EXPRESSWALA ACADEMY

Trigonometry up to Transformations

MCQ Test, Set 01

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 $\sec\theta = \frac{13}{5}$ and θ is acute, then $\tan\theta =$

A. $\frac{5}{13}$ **B.** $\frac{12}{5}$ **C.** $\frac{5}{12}$ **D.** $\frac{12}{13}$

2. The radian measure of 210° is

A. $\frac{7\pi}{6}$ **B.** $\frac{5\pi}{6}$ **C.** $\frac{7\pi}{12}$ **D.** $\frac{4\pi}{3}$

3. If $\theta = 230^\circ$, which of the following is positive?

A. $\cos\theta$ **B.** $\sin\theta$ **C.** $\sec\theta$ **D.** $\tan\theta$

4. $\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ =$

A. 1 **B.** $\frac{\sqrt{3}}{2}$ **C.** $\frac{1}{2}$ **D.** 0

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

A. $\tan\theta$ **B.** $\cot\theta$

C. $-\cot\theta$ **D.** $-\tan\theta$

6. $\cos 1290^\circ =$

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

7. The range of $\sec x$ is

A. $(-1, 1)$ **B.** $(-\infty, -1] \cup [1, \infty)$

C. R **D.** $[-1, 1]$

8. The correct order of $\sin 1$, $\sin 2$, $\sin 3$ is

A. $\sin 2 > \sin 1 > \sin 3$ **B.** $\sin 3 > \sin 2 > \sin 1$

C. $\sin 2 > \sin 3 > \sin 1$ **D.** $\sin 1 > \sin 2 > \sin 3$

9. $\frac{\sin 37^\circ}{\cos 53^\circ} =$

A. -1 **B.** 0

C. 1 **D.** $\tan 37^\circ$

10. $\sin^6\theta + \cos^6\theta + 3\sin^2\theta\cos^2\theta =$

A. 0 **B.** 2 **C.** 3 **D.** 1

11. The least value of $\cos^2\theta + \sec^2\theta$ is

A. 2 **B.** 1 **C.** 0 **D.** 4

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12. $\sin 75^\circ =$

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

C. $\frac{\sqrt{3}+1}{2}$ **D.** $\frac{\sqrt{3}+1}{2\sqrt{2}}$

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13. $\tan 75^\circ =$

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

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14. $\sin^2\left(\frac{\pi}{8}+\frac{\theta}{2}\right) - \sin^2\left(\frac{\pi}{8}-\frac{\theta}{2}\right) =$

A. $\frac{1}{\sqrt{2}}\cos\theta$ **B.** $\sin\theta$

C. $\frac{1}{\sqrt{2}}\sin\theta$ **D.** $\sqrt{2}\sin\theta$

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

A. 0 **B.** 1

C. $\tan A \tan B \tan C$ **D.** $-\tan A \tan B \tan C$

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16. $(1+\tan 8^\circ)(1+\tan 37^\circ) =$

A. 1 **B.** 0 **C.** 4 **D.** 2

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17. $2\sin 22\frac{1}{2}^\circ \cos 22\frac{1}{2}^\circ =$

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

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18. If $\sin A = \frac{1}{4}$, then $\sin 3A =$

A. $\frac{3}{4}$ **B.** $\frac{13}{16}$ **C.** $\frac{11}{16}$ **D.** $\frac{1}{2}$

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19. $\sin 18^\circ =$

A. $\frac{\sqrt{10+2\sqrt{5}}}{4}$ **B.** $\frac{\sqrt{5}-1}{2}$

C. $\frac{\sqrt{5}+1}{4}$ **D.** $\frac{\sqrt{5}-1}{4}$

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20. $\cot 15^\circ - \tan 15^\circ =$

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

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

A. 1 **B.** $-\frac{1}{2}$ **C.** 0 **D.** $\frac{1}{2}$

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22. $\sin 20^\circ \sin 40^\circ \sin 80^\circ =$

A. $\frac{1}{8}$ **B.** $\frac{\sqrt{3}}{8}$ **C.** $\frac{3}{8}$ **D.** $\frac{\sqrt{3}}{4}$

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23. $\sqrt{1+\sin 50^\circ} - \sqrt{1-\sin 50^\circ} =$

