

MATHEMATICS
WORKSHEET_170123

CHAPTER 03 TRIGONOMETRIC FUNCTIONS

SUBJECT: MATHEMATICS

MAX. MARKS : 40

CLASS : XI

DURATION : 1½ hrs

General Instructions:

- (i). All questions are compulsory.
- (ii). This question paper contains 20 questions divided into five Sections A, B, C, D and E.
- (iii). **Section A** comprises of 10 MCQs of 1 mark each. **Section B** comprises of 4 questions of 2 marks each. **Section C** comprises of 3 questions of 3 marks each. **Section D** comprises of 1 question of 5 marks each and **Section E** comprises of 2 Case Study Based Questions of 4 marks each.
- (iv). There is no overall choice.
- (v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. The value of $\frac{1 - \tan^2 15^\circ}{1 + \tan^2 15^\circ}$
(a) 1 (b) $\sqrt{3}$ (c) $\sqrt{3}/2$ (d) 2
2. If $\cos x = -1/2$ and $0 < x < 2\pi$, then the solutions are:
(a) $x = \pi/3, 4\pi/3$ (b) $x = 2\pi/3, 4\pi/3$ (c) $x = 2\pi/3, 7\pi/3$ (d) $x = 2\pi/3, 5\pi/3$
3. If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$, then $\tan(2A + B)$ is equal to
(a) 1 (b) 2 (c) 3 (d) 4
4. The value of $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ$ is
(a) 1 (b) 0 (c) $\frac{1}{2}$ (d) 2
5. If $\alpha + \beta = \frac{\pi}{4}$, then the value of $(1 + \tan \alpha)(1 + \tan \beta)$ is
(a) 1 (b) 2 (c) -2 (d) none of these
6. If $\cos x + \sqrt{3} \sin x = 2$, then the value of x is:
(a) $\pi/3$ (b) $2\pi/3$ (c) $4\pi/3$ (d) $5\pi/3$
7. The radius of the circle in which a central angle of 30° intercepts an arc of length 22 cm is: (Use $\pi = 22/7$)
(a) 43 cm (b) 41 cm (c) 42 cm (d) 40 cm
8. The angle in the radian through which a pendulum swings its length is 80 cm and tip describes an arc of length 20 cm is:
(a) $1/4$ (b) $2/25$ (c) $3/25$ (d) $4/25$

For Q9 and Q10, a statement of assertion (A) is followed by a statement of reason (R). Choose the correct answer out of the following choices.

- (a) Both Assertion (A) and Reason (R) are true & Reason (R) is the correct explanation of Assertion (A)
- (b) Both Assertion (A) and Reason (R) are true & Reason (R) is not the correct explanation of Assertion (A)
- (c) Assertion (A) is true but Reason (R) is false
- (d) Assertion (A) is false but Reason (R) is true

9. **Assertion (A):** The value of $\sin(-690^\circ) \cos(-300^\circ) + \cos(-750^\circ) \sin(-240^\circ) = 1$
Reason (R): The value of $\sin$ and $\cos$ is negative in the third and fourth quadrant respectively.
10. **Assertion (A):** $\sin(x+y) \cos(x-y) - \cos(x+y) \sin(x-y) = \sin 2x$
Reason (R): $\sin A \cos B - \cos A \sin B = \sin(A-B)$

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. If the angular diameter of the moon be $30'$, how far from the eye a coin of diameter 2.2 cm be kept to hide the moon?
12. Find the value of $2\sin^2 \frac{3\pi}{4} + 2\cos^2 \frac{3\pi}{4} - 2\tan^2 \frac{3\pi}{4}$.
13. Prove the following : $\sin 10^\circ + \sin 20^\circ + \sin 40^\circ + \sin 50^\circ = \sin 70^\circ + \sin 80^\circ$.
14. Find the value of $\tan 22^\circ 30'$.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. If $\sin x = \frac{3}{5}$, $\cos y = \frac{-12}{13}$ and x, y both lie in the second quadrant, find the values of $\cos(x-y)$
16. If $\sin \alpha = k \sin \beta$, prove that, $\tan\left(\frac{\alpha - \beta}{2}\right) = \frac{k-1}{k+1} \tan \frac{\alpha + \beta}{2}$.
17. Prove that $\frac{\sin A \cdot \sin 2A + \sin 3A \cdot \sin 6A}{\sin A \cdot \cos 2A + \sin 3A \cdot \cos 6A} = \tan 5A$

OR

Prove that $\sqrt{2 + \sqrt{2 + 2 \cos 4x}} = 2 \cos x, 0 < x < \frac{\pi}{4}$.

SECTION – D

Questions 18 carry 5 marks.

18. If α, β are two distinct roots of the equation $a \tan \theta + b \sec \theta = c$, prove that $\tan(\alpha + \beta) = \frac{2ac}{a^2 - c^2}$.

OR

Prove that: $\sin^3 x + \sin^3\left(\frac{2\pi}{3} + x\right) + \sin^3\left(\frac{4\pi}{3} + x\right) = -\frac{3}{4} \sin 3x$.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. A railway train is travelling on a circular curve of 1500 metres radius at the rate of 66 km/h.



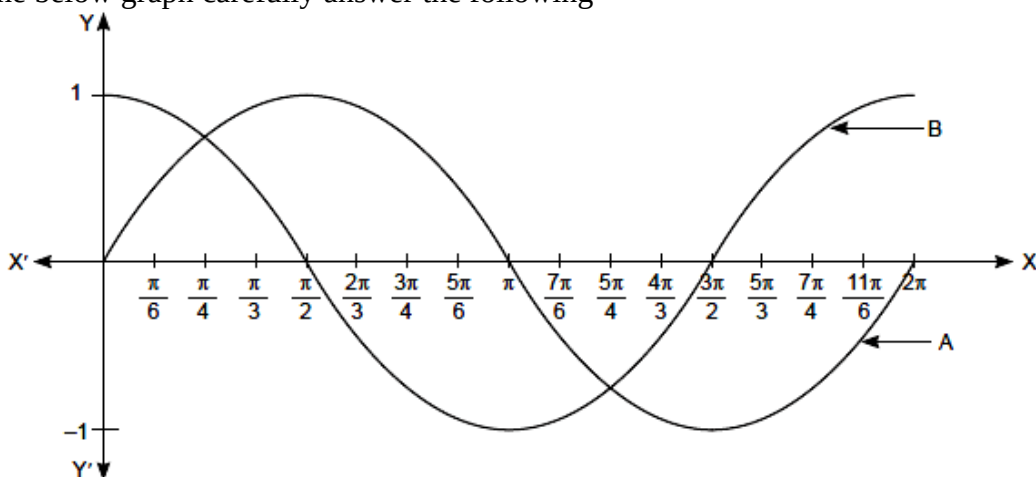
Now, answer the following:

- (i) Find the angle in radians by which it turned in 10 seconds.
- (ii) Find the degree measure of the angle turned by railway train in 10 seconds.
- (iii) How much degree will train turn in 20 seconds?

OR

- (iii) If train changes its speed to 60 km/h then what angle will train turn in 10 seconds.

20. Observe the below graph carefully answer the following



- (i) Graph A represent the graph of which trigonometric function.
- (ii) Graph B represent the graph of which trigonometric function.
- (iii) From the above graph write the principal value of x if $\sin x = 1$
- (iv) From the graph find the angle for which the value of $\sin x$ and $\cos x$ is same.