

Trigonometry up to Transformations

MCQ Test, Set 02

Time: 30 minutes

Maximum marks: 25

Name: _____ Class: _____ Date: _____

1. There are 25 questions. Each has exactly one correct answer: choose A, B, C or D.
2. Each correct answer carries 1 mark. There is no negative marking.
3. The key sheet and worked solutions are at the end of this test.

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

A. 1**B.** $\sin^2 \theta$ **C.** 0**D.** $\cos^2 \theta$

2. $\frac{5\pi}{9}$ radians in degrees is

A. 200° **B.** 120° **C.** 50° **D.** 100°

3. If $\sin \theta < 0$ and $\cot \theta > 0$, then θ lies in

A. IV_Q **B.** III_Q **C.** I_Q **D.** II_Q

4. $\tan^2 60^\circ + 2 \tan^2 45^\circ =$

A. 5**B.** $\frac{7}{3}$ **C.** 4**D.** 3

5. $\cos(270^\circ - \theta) =$

A. $-\cos \theta$ **B.** $\cos \theta$ **C.** $-\sin \theta$ **D.** $\sin \theta$

6. $\tan 930^\circ =$

A. $-\frac{1}{\sqrt{3}}$ **B.** $\sqrt{3}$ **C.** $\frac{1}{\sqrt{3}}$ **D.** $-\sqrt{3}$

7. For which value of k is $\sin \theta = k$ impossible?

A. $\frac{4}{3}$ **B.** -1 **C.** $-\frac{1}{2}$ **D.** $\frac{3}{4}$

8. From its graph, the period of $\cot x$ is

A. 2π **B.** π **C.** $\frac{\pi}{2}$ **D.** 4π

9. $\sec 70^\circ - \csc 20^\circ =$

A. 0**B.** -1 **C.** $2 \sec 70^\circ$ **D.** 1

10. If $\sin \theta \cos \theta = \frac{1}{5}$, then $\sin^4 \theta + \cos^4 \theta =$

A. $\frac{24}{25}$ **B.** $\frac{23}{25}$ **C.** $\frac{21}{25}$ **D.** $\frac{22}{25}$

11. $\sqrt{1 - \sin^2 130^\circ} =$

A. $\sin 130^\circ$

B. $-\sin 130^\circ$

C. $-\cos 130^\circ$

D. $\cos 130^\circ$

12. $\sin 40^\circ \cos 20^\circ + \cos 40^\circ \sin 20^\circ =$

A. $\sin 20^\circ$

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

C. 1

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

13. $\frac{1 + \tan 15^\circ}{1 - \tan 15^\circ} =$

A. $2 + \sqrt{3}$

B. 1

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

D. $\sqrt{3}$

14. $\sin^2 105^\circ - \sin^2 15^\circ =$

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

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

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

D. 1

15. $\tan 20^\circ + \tan 40^\circ + \tan 120^\circ =$

A. 0

B. $-\sqrt{3} \tan 20^\circ \tan 40^\circ$

C. $\tan 20^\circ \tan 40^\circ$

D. $\sqrt{3} \tan 20^\circ \tan 40^\circ$

16. $(1 + \tan 1^\circ)(1 + \tan 2^\circ)(1 + \tan 3^\circ) \cdots (1 + \tan 44^\circ) =$

A. 2^{11}

B. 2^{44}

C. 44

D. 2^{22}

17. $\frac{1 - \cos 2A}{1 + \cos 2A} =$

A. $\tan^2 A$

B. $\cot^2 A$

C. $\tan A$

D. $\sin^2 A$

18. If $\cos A = \frac{1}{3}$, then $\cos 3A =$

A. $-\frac{23}{27}$

B. $-\frac{5}{9}$

C. $\frac{4}{27}$

D. $\frac{23}{27}$

19. $\tan 22\frac{1}{2}^\circ =$

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

B. $\sqrt{2} - 1$

C. $2 - \sqrt{3}$

D. $\sqrt{2} + 1$

20. $\cos \frac{\pi}{5} \cos \frac{2\pi}{5} =$

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

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

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

D. $-\frac{1}{4}$

21. $\sin \frac{\pi}{5} + \sin \frac{2\pi}{5} + \sin \frac{3\pi}{5} + \sin \frac{4\pi}{5} =$

