** If $\tan \alpha = \frac{x}{x+1}$ and $\tan \beta = \frac{1}{2x+1}$, then $\alpha + \beta$
 (1) 0 (2) $\pi/4$ (3) $\pi/3$ (4) $\pi/2$
- Q.23** $\tan 20^\circ + 2 \tan 50^\circ =$
 (1) $\tan 70^\circ$ (2) $\cot 70^\circ$
 (3) $\sin 70^\circ$ (4) $\tan 30^\circ$

- Q.24** The expression $\frac{\sin(\alpha+\beta) - 2\sin\alpha + \sin(\alpha-\beta)}{\cos(\alpha+\beta) - 2\cos\alpha + \cos(\alpha-\beta)}$ is independent of

- (1) β (2) α
 (3) α, β (4) None of these

- Q.25** If $A - B = \frac{\pi}{4}$, then $(1 + \tan A)(1 - \tan B) =$
 (1) 1 (2) 2 (3) -1 (4) -2

- Q.26** $\tan 5x \tan 3x \tan 2x = \dots$

- (1) $\tan 5x - \tan 3x - \tan 2x$
 (2) $\frac{\sin 5x - \sin 3x - \sin 2x}{\cos 5x - \cos 3x - \cos 2x}$
 (3) 0
 (4) None of these

- Q.27** $2 \sin^2 \beta + 4 \cos(\alpha + \beta) \sin \alpha \sin \beta + \cos 2(\alpha + \beta)$ is equal to -
 (1) $\sin 2\alpha$ (2) $\cos 2\beta$
 (3) $\cos 2\alpha$ (4) $\sin 2\beta$

- Q.28** Let $f(\theta) = \frac{\cot \theta}{1 + \cot \theta}$ and $\alpha + \beta = \frac{5\pi}{4}$, then the value of $f(\alpha) \cdot f(\beta)$ is -

- (1) 2 (2) $-\frac{1}{2}$
 (3) $\frac{1}{2}$ (4) None of these

- Q.29** Exact value of $\tan 200^\circ (\cot 10^\circ - \tan 10^\circ)$ is-

- (1) 1 (2) 2
 (3) 0 (4) None of these

- Q.30** If $\tan \alpha = \frac{1}{7}$ and $\sin \beta = \frac{1}{\sqrt{10}}$, then $\tan(\alpha + 2\beta)$

- is equal to
 (1) 1 (2) 0 (3) 1/2 (4) 3/4

FORMULAE FOR PRODUCT INTO SUM OR DIFFERENCE CONVERSION

- Q.31** $\frac{\sin 70^\circ + \cos 40^\circ}{\cos 70^\circ + \sin 40^\circ} =$
 (1) 1 (2) $\frac{1}{\sqrt{3}}$ (3) $\sqrt{3}$ (4) $\frac{1}{2}$

Q.32 $2 \sin \left(\frac{5\pi}{12} \right) \sin \left(\frac{\pi}{12} \right) =$

- (1) $-\frac{1}{2}$ (2) $\frac{1}{2}$ (3) $\frac{1}{4}$ (4) $\frac{1}{6}$

Q.33 $\frac{1}{\cos 290^\circ} + \frac{1}{\sqrt{3} \sin 250^\circ} =$

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

Q.34 $\cos^2 48^\circ - \sin^2 12^\circ =$

- (1) $\frac{\sqrt{5}-1}{4}$ (2) $\frac{\sqrt{5}+1}{8}$
(3) $\frac{\sqrt{3}-1}{4}$ (4) $\frac{\sqrt{3}+1}{2\sqrt{2}}$

Q.35 $\frac{\cos^2 33^\circ - \cos^2 57^\circ}{\sin 21^\circ - \cos 21^\circ} =$

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

Q.36 $\cos 20^\circ \cos 100^\circ + \cos 100^\circ \cos 140^\circ - \cos 140^\circ \cos 200^\circ =$

- (1) 0 (2) $\frac{3}{4}$ (3) $-\frac{3}{4}$ (4) $-\frac{4}{3}$

Q.37 $\tan 20^\circ + \tan 40^\circ + \sqrt{3} \tan 20^\circ \tan 40^\circ =$

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

Q.38 $1 + \cos 56^\circ + \cos 58^\circ - \cos 66^\circ =$

- (1) $2 \cos 28^\circ \cos 29^\circ \cos 33^\circ$
(2) $4 \cos 28^\circ \cos 29^\circ \cos 33^\circ$
(3) $4 \cos 28^\circ \cos 29^\circ \sin 33^\circ$
(4) $2 \cos 28^\circ \cos 29^\circ \sin 33^\circ$