A. $2\sin 50^\circ$ **B.** $2\sin 25^\circ$

C. $\sin 25^\circ$ **D.** $2\cos 25^\circ$

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24. $2\sin 75^\circ \cos 15^\circ =$

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

25. The period of $4\cos(5x+3)-1$ is

A. $\frac{5\pi}{2}$ **B.** $\frac{2\pi}{5}$ **C.** 2π **D.** $\frac{\pi}{5}$

Key sheet

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

Solutions

1. If $\sec\theta = \frac{13}{5}$ and θ is acute, then $\tan\theta =$

$\sec\theta = \frac{\text{hyp}}{\text{adj}} = \frac{13}{5}$: take hyp $= 13$, adj $= 5$

$\text{opp} = \sqrt{13^2 - 5^2} = \sqrt{144} = 12$

$\tan\theta = \frac{\text{opp}}{\text{adj}} = \frac{12}{5}$

Ans: (B) $\frac{12}{5}$

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2. The radian measure of 210° is

$210^\circ = 210 \times \frac{\pi}{180} = \frac{7\pi}{6}$

Ans: (A) $\frac{7\pi}{6}$

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3. If $\theta = 230^\circ$, which of the following is positive?

$230^\circ \in \text{III}_Q$, where only tan, cot are +ve

Ans: (D) $\tan\theta$

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4. $\sin 60^\circ \cos 30^\circ - \cos 60^\circ \sin 30^\circ =$

$= \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{3}}{2} - \frac{1}{2} \cdot \frac{1}{2} = \frac{3}{4} - \frac{1}{4}$

$= \frac{1}{2}$

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

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

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

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

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

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

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6. $\cos 1290^\circ =$

$\cos 1290^\circ = \cos(1080^\circ + 210^\circ) = \cos 210^\circ$

$210^\circ \in \text{III}_Q$, where cos is -ve

$\cos 210^\circ = \cos(180^\circ + 30^\circ) = -\cos 30^\circ = -\frac{\sqrt{3}}{2}$

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

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7. The range of $\sec x$ is

$\sec x = \frac{1}{\cos x}$ and $-1 \le \cos x \le 1$, $\cos x \neq 0$

So $\sec x \le -1$ or $\sec x \ge 1$

Ans: (B) $(-\infty, -1] \cup [1, \infty)$

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8. The correct order of $\sin 1$, $\sin 2$, $\sin 3$ is

$1 \approx 57^\circ$, $2 \approx 114^\circ$, $3 \approx 171^\circ$

$\sin 2 = \sin 66^\circ$, $\sin 3 = \sin 9^\circ$

$\sin x$ increases on $(0^\circ, 90^\circ)$: $\sin 66^\circ > \sin 57^\circ > \sin 9^\circ$

Ans: (A) $\sin 2 > \sin 1 > \sin 3$

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9. $\frac{\sin 37^\circ}{\cos 53^\circ} =$

$\cos 53^\circ = \cos(90^\circ - 37^\circ) = \sin 37^\circ$

So the ratio is 1

Ans: (C) 1

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10. $\sin^6\theta + \cos^6\theta + 3\sin^2\theta\cos^2\theta =$

$\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta\cos^2\theta$

Adding $3\sin^2\theta\cos^2\theta$ gives 1

Ans: (D) 1

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11. The least value of $\cos^2\theta + \sec^2\theta$ is

Consider $\cos^2\theta$ and $\sec^2\theta$; both are +ve

A.M $\geq$ G.M: $\frac{\cos^2\theta+\sec^2\theta}{2} \geq \sqrt{\cos^2\theta\cdot\sec^2\theta} = \sqrt{1} = 1$

$\Rightarrow \cos^2\theta + \sec^2\theta \geq 2$; equality when $\cos^2\theta = 1$

Ans: (A) 2

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12. $\sin 75^\circ =$

$\sin(45^\circ + 30^\circ) = \sin 45^\circ\cos 30^\circ + \cos 45^\circ\sin 30^\circ$

$= \frac{1}{\sqrt{2}}\cdot\frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}}\cdot\frac{1}{2} = \frac{\sqrt{3}+1}{2\sqrt{2}}$