A. $\cot 18^\circ$

B. $2 \cot 18^\circ$

C. $\tan 18^\circ$

D. 1

22. $\tan 6^\circ \tan 54^\circ \tan 66^\circ =$

A. $\tan 6^\circ$

B. $\cot 18^\circ$

C. $3 \tan 18^\circ$

D. $\tan 18^\circ$

23. If $45^\circ < A < 90^\circ$, then $\sqrt{1 - \sin 2A} =$

A. $\cos 2A$

B. $\sin A + \cos A$

C. $\sin A - \cos A$

D. $\cos A - \sin A$

24. $\cos 75^\circ + \cos 15^\circ =$

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

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

B. $\sqrt{2}$

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

25. The period of $\cot(7 - 2x)$ is

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

B. 2π

C. π

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

Key sheet

1. A	2. D	3. B	4. A	5. C
6. C	7. A	8. B	9. A	10. B
11. C	12. B	13. D	14. C	15. B
16. D	17. A	18. A	19. B	20. C
21. A	22. D	23. C	24. D	25. D

Solutions

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

$$1 - \cos^2 \theta = \sin^2 \theta \text{ and } 1 + \cot^2 \theta = \csc^2 \theta$$

$$\sin^2 \theta \cdot \csc^2 \theta = 1$$

Ans: (A) 1

2. $\frac{5\pi}{9}$ radians in degrees is

$$\frac{5\pi}{9} = \frac{5}{9} \times 180^\circ = 100^\circ$$

Ans: (D) 100°

3. If $\sin \theta < 0$ and $\cot \theta > 0$, then θ lies in

$\sin$ is -ve and $\cot$ is +ve only in III_Q

Ans: (B) III_Q

4. $\tan^2 60^\circ + 2 \tan^2 45^\circ =$

$$= (\sqrt{3})^2 + 2(1)^2 = 3 + 2$$

$$= 5$$

Ans: (A) 5

5. $\cos(270^\circ - \theta) =$

$270^\circ - \theta$ is of the form $90^\circ \pm \theta$ or $270^\circ \pm \theta$, so $\cos$ changes to $\sin$

For acute θ , $270^\circ - \theta \in \text{III}_Q$, where $\cos$ is -ve

$$\therefore \cos(270^\circ - \theta) = -\sin \theta$$

Ans: (C) $-\sin \theta$

6. $\tan 930^\circ =$

$$\tan 930^\circ = \tan(720^\circ + 210^\circ) = \tan 210^\circ$$

$210^\circ \in \text{III}_Q$, where $\tan$ is +ve

$$\tan 210^\circ = \tan(180^\circ + 30^\circ) = +\tan 30^\circ = \frac{1}{\sqrt{3}}$$

Ans: (C) $\frac{1}{\sqrt{3}}$

7. For which value of k is $\sin \theta = k$ impossible?

$$-1 \leq \sin \theta \leq 1$$

$$\frac{4}{3} > 1, \text{ so } \sin \theta = \frac{4}{3} \text{ is impossible}$$

Ans: (A) $\frac{4}{3}$

8. From its graph, the period of $\cot x$ is

The graph of $\cot x$ repeats after every interval of length π (asymptotes at $0, \pi, 2\pi$)

Ans: (B) π

9. $\sec 70^\circ - \csc 20^\circ =$

$$70^\circ + 20^\circ = 90^\circ \Rightarrow \sec 70^\circ = \csc 20^\circ$$

$$\text{Difference} = 0$$

Ans: (A) 0

10. If $\sin \theta \cos \theta = \frac{1}{5}$, then $\sin^4 \theta + \cos^4 \theta =$

$$\begin{aligned}\sin^4 \theta + \cos^4 \theta &= (\sin^2 \theta + \cos^2 \theta)^2 - 2 \sin^2 \theta \cos^2 \theta = 1 - 2(\sin \theta \cos \theta)^2 \\ &= 1 - 2\left(\frac{1}{5}\right)^2 = 1 - \frac{2}{25} = \frac{23}{25}\end{aligned}$$

Ans: (B) $\frac{23}{25}$

11. $\sqrt{1 - \sin^2 130^\circ} =$

$$= \sqrt{\cos^2 130^\circ} = |\cos 130^\circ|$$

$$130^\circ \in \text{II}_Q \Rightarrow \cos 130^\circ < 0, \text{ so } = -\cos 130^\circ$$

Ans: (C) $-\cos 130^\circ$

12. $\sin 40^\circ \cos 20^\circ + \cos 40^\circ \sin 20^\circ =$

$$= \sin(40^\circ + 20^\circ) = \sin 60^\circ = \frac{\sqrt{3}}{2}$$

Ans: (B) $\frac{\sqrt{3}}{2}$

13. $\frac{1 + \tan 15^\circ}{1 - \tan 15^\circ} =$

$$\frac{1 + \tan \theta}{1 - \tan \theta} = \tan(45^\circ + \theta)$$

$$= \tan 60^\circ = \sqrt{3}$$

Ans: (D) $\sqrt{3}$

14. $\sin^2 105^\circ - \sin^2 15^\circ =$

$$= \sin 120^\circ \sin 90^\circ = \frac{\sqrt{3}}{2}$$

Ans: (C) $\frac{\sqrt{3}}{2}$

15. $\tan 20^\circ + \tan 40^\circ + \tan 120^\circ =$

$$20^\circ + 40^\circ + 120^\circ = 180^\circ, \text{ so } \Sigma \tan A = \Pi \tan A$$

$$= \tan 20^\circ \tan 40^\circ \tan 120^\circ = -\sqrt{3} \tan 20^\circ \tan 40^\circ$$

Ans: (B) $-\sqrt{3} \tan 20^\circ \tan 40^\circ$

16. $(1 + \tan 1^\circ)(1 + \tan 2^\circ)(1 + \tan 3^\circ) \cdots (1 + \tan 44^\circ) =$

$$\text{Pair } (1^\circ, 44^\circ), (2^\circ, 43^\circ), \dots, (22^\circ, 23^\circ): \text{ each pair gives } 2$$
$$22 \text{ pairs} \Rightarrow 2^{22}$$

Ans: (D) 2^{22}

17. $\frac{1 - \cos 2A}{1 + \cos 2A} =$

$$1 - \cos 2A = 2 \sin^2 A, 1 + \cos 2A = 2 \cos^2 A$$

$$\text{Ratio} = \tan^2 A$$

Ans: (A) $\tan^2 A$

18. If $\cos A = \frac{1}{3}$, then $\cos 3A =$

$$\cos 3A = 4 \cos^3 A - 3 \cos A = \frac{4}{27} - 1 = -\frac{23}{27}$$

Ans: (A) $-\frac{23}{27}$

19. $\tan 22\frac{1}{2}^\circ =$

$$\tan^2 22\frac{1}{2}^\circ = \frac{1 - \cos 45^\circ}{1 + \cos 45^\circ} = \frac{\sqrt{2}-1}{\sqrt{2}+1} = (\sqrt{2}-1)^2$$

$$\therefore \tan 22\frac{1}{2}^\circ = \sqrt{2} - 1$$

Ans: (B) $\sqrt{2} - 1$

20. $\cos \frac{\pi}{5} \cos \frac{2\pi}{5} =$

$$\cos \theta \cos 2\theta = \frac{\sin 4\theta}{4 \sin \theta}$$

$$= \frac{\sin \frac{4\pi}{5}}{4 \sin \frac{\pi}{5}} = \frac{1}{4}$$

Ans: (C) $\frac{1}{4}$

21. $\sin \frac{\pi}{5} + \sin \frac{2\pi}{5} + \sin \frac{3\pi}{5} + \sin \frac{4\pi}{5} =$

$$\frac{\sin \frac{a_1+a_n}{2} \sin \frac{nd}{2}}{\sin \frac{d}{2}} = \frac{\sin \frac{\pi}{2} \sin \frac{2\pi}{5}}{\sin \frac{\pi}{10}}$$

$$= \frac{\sin 72^\circ}{\sin 18^\circ} = \frac{\cos 18^\circ}{\sin 18^\circ} = \cot 18^\circ$$

Ans: (A) $\cot 18^\circ$

22. $\tan 6^\circ \tan 54^\circ \tan 66^\circ =$

$$\tan \theta \tan(60^\circ - \theta) \tan(60^\circ + \theta) = \tan 3\theta \text{ with } \theta = 6^\circ$$

$$= \tan 18^\circ$$

Ans: (D) $\tan 18^\circ$

23. If $45^\circ < A < 90^\circ$, then $\sqrt{1 - \sin 2A} =$

$$\sqrt{1 - \sin 2A} = |\cos A - \sin A|$$

For $45^\circ < A < 90^\circ$, $\sin A > \cos A$, so $= \sin A - \cos A$

Ans: (C) $\sin A - \cos A$

24. $\cos 75^\circ + \cos 15^\circ =$

$$\cos C + \cos D = 2 \cos \frac{C+D}{2} \cos \frac{C-D}{2}$$

$$= 2 \cos 45^\circ \cos 30^\circ = 2 \cdot \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{\sqrt{2}}$$

Ans: (D) $\frac{\sqrt{3}}{\sqrt{2}}$

25. The period of $\cot(7 - 2x)$ is

$$\text{Period of } \cot(ax + b) \text{ is } \frac{\pi}{|a|} = \frac{\pi}{|-2|} = \frac{\pi}{2}$$

Ans: (D) $\frac{\pi}{2}$