Q.39 $\frac{\cos 12^\circ - \sin 12^\circ}{\cos 12^\circ + \sin 12^\circ} + \frac{\sin 147^\circ}{\cos 147^\circ} =$

- (1) 1 (2) -1
(3) 0 (4) None of these

Q.40 $\frac{\sin(B+A) + \cos(B-A)}{\sin(B-A) + \cos(B+A)} =$

- (1) $\frac{\cos B + \sin B}{\cos B - \sin B}$ (2) $\frac{\cos A + \sin A}{\cos A - \sin A}$
(3) $\frac{\cos A - \sin A}{\cos A + \sin A}$ (4) None of these

FORMULAE FOR SUM OR DIFFERENCE INTO PRODUCT CONVERSION

Q.41 $\frac{\sin 3\theta + \sin 5\theta + \sin 7\theta + \sin 9\theta}{\cos 3\theta + \cos 5\theta + \cos 7\theta + \cos 9\theta} =$

- (1) $\tan 6\theta$ (2) $\tan 3\theta$
(3) $\cot 2\theta$ (4) $\cot 6\theta$

Q.42 If $\cos A = m \cos B$, then-

- (1) $\cot \frac{A+B}{2} = \frac{m+1}{m-1} \tan \frac{B-A}{2}$
(2) $\tan \frac{A+B}{2} = \frac{m+1}{m-1} \cot \frac{B-A}{2}$
(3) $\cot \frac{A+B}{2} = \frac{m+1}{m-1} \tan \frac{A-B}{2}$
(4) None of these

Q.43 If $\cos \alpha + \cos \beta = 0 = \sin \alpha + \sin \beta$, then $\cos 2\alpha + \cos 2\beta$ is equal to -

- (1) $-2\sin(\alpha + \beta)$ (2) $-2\cos(\alpha + \beta)$
(3) $2\sin(\alpha + \beta)$ (4) $2\cos(\alpha + \beta)$

Q.44 If $\cos 2B = \frac{\cos(A+C)}{\cos(A-C)}$, then-

- (1) $\tan A, \tan B, \tan C$ are in A.P.
(2) $\tan A, \tan B, \tan C$ are in G.P.
(3) $\tan A, \tan B, \tan C$ are in H.P.
(4) None of these

Q.45 If an angle α is divided into two parts A and B such that $A - B = x$ and $\tan A : \tan B = k : 1$, then the value of $\sin x$ is-

- (1) $\left(\frac{k+1}{k-1} \right) \sin \alpha$ (2) $\left(\frac{k}{k+1} \right) \sin \alpha$
(3) $\left(\frac{k-1}{k+1} \right) \sin \alpha$ (4) None of these

RIGONOMETRIC RATIO OF MULTIPLE ANGLE

Q.46 $\frac{\sin \theta + \sin 2\theta}{1 + \cos \theta + \cos 2\theta} =$

- (1) $\frac{1}{2} \tan \theta$ (2) $\frac{1}{2} \cot \theta$
(3) $\tan \theta$ (4) $\cot \theta$

Q.47 $1 - 2 \sin^2 \left(\frac{\pi}{4} + \theta \right) =$

- (1) $\cos 2\theta$ (2) $-\cos 2\theta$
(3) $\sin 2\theta$ (4) $-\sin 2\theta$

Q.48 $\sqrt{2 + \sqrt{2 + 2\cos 4\theta}} ; \forall \frac{\pi}{4} < \theta < \frac{\pi}{2}$ is

- (1) $\cos \theta$ (2) $\sin \theta$
(3) $2 \sin \theta$ (4) $2 \cos \theta$

Q.49 $\cos^2 A (3 - 4 \cos^2 A)^2 + \sin^2 A (3 - 4 \sin^2 A)^2$ is equal to-

- (1) $\cos 4A$ (2) $\sin 4A$
(3) 1 (4) None of these

Q.50 $\frac{1 - \cos 4\alpha}{\sec^2 2\alpha - 1} + \frac{1 + \cos 4\alpha}{\operatorname{cosec}^2 2\alpha - 1}$ is equal to -

- (1) 0 (2) 2 (3) 1 (4) 4

Q.51 In a ΔABC , $\frac{\sin 2A + \sin 2B + \sin 2C}{\sin A + \sin B + \sin C} =$

