

Trigonometry up to Transformations

MCQ Test, Set 05

Time: 30 minutes

Maximum marks: 25

Name: _____ Class: _____ Date: _____

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

1. If $\cos \theta = \frac{7}{25}$ and θ is acute, then $\csc \theta =$

- A. $\frac{24}{7}$ B. $\frac{25}{24}$ C. $\frac{24}{25}$ D. $\frac{25}{7}$

2. Four complete rotations measure

- A. 16π radians B. 4π radians C. 2π radians D. 8π radians

3. If $\cos \theta < 0$ and $\csc \theta > 0$, then θ lies in

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

4. $\frac{1 - \cos 60^\circ}{1 + \cos 60^\circ} =$

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

5. $\tan(180^\circ + \theta) =$

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

6. $\sin 1590^\circ =$

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

7. The least value of $5 + 2 \sin x$ is

- A. 5 B. 7 C. 1 D. 3

8. Arrange $\tan 4$, $\tan 5$, $\tan 6$ (angles in radians):

- A. $\tan 4 > \tan 5 > \tan 6$ B. $\tan 4 > \tan 6 > \tan 5$
C. $\tan 5 > \tan 4 > \tan 6$ D. $\tan 6 > \tan 5 > \tan 4$

9. If $\tan 2A = \cot(A - 18^\circ)$, where $2A$ is acute, then $A =$

- A. 18° B. 24° C. 36° D. 72°

10. The value of $\cos^2 \theta + \sin^4 \theta$ at $\theta = 60^\circ$ is

- A. $\frac{13}{16}$ B. $\frac{5}{8}$ C. 1 D. $\frac{7}{16}$

11. The least value of $\tan^2 \theta + 49 \cot^2 \theta$ is

- A. 2 B. 14 C. 7 D. 50

12. $\sin 165^\circ =$

A. $\frac{\sqrt{3}-1}{2\sqrt{2}}$
C. $\frac{1-\sqrt{3}}{2\sqrt{2}}$

B. $\frac{\sqrt{3}+1}{2\sqrt{2}}$
D. $\frac{\sqrt{3}-1}{2}$

13. If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$ (A, B acute), then $A + B =$

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

B. $\frac{\pi}{6}$

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

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

14. $\sin(60^\circ + \theta) \sin(60^\circ - \theta) =$

A. $\frac{1}{4} - \sin^2 \theta$

B. $\frac{3}{4} - \sin^2 \theta$

C. $\frac{3}{4} - \cos^2 \theta$

D. $\frac{3}{4} + \sin^2 \theta$

15. In $\triangle ABC$, $\cot A \cot B + \cot B \cot C + \cot C \cot A =$

A. 0

B. $\cot A \cot B \cot C$

C. 1

D. -1

16. $(1 + \tan 11^\circ)(1 + \tan 34^\circ)(1 + \tan 14^\circ)(1 + \tan 31^\circ) =$