Ans: (D) $\frac{\sqrt{3}+1}{2\sqrt{2}}$

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13. $\tan 75^\circ =$

$\tan(45^\circ + 30^\circ) = \frac{1+\frac{1}{\sqrt{3}}}{1-\frac{1}{\sqrt{3}}} = \frac{\sqrt{3}+1}{\sqrt{3}-1}$

$= \frac{(\sqrt{3}+1)^2}{2} = \frac{4+2\sqrt{3}}{2} = 2+\sqrt{3}$

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

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14. $\sin^2\left(\frac{\pi}{8}+\frac{\theta}{2}\right) - \sin^2\left(\frac{\pi}{8}-\frac{\theta}{2}\right) =$

$= \sin\left(\frac{\pi}{4}\right)\sin\theta = \frac{1}{\sqrt{2}}\sin\theta$

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

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

$A + B = 180^\circ - C \Rightarrow \frac{\tan A+\tan B}{1-\tan A\tan B} = -\tan C$

$\Rightarrow \tan A + \tan B + \tan C = \tan A\tan B\tan C$

Ans: (C) $\tan A\tan B\tan C$

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16. $(1+\tan 8^\circ)(1+\tan 37^\circ) =$

$8^\circ + 37^\circ = 45^\circ \Rightarrow (1+\tan A)(1+\tan B) = 2$

Ans: (D) 2

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17. $2\sin 22\frac{1}{2}^\circ \cos 22\frac{1}{2}^\circ =$

$2\sin A\cos A = \sin 2A$

$= \sin 45^\circ = \frac{1}{\sqrt{2}}$

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

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18. If $\sin A = \frac{1}{4}$, then $\sin 3A =$

$\sin 3A = 3\sin A - 4\sin^3 A = \frac{3}{4} - 4\cdot\frac{1}{64} = \frac{3}{4} - \frac{1}{16} = \frac{11}{16}$

Ans: (C) $\frac{11}{16}$

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19. $\sin 18^\circ =$

Standard value: $\sin 18^\circ = \frac{\sqrt{5}-1}{4}$

Ans: (D) $\frac{\sqrt{5}-1}{4}$

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20. $\cot 15^\circ - \tan 15^\circ =$

$\cot A - \tan A = 2\cot 2A$

$= 2\cot 30^\circ = 2\sqrt{3}$

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

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

$a_1 = \frac{\pi}{7}$, $d = \frac{2\pi}{7}$, $n = 3$: sum $= \frac{\cos\frac{3\pi}{7}\sin\frac{3\pi}{7}}{\sin\frac{\pi}{7}} = \frac{\sin\frac{6\pi}{7}}{2\sin\frac{\pi}{7}} = \frac{1}{2}$

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

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22. $\sin 20^\circ \sin 40^\circ \sin 80^\circ =$

$\sin\theta\sin(60^\circ-\theta)\sin(60^\circ+\theta) = \frac{1}{4}\sin 3\theta$ with $\theta = 20^\circ$

$= \frac{1}{4}\sin 60^\circ = \frac{\sqrt{3}}{8}$

Ans: (B) $\frac{\sqrt{3}}{8}$

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23. $\sqrt{1+\sin 50^\circ} - \sqrt{1-\sin 50^\circ} =$

$\sqrt{1+\sin 50^\circ} = \cos 25^\circ + \sin 25^\circ$, $\sqrt{1-\sin 50^\circ} = \cos 25^\circ - \sin 25^\circ$ $(25^\circ < 45^\circ)$

Difference $= 2\sin 25^\circ$

Ans: (B) $2\sin 25^\circ$

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24. $2\sin 75^\circ \cos 15^\circ =$

$2\sin A\cos B = \sin(A+B) + \sin(A-B)$

$= \sin 90^\circ + \sin 60^\circ = 1 + \frac{\sqrt{3}}{2} = \frac{2+\sqrt{3}}{2}$

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

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25. The period of $4\cos(5x+3) - 1$ is

Period of $\cos(ax+b)+k$ is $\frac{2\pi}{|a|} = \frac{2\pi}{5}$

Ans: (B) $\frac{2\pi}{5}$