

Trigonometry up to Transformations

MCQ Test, Set 07

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. If $\tan \theta = \frac{21}{20}$ and θ is acute, then $\cos \theta =$

A. $\frac{29}{21}$

B. $\frac{29}{20}$

C. $\frac{21}{29}$

D. $\frac{20}{29}$

2. 1 radian is approximately

A. 60°

B. 90°

C. 45°

D. 57°

3. If $\theta = 130^\circ$, which of the following is positive?

A. $\sin \theta$

B. $\tan \theta$

C. $\cot \theta$

D. $\cos \theta$

4. $\sec^2 30^\circ =$

A. 4

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

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

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

5. $\csc(180^\circ - \theta) =$

A. $\csc \theta$

B. $-\csc \theta$

C. $\sec \theta$

D. $-\sec \theta$

6. $\cos 1080^\circ - \sin 990^\circ =$

A. 2

B. 0

C. -2

D. 1

7. Which value can $\sec \theta$ never take?

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

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

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

D. 1

8. Which is true for $\sin 4$, $\sin 5$, $\sin 6$ (angles in radians)?

A. $\sin 6 > \sin 5 > \sin 4$

B. $\sin 4 > \sin 5 > \sin 6$

C. $\sin 5 > \sin 4 > \sin 6$

D. $\sin 6 > \sin 4 > \sin 5$

9. $\tan 25^\circ + \tan 155^\circ =$

A. 1

B. $2 \tan 25^\circ$

C. $-2 \tan 25^\circ$

D. 0

10. $2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta) =$

A. -5

B. -1

C. 1

D. 0

11. The least value of $2 \tan^2 \theta + 8 \cot^2 \theta$ is

A. 10

B. 8

C. 16

D. 4

12. If $\sin A = \frac{4}{5}$ and $\cos B = \frac{15}{17}$ (A, B acute), then $\cos(A - B) =$

A. $\frac{77}{85}$

B. $\frac{84}{85}$

C. $\frac{36}{85}$

D. $\frac{13}{85}$

13. $\tan 105^\circ =$

A. $\sqrt{3} - 2$

B. $2 + \sqrt{3}$

C. $-(2 + \sqrt{3})$

D. $2 - \sqrt{3}$

14. $\sin^2(45^\circ + \theta) - \sin^2(45^\circ - \theta) =$

A. $2 \sin \theta$

B. $\cos 2\theta$

C. $\sin 2\theta$

D. $\sin^2 \theta$

15. $\tan 10^\circ \tan 20^\circ + \tan 20^\circ \tan 60^\circ + \tan 60^\circ \tan 10^\circ =$

A. 0

B. 3

C. $\sqrt{3}$

D. 1

16. If $A + B = 225^\circ$, then $(1 + \tan A)(1 + \tan B) =$

A. 0

B. 1

C. 2

D. -2

17. $\frac{2 \tan 15^\circ}{1 - \tan^2 15^\circ} =$

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

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

C. 1

D. $\sqrt{3}$

18. $\frac{3 \tan 10^\circ - \tan^3 10^\circ}{1 - 3 \tan^2 10^\circ} =$

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

B. $\tan 10^\circ$

C. $\sqrt{3}$

D. 1

19. $\sin 36^\circ \cos 54^\circ =$

A. $\frac{5 + \sqrt{5}}{8}$

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

C. $\frac{5 - \sqrt{5}}{8}$

D. $\frac{3 - \sqrt{5}}{8}$

20. $\tan 15^\circ (1 + \sec 30^\circ) =$

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

B. $\sqrt{3}$

C. $2 - \sqrt{3}$

D. 1

21. $\cos \frac{\pi}{11} + \cos \frac{3\pi}{11} + \cos \frac{5\pi}{11} + \cos \frac{7\pi}{11} + \cos \frac{9\pi}{11} =$