A. 8

B. 2

C. 16

D. 4

17. $1 - 2 \sin^2 75^\circ =$

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

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

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

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

18. $4 \cos^3 40^\circ - 3 \cos 40^\circ =$

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

B. $\cos 40^\circ$

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

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

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

A. $2\sqrt{3}$

B. $2\sqrt{2}$

C. $\sqrt{2}$

D. 2

20. $\cos \frac{\pi}{7} \cos \frac{2\pi}{7} \cos \frac{4\pi}{7} =$

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

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

C. $\frac{1}{16}$

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

21. $\sin x + \sin 3x + \sin 5x =$

A. $\frac{\sin 9x}{\sin x}$

B. $\frac{\sin 6x}{2 \sin x}$

C. $\frac{\sin^2 3x}{\sin x}$

D. $3 \sin 3x$

22. $\sin^2 12^\circ + \sin^2 48^\circ + \sin 12^\circ \sin 48^\circ =$

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

B. 1

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

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

23. If $\frac{x}{y} = \frac{\tan 67\frac{1}{2}^\circ}{\tan 22\frac{1}{2}^\circ}$, then $\frac{x+y}{x-y} =$

A. $\sqrt{2} + 1$

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

C. $\sqrt{2}$

D. 2

24. $\sin 75^\circ - \sin 15^\circ =$

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

B. 0

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

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

25. The period of $\sin \frac{x}{4} + \cos \frac{x}{6}$ is

A. 10π

B. 12π

C. 48π

D. 24π

Key sheet

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

Solutions

1. If $\cos \theta = \frac{7}{25}$ and θ is acute, then $\csc \theta =$
 $\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{7}{25}$: take adj = 7, hyp = 25
 $\text{opp} = \sqrt{25^2 - 7^2} = \sqrt{576} = 24$
 $\csc \theta = \frac{\text{hyp}}{\text{opp}} = \frac{25}{24}$
Ans: (B) $\frac{25}{24}$
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2. Four complete rotations measure
One complete rotation = $360^\circ = 2\pi$
Four rotations = $4 \times 2\pi = 8\pi$
Ans: (D) 8π radians
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3. If $\cos \theta < 0$ and $\csc \theta > 0$, then θ lies in
 $\cos$ is -ve and $\csc$ is +ve only in II_Q
Ans: (B) II_Q
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4. $\frac{1 - \cos 60^\circ}{1 + \cos 60^\circ} =$
 $= \frac{1 - \frac{1}{2}}{1 + \frac{1}{2}} = \frac{1/2}{3/2}$
 $= \frac{1}{3}$
Ans: (A) $\frac{1}{3}$
-

5. $\tan(180^\circ + \theta) =$
 $180^\circ + \theta$ is of the form $180^\circ \pm \theta$ or $360^\circ \pm \theta$, so $\tan$ does not change
For acute θ , $180^\circ + \theta \in \text{III}_Q$, where $\tan$ is +ve
 $\therefore \tan(180^\circ + \theta) = \tan \theta$
Ans: (D) $\tan \theta$
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6. $\sin 1590^\circ =$
 $\sin 1590^\circ = \sin(1440^\circ + 150^\circ) = \sin 150^\circ$
 $150^\circ \in \text{II}_Q$, where $\sin$ is +ve
 $\sin 150^\circ = \sin(180^\circ - 30^\circ) = +\sin 30^\circ = \frac{1}{2}$
Ans: (C) $\frac{1}{2}$
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7. The least value of $5 + 2 \sin x$ is
 $-1 \leq \sin x \leq 1 \Rightarrow -2 \leq 2 \sin x \leq 2$
 $\Rightarrow 3 \leq 5 + 2 \sin x \leq 7$
Ans: (D) 3
-

8. Arrange $\tan 4$, $\tan 5$, $\tan 6$ (angles in radians):

$$4 \approx 229^\circ, 5 \approx 286^\circ, 6 \approx 343^\circ$$

$$\tan 229^\circ = \tan 49^\circ > 0, \tan 286^\circ = -\tan 74^\circ, \tan 343^\circ = -\tan 17^\circ \\ -\tan 17^\circ > -\tan 74^\circ, \text{ so } \tan 4 > \tan 6 > \tan 5$$

Ans: (B) $\tan 4 > \tan 6 > \tan 5$

9. If $\tan 2A = \cot(A - 18^\circ)$, where $2A$ is acute, then $A =$

$$\tan 2A = \cot(A - 18^\circ) \Rightarrow 2A + (A - 18^\circ) = 90^\circ$$

$$3A = 108^\circ \Rightarrow A = 36^\circ$$

Ans: (C) 36°

10. The value of $\cos^2 \theta + \sin^4 \theta$ at $\theta = 60^\circ$ is

$$\cos^2 \theta + \sin^4 \theta = 1 - \sin^2 \theta \cos^2 \theta$$

$$= 1 - \frac{3}{4} \cdot \frac{1}{4} = \frac{13}{16}$$

Ans: (A) $\frac{13}{16}$

11. The least value of $\tan^2 \theta + 49 \cot^2 \theta$ is

Consider $\tan^2 \theta$ and $49 \cot^2 \theta$; both are +ve

$$\text{A.M} \geq \text{G.M: } \frac{\tan^2 \theta + 49 \cot^2 \theta}{2} \geq \sqrt{\tan^2 \theta \cdot 49 \cot^2 \theta} = \sqrt{49} = 7$$

$$\Rightarrow \tan^2 \theta + 49 \cot^2 \theta \geq 14; \text{ equality when } \tan^2 \theta = 7$$

Ans: (B) 14

12. $\sin 165^\circ =$

$$\sin 165^\circ = \sin(180^\circ - 15^\circ) = \sin 15^\circ$$

$$\sin(45^\circ - 30^\circ) = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{3}}{2} - \frac{1}{\sqrt{2}} \cdot \frac{1}{2} = \frac{\sqrt{3}-1}{2\sqrt{2}}$$