- (1) $8 \sin \frac{A}{2} \sin \frac{B}{2} \sin \frac{C}{2}$
(2) $8 \cos \frac{A}{2} \cos \frac{B}{2} \cos \frac{C}{2}$
(3) $8 \tan \frac{A}{2} \tan \frac{B}{2} \tan \frac{C}{2}$
(4) $8 \cot \frac{A}{2} \cot \frac{B}{2} \cot \frac{C}{2}$

Q.52 $\cot 5^\circ - \tan 5^\circ - 2 \tan 10^\circ - 4 \tan 20^\circ - 8 \cot 40^\circ$ is equal to -

- (1) 0 (2) $8 \tan 40^\circ$
(3) $8 \tan 80^\circ$ (4) None of these

Q.53 If $\frac{\cos \theta}{a} = \frac{\sin \theta}{b}$, then $\frac{a}{\sec 2\theta} + \frac{b}{\operatorname{cosec} 2\theta}$ is equal to

- (1) a (2) b (3) a/b (4) $a + b$

THE GREATEST AND LEAST VALUE OF EXPRESSION

Q.54 The minimum value of $\tan \theta + \cot \theta$ in $\left(0, \frac{\pi}{2}\right)$ is-

- (1) 0 (2) 1
(3) 2 (4) None of these

Q.55 The maximum value of $\sin(\theta + \pi/6) + \cos(\theta + \pi/6)$ is attained at

- (1) $\frac{\pi}{12}$ (2) $\frac{\pi}{6}$ (3) $\frac{\pi}{3}$ (4) $\frac{\pi}{2}$

Q.56 The maximum value of $12 \sin \theta - 9 \sin^2 \theta$ is-

- (1) 3 (2) 4
(3) 5 (4) None of these

Q.57 Minimum value of $5 \sin^2 \theta + 4 \cos^2 \theta$ is -

- (1) 1 (2) 2 (3) 3 (4) 4

Q.58 $\cos 2\theta + 2 \cos \theta$ is always-

- (1) greater than $-\frac{3}{2}$
(2) less than or equal to $\frac{3}{2}$

(3) greater than or equal to $-\frac{3}{2}$

(4) None of these

Q.59 Maximum value of $(5 \sin x - 12 \cos x)(5 \cos x + 12 \sin x)$ is

- (1) $\frac{169}{2}$ (2) $\frac{169}{4}$ (3) $\frac{196}{2}$ (4) 1

Q.60 Maximum value of $\cos^3 x + \cos^3(120^\circ - x) + \cos^3(120^\circ + x)$ is

- (1) 1 (2) $\frac{1}{2}$
(3) $\frac{3}{4}$ (4) $3/8$

Q.61 The number of values of x where the function $f(x) = \cos x + \cos(\sqrt{2}x)$ attains its maximum is-

- (1) 0 (2) 1
(3) 2 (4) Infinite

Q.62 The maximum value of $5 \cos \theta + 3 \cos\left(\theta + \frac{\pi}{3}\right) + 3$ is

- (1) 5 (2) 10 (3) 11 (4) -1

MISCELLANEOUS QUESTIONS

Q.63 $\cos \frac{\pi}{5} \cos \frac{2\pi}{5} \cos \frac{4\pi}{5} \cos \frac{8\pi}{5} =$

- (1) $\frac{1}{16}$ (2) 0 (3) $-\frac{1}{8}$ (4) $-\frac{1}{16}$

Q.64 The value of $\tan 6^\circ \tan 42^\circ \tan 66^\circ \tan 78^\circ$ is-

- (1) 1 (2) $1/2$ (3) $1/4$ (4) $1/8$

Q.65 A quadratic equation whose roots are $\operatorname{cosec}^2 \theta$ and $\sec^2 \theta$, can be -

- (1) $x^2 - 2x + 2 = 0$ (2) $x^2 - 3x + 3 = 0$
(3) $x^2 - 5x + 5 = 0$ (4) $x^2 + 4x - 4 = 0$

Q.66 The value of $\sin \frac{\pi}{14} \sin \frac{3\pi}{14} \sin \frac{5\pi}{14} \sin \frac{7\pi}{14} \sin \frac{9\pi}{14}$

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

- (1) $\frac{1}{64}$ (2) $\frac{1}{63}$
(3) $\frac{3}{64}$ (4) None of these

Q.67 If $K = \sin\left(\frac{\pi}{18}\right) \sin\left(\frac{5\pi}{18}\right) \sin\left(\frac{7\pi}{18}\right)$, then the numerical value of K is