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

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

C. 0

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

22. $\tan 12^\circ + \tan 72^\circ - \tan 48^\circ =$

A. $\tan 36^\circ$

B. $3 \cot 36^\circ$

C. $3 \tan 12^\circ$

D. $3 \tan 36^\circ$

23. If $0^\circ < A < 90^\circ$, then $\sqrt{1 + \sin 2A} =$

A. $\cos A - \sin A$

B. $\sin A - \cos A$

C. $\cos A + \sin A$

D. $1 + \sin A$

24. $\sin 105^\circ + \cos 105^\circ =$

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

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

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

D. 0

25. The period of $|\sin 2x|$ is

A. π

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

C. 2π

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

Key sheet

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

Solutions

1. If $\tan \theta = \frac{21}{20}$ and θ is acute, then $\cos \theta =$

$$\tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{21}{20}: \text{take opp} = 21, \text{adj} = 20$$

$$\text{hyp} = \sqrt{21^2 + 20^2} = \sqrt{841} = 29$$

$$\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{20}{29}$$

Ans: (D) $\frac{20}{29}$

2. 1 radian is approximately

$$1^c = \frac{180^\circ}{\pi} \approx 57^\circ$$

Ans: (D) 57°

3. If $\theta = 130^\circ$, which of the following is positive?

$130^\circ \in \text{II}_Q$, where only $\sin, \csc$ are +ve

Ans: (A) $\sin \theta$

4. $\sec^2 30^\circ =$

$$\sec 30^\circ = \frac{2}{\sqrt{3}}, \text{ so } \sec^2 30^\circ = \frac{4}{3}$$

$$= \frac{4}{3}$$

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

5. $\csc(180^\circ - \theta) =$

$180^\circ - \theta$ is of the form $180^\circ \pm \theta$ or $360^\circ \pm \theta$, so $\csc$ does not change

For acute θ , $180^\circ - \theta \in \text{II}_Q$, where $\csc$ is +ve

$$\therefore \csc(180^\circ - \theta) = \csc \theta$$

Ans: (A) $\csc \theta$

6. $\cos 1080^\circ - \sin 990^\circ =$

$$\cos 1080^\circ = \cos(3 \times 360^\circ) = 1$$

$$\sin 990^\circ = \sin(720^\circ + 270^\circ) = \sin 270^\circ = -1$$

$$1 - (-1)$$

$$= 2$$

Ans: (A) 2

7. Which value can $\sec \theta$ never take?

$$\sec \theta \leq -1 \text{ or } \sec \theta \geq 1$$

$$-1 < -\frac{2}{3} < 1, \text{ so } \sec \theta \text{ cannot be } -\frac{2}{3}$$

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

8. Which is true for $\sin 4, \sin 5, \sin 6$ (angles in radians)?

$$\sin 229^\circ = -\sin 49^\circ, \sin 286^\circ = -\sin 74^\circ, \sin 343^\circ = -\sin 17^\circ$$

$$-\sin 17^\circ > -\sin 49^\circ > -\sin 74^\circ$$

Ans: (D) $\sin 6 > \sin 4 > \sin 5$

9. $\tan 25^\circ + \tan 155^\circ =$

$$\tan 155^\circ = \tan(180^\circ - 25^\circ) = -\tan 25^\circ$$

$$\text{Sum} = 0$$

Ans: (D) 0

10. $2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta) =$

$$\text{Let } k = \sin^2 \theta \cos^2 \theta: 2(1 - 3k) - 3(1 - 2k)$$

$$= 2 - 6k - 3 + 6k = -1$$

Ans: (B) -1

11. The least value of $2 \tan^2 \theta + 8 \cot^2 \theta$ is

Consider $2 \tan^2 \theta$ and $8 \cot^2 \theta$; both are +ve

$$A.M \geq G.M: \frac{2 \tan^2 \theta + 8 \cot^2 \theta}{2} \geq \sqrt{2 \tan^2 \theta \cdot 8 \cot^2 \theta} = \sqrt{16} = 4$$

$$\Rightarrow 2 \tan^2 \theta + 8 \cot^2 \theta \geq 8; \text{equality when } \tan^2 \theta = 2$$

Ans: (B) 8

12. If $\sin A = \frac{4}{5}$ and $\cos B = \frac{15}{17}$ (A, B acute), then $\cos(A - B) =$

$$\cos A = \frac{3}{5}, \sin B = \frac{8}{17}$$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B = \frac{45}{85} + \frac{32}{85} = \frac{77}{85}$$

