Topic: Allied Angles

Sub: Mathematics **Assignment: 02** Prof. Chetan Sir

Que.1: Measurement of Angles

1. Find the radian measures corresponding to the following degree measures:

(i) $15°$ (ii) $240°$ (iii) $530°$ (iv) $-1215°$

2. Find the degree measures corresponding to the following radian measures:

(i) $\frac{3\pi}{4}$ (ii) -4π (iii) $\frac{5\pi}{3}$ (iv) $\frac{7\pi}{6}$

3. Find the value of:

(i) $\cos 210°$ (ii) $\sin 225°$ (iii) $\tan 330°$ (iv) $\cot(-315°)$

(v) $\sin 765°$ (vi) $\operatorname{cosec}(-1410°)$ (vii) $\tan\left(\frac{19\pi}{3}\right)$ (viii) $\sin\left(-\frac{11\pi}{3}\right)$

(ix) $\cot\left(-\frac{15\pi}{4}\right)$ (x) $\cos\left(\frac{53\pi}{6}\right)$ (xi) $\sin\left(\frac{25\pi}{3}\right)$ (xii) $\cos\left(-\frac{17\pi}{3}\right)$

Que.2: Solve the following questions

1. The value of $\frac{\sin 300° \tan 330° \sec 420°}{\tan 135° \sin 210° \sec 315°}$ is:

(A) -1 (B) 1 (C) $\sqrt{2}$ (D) $\sqrt{3}$

2. The value of $2\cos 10° + \sin 100° + \sin 1000° + \sin 10000°$ is:

(A) 0 (B) $\sin 10°$ (C) $\cos 10°$ (D) -1

3. The value of $\cos^2 73° + \cos^2 47° - \sin^2 43° + \sin^2 107°$ is equal to:

(A) $1/2$ (B) $3/4$ (C) 1 (D) None of these

4. If $2\cos^2\theta + 3\cos\theta = 2$, then a possible value of $\cos\theta$ is:

(A) $1/2$ (B) -2 (C) $-1/2$ (D) 1

5. If $3\tan^2\theta - 4\sqrt{3}\tan\theta + 3 = 0$, then a possible value of $\tan\theta$ is:

(A) $\sqrt{3}$ (B) 3 (C) $1/3$ (D) $2\sqrt{3}$

6. If $\tan\theta = -2$ and $\frac{\pi}{2} < \theta < \pi$, then the value of $\sin\theta$ is:

(A) $\frac{2}{\sqrt{5}}$ (B) $-\frac{2}{\sqrt{5}}$ (C) $\frac{1}{\sqrt{5}}$ (D) $-\frac{1}{\sqrt{5}}$

7. If $\cos\theta = -\frac{3}{5}$ and $\pi < \theta < \frac{3\pi}{2}$, then the value of $\frac{\operatorname{cosec}\theta + \cot\theta}{\sec\theta - \tan\theta}$ is:

(A) $\frac{1}{6}$ (B) $-\frac{1}{6}$ (C) 6 (D) -6

8. If $\sin\theta = -\frac{1}{\sqrt{2}}$ and $\tan\theta = 1$, then θ lies in which quadrant?

(A) First (B) Second (C) Third (D) Fourth

9. If $\sin\theta = \frac{12}{13}$ and $\frac{\pi}{2} < \theta < \pi$, find the value of $\sec\theta + \tan\theta$.

(A) 5 (B) 3 (C) -3 (D) -5

10. If $a\cos\theta + b\sin\theta = 3$ and $a\sin\theta - b\cos\theta = 4$, then $a^2 + b^2$ has the value:

(A) 25 (B) 14 (C) 7 (D) 10

11. The expression $\frac{\tan\left(x-\frac{\pi}{2}\right)\cos\left(\frac{3\pi}{2}+x\right)-\sin^3\left(\frac{7\pi}{2}-x\right)}{\cos\left(x-\frac{\pi}{2}\right)\tan\left(\frac{3\pi}{2}+x\right)}$ when simplified reduces to:

(A) $\sin x\cos x$ (B) $-\sin^2 x$ (C) $-\sin x\cos x$ (D) $\sin^2 x$

12. The value of $\sin^2\frac{\pi}{9}+\sin^2\frac{2\pi}{9}+\sin^2\frac{3\pi}{9}+\cdots+\sin^2\frac{17\pi}{9}$ is:

(A) 9 (B) 8 (C) 17/2 (D) 9/2

13. The value of $\sin^2 6^\circ+\sin^2 12^\circ+\sin^2 18^\circ+\cdots+\sin^2 84^\circ+\sin^2 90^\circ$ is:

(A) 7 (B) 8 (C) 15 (D) 15/2

14. The value of $\cos 0+\cos\frac{\pi}{7}+\cos\frac{2\pi}{7}+\cos\frac{3\pi}{7}+\cos\frac{4\pi}{7}+\cos\frac{5\pi}{7}+\cos\frac{6\pi}{7}$ is:

(A) 1/2 (B) −1/2 (C) 0 (D) 1

15. The value of $\cos^2\frac{\pi}{12}+\cos^2\frac{3\pi}{12}+\cos^2\frac{5\pi}{12}$ is:

(A) $\frac{3}{2}$ (B) $\frac{2}{3}$ (C) $\frac{3+\sqrt{3}}{4}$ (D) $\frac{3}{4}$

16. The value of $\tan(\frac{\pi}{20})\tan(\frac{3\pi}{20})\tan(\frac{5\pi}{20})\tan(\frac{7\pi}{20})\tan(\frac{9\pi}{20})$ is:

(A) -1 (B) 1 (C) 1/2 (D) 0

17. The value of $\sin(\frac{\pi}{5})+\sin(\frac{2\pi}{5})+\sin(\frac{3\pi}{5})+\cdots+\sin(\frac{9\pi}{5})$ is:

(A) 1 (B) -1 (C) 0 (D) 2

Que.3: Proofs and Simplifications

1. Prove that: $2\sin^2\frac{\pi}{6}+\operatorname{cosec}\frac{7\pi}{6}\cos^2\frac{\pi}{3}=0$.

2. Prove that: $\cot^2\frac{\pi}{6}+\operatorname{cosec}\frac{5\pi}{6}+3\tan^2\frac{\pi}{6}=6$.

3. Prove that: $\sec(\frac{3\pi}{2}-A)\sec(\frac{\pi}{2}-A)-\tan(\frac{3\pi}{2}-A)\tan(\frac{\pi}{2}+A)+1=0$.

4. Prove that: $\cot A+\tan(\pi+A)+\tan(\frac{\pi}{2}+A)+\tan(2\pi-A)=0$.

5. Prove that: $\frac{\cos(\pi-A)\sin(\frac{\pi}{2}+A)\cot(A)}{\tan(\frac{3\pi}{2}-A)\tan(\frac{\pi}{2}-A)\sin(2\pi-A)}=\sin A$.

6. Prove that: $\frac{\cos(\pi+\theta)\cos(-\theta)}{\sin(\pi-\theta)\cos(\frac{\pi}{2}+\theta)}=\cot^2\theta$.

7. Prove that: $\cos\theta+\sin(270^\circ+\theta)-\sin(270^\circ-\theta)+\cos(180^\circ+\theta)=0$.

8. Prove that: $\cos\left(\frac{3\pi}{2}+\theta\right)\cos(2\pi+\theta)\left[\cot\left(\frac{3\pi}{2}-\theta\right)+\cot(2\pi+\theta)\right]=1$.

9. If $\tan\theta=-5/12$ and θ is not in the second quadrant, then show that $\frac{\sin(360^\circ-\theta)+\tan(90^\circ+\theta)