MATHEMATICS

(1) $\frac{1}{7}$

(2) $\frac{1}{8}$

(3) $\frac{1}{6}$

(4) none of these

Q.68 Find the number of solutions of the equation

$$30 |\sin x| = x \text{ in } 0 \leq x \leq 2\pi$$

(1) 4

(2) 2

(3) 8

(4) 6

Q.69 Total number of solutions of the equation

$$3x + 2 \tan x = \frac{5\pi}{2} \text{ in } x \in [0, 2\pi] =$$

(1) 1

(2) 2

(3) 3

(4) 4

Q.70 The number of solutions of

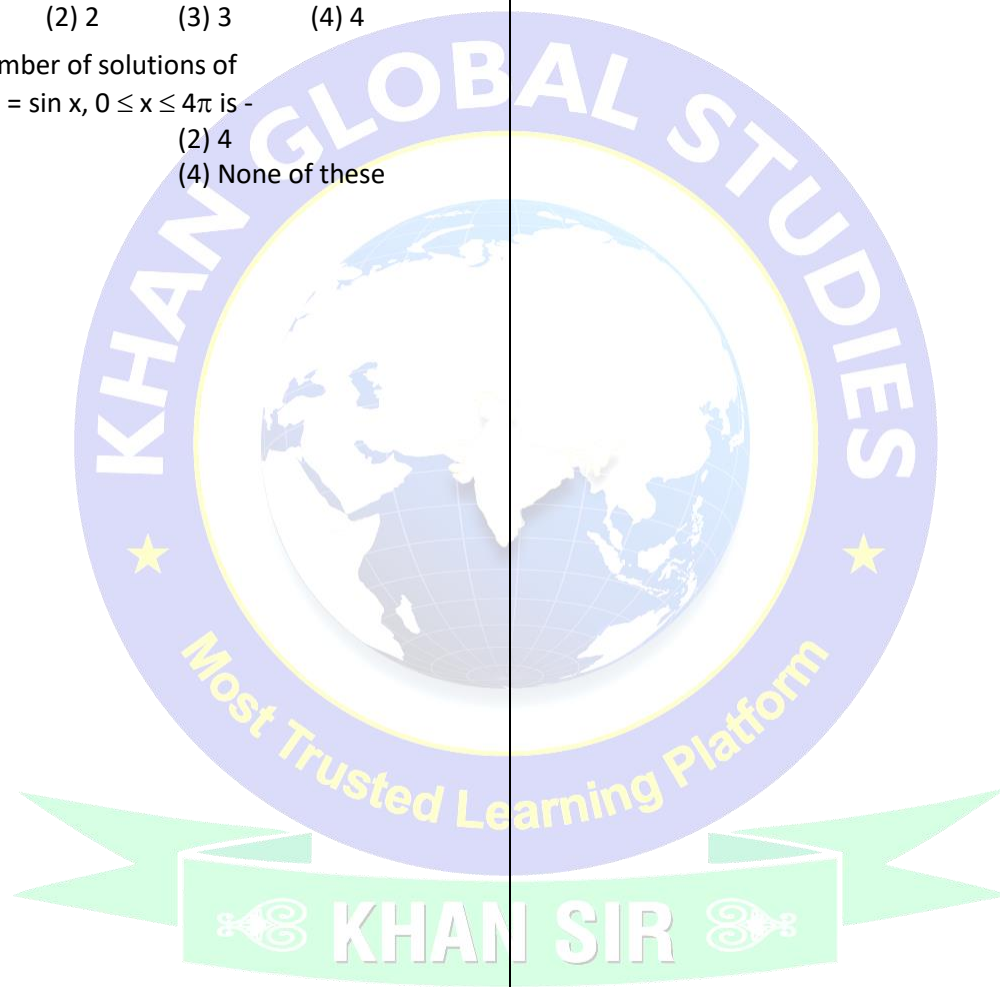
$$|\cos x| = \sin x, 0 \leq x \leq 4\pi \text{ is -}$$

(1) 8

(2) 4

(3) 2

(4) None of these



ANSWER KEY

TOPIC WISE QUESTIONS

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	1	3	4	3	4	2	4	1	4	2	3	2	3	4	3
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	3	2	3	3	1	1	2	1	1	2	1	3	3	2	1
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	3	2	3	2	2	3	2	3	3	2	1	1	2	2	3
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	3	4	3	3	2	1	1	1	3	1	2	4	3	1	3
Que.	61	62	63	64	65	66	67	68	69	70					
Ans.	2	2	4	1	3	1	2	1	3	2					