Ans: (A) $\frac{77}{85}$

13. $\tan 105^\circ =$

$$\tan(60^\circ + 45^\circ) = \frac{\sqrt{3}+1}{1-\sqrt{3}} = -\frac{(\sqrt{3}+1)^2}{2} = -(2 + \sqrt{3})$$

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

14. $\sin^2(45^\circ + \theta) - \sin^2(45^\circ - \theta) =$

$$= \sin 90^\circ \sin 2\theta = \sin 2\theta$$

Ans: (C) $\sin 2\theta$

15. $\tan 10^\circ \tan 20^\circ + \tan 20^\circ \tan 60^\circ + \tan 60^\circ \tan 10^\circ =$

$$10^\circ + 20^\circ + 60^\circ = 90^\circ$$

$$\text{So } \Sigma \tan A \tan B = 1$$

Ans: (D) 1

16. If $A + B = 225^\circ$, then $(1 + \tan A)(1 + \tan B) =$

$$\tan(A + B) = \tan 225^\circ = 1$$

$$\Rightarrow \tan A + \tan B + \tan A \tan B = 1 \Rightarrow (1 + \tan A)(1 + \tan B) = 2$$

Ans: (C) 2

17. $\frac{2 \tan 15^\circ}{1 - \tan^2 15^\circ} =$

$$\frac{2 \tan A}{1 - \tan^2 A} = \tan 2A$$

$$= \tan 30^\circ = \frac{1}{\sqrt{3}}$$

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

18. $\frac{3 \tan 10^\circ - \tan^3 10^\circ}{1 - 3 \tan^2 10^\circ} =$
 $\frac{3 \tan A - \tan^3 A}{1 - 3 \tan^2 A} = \tan 3A$
 $= \tan 30^\circ = \frac{1}{\sqrt{3}}$

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

19. $\sin 36^\circ \cos 54^\circ =$
 $\cos 54^\circ = \sin 36^\circ$, so G.E = $\sin^2 36^\circ$
 $= \frac{10 - 2\sqrt{5}}{16} = \frac{5 - \sqrt{5}}{8}$

Ans: (C) $\frac{5 - \sqrt{5}}{8}$

20. $\tan 15^\circ (1 + \sec 30^\circ) =$
 $\tan \frac{\theta}{2} (1 + \sec \theta) = \tan \theta$
 $= \tan 30^\circ = \frac{1}{\sqrt{3}}$

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

21. $\cos \frac{\pi}{11} + \cos \frac{3\pi}{11} + \cos \frac{5\pi}{11} + \cos \frac{7\pi}{11} + \cos \frac{9\pi}{11} =$
 $n = 5, d = \frac{2\pi}{11}$: $\text{sum} = \frac{\cos \frac{5\pi}{11} \sin \frac{5\pi}{11}}{\sin \frac{\pi}{11}} = \frac{\sin \frac{10\pi}{11}}{2 \sin \frac{\pi}{11}} = \frac{1}{2}$

Ans: (B) $\frac{1}{2}$

22. $\tan 12^\circ + \tan 72^\circ - \tan 48^\circ =$
 $\tan \theta + \tan(60^\circ + \theta) - \tan(60^\circ - \theta) = 3 \tan 3\theta$ with $\theta = 12^\circ$

Ans: (D) $3 \tan 36^\circ$

23. If $0^\circ < A < 90^\circ$, then $\sqrt{1 + \sin 2A} =$
 $1 + \sin 2A = (\cos A + \sin A)^2$
 $\cos A + \sin A > 0$ for acute A

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

24. $\sin 105^\circ + \cos 105^\circ =$
 $\cos 105^\circ = \sin(-15^\circ)$
 $\sin 105^\circ + \sin(-15^\circ) = 2 \sin 45^\circ \cos 60^\circ = \frac{1}{\sqrt{2}}$

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

25. The period of $|\sin 2x|$ is
 Period of $|\sin x|$ is π , so period of $|\sin 2x|$ is $\frac{\pi}{2}$

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