Ans: (A) $\frac{\sqrt{3}-1}{2\sqrt{2}}$

13. If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$ (A, B acute), then $A + B =$

$$\tan(A + B) = \frac{\frac{1}{2} + \frac{1}{3}}{1 - \frac{1}{6}} = \frac{5/6}{5/6} = 1$$

$$\therefore A + B = \frac{\pi}{4}$$

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

14. $\sin(60^\circ + \theta) \sin(60^\circ - \theta) =$

$$= \sin^2 60^\circ - \sin^2 \theta = \frac{3}{4} - \sin^2 \theta$$

Ans: (B) $\frac{3}{4} - \sin^2 \theta$

15. In $\triangle ABC$, $\cot A \cot B + \cot B \cot C + \cot C \cot A =$

$$\cot(A + B) = \cot(180^\circ - C) = -\cot C$$

$$\frac{\cot A \cot B - 1}{\cot B + \cot A} = -\cot C \Rightarrow \Sigma \cot A \cot B = 1$$

Ans: (C) 1

16. $(1 + \tan 11^\circ)(1 + \tan 34^\circ)(1 + \tan 14^\circ)(1 + \tan 31^\circ) =$
 $11^\circ + 34^\circ = 45^\circ$ and $14^\circ + 31^\circ = 45^\circ$
 $= 2 \times 2 = 4$
Ans: (D) 4

17. $1 - 2 \sin^2 75^\circ =$
 $1 - 2 \sin^2 A = \cos 2A$
 $= \cos 150^\circ = -\cos 30^\circ = -\frac{\sqrt{3}}{2}$
Ans: (A) $-\frac{\sqrt{3}}{2}$

18. $4 \cos^3 40^\circ - 3 \cos 40^\circ =$
 $4 \cos^3 A - 3 \cos A = \cos 3A$
 $= \cos 120^\circ = -\frac{1}{2}$
Ans: (A) $-\frac{1}{2}$

19. $\tan 22\frac{1}{2}^\circ + \cot 22\frac{1}{2}^\circ =$
 $\tan 22\frac{1}{2}^\circ = \sqrt{2} - 1, \cot 22\frac{1}{2}^\circ = \sqrt{2} + 1$
Sum $= 2\sqrt{2}$
Ans: (B) $2\sqrt{2}$

20. $\cos \frac{\pi}{7} \cos \frac{2\pi}{7} \cos \frac{4\pi}{7} =$
 $= \frac{\sin \frac{8\pi}{7}}{8 \sin \frac{\pi}{7}}$
 $\sin \frac{8\pi}{7} = -\sin \frac{\pi}{7}$, so G.E $= -\frac{1}{8}$
Ans: (B) $-\frac{1}{8}$

21. $\sin x + \sin 3x + \sin 5x =$
 $a_1 = x, a_n = 5x, d = 2x, n = 3$
Sum $= \frac{\sin 3x \sin 3x}{\sin x} = \frac{\sin^2 3x}{\sin x}$
Ans: (C) $\frac{\sin^2 3x}{\sin x}$

22. $\sin^2 12^\circ + \sin^2 48^\circ + \sin 12^\circ \sin 48^\circ =$
 $12^\circ + 48^\circ = 60^\circ$
If $A + B = 60^\circ$, $\sin^2 A + \sin^2 B + \sin A \sin B = \frac{3}{4}$
Ans: (D) $\frac{3}{4}$

23. If $\frac{x}{y} = \frac{\tan 67\frac{1}{2}^\circ}{\tan 22\frac{1}{2}^\circ}$, then $\frac{x+y}{x-y} =$
 $\frac{x+y}{x-y} = \frac{\sin(A+B)}{\sin(A-B)} = \frac{\sin 90^\circ}{\sin 45^\circ} = \sqrt{2}$
Ans: (C) $\sqrt{2}$

24. $\sin 75^\circ - \sin 15^\circ =$

$$\begin{aligned}\sin C - \sin D &= 2 \cos \frac{C+D}{2} \sin \frac{C-D}{2} \\ &= 2 \cos 45^\circ \sin 30^\circ = \frac{1}{\sqrt{2}}\end{aligned}$$

Ans: (C) $\frac{1}{\sqrt{2}}$

25. The period of $\sin \frac{x}{4} + \cos \frac{x}{6}$ is

Periods 8π and 12π ; L.C.M = 24π

Ans: (D) 24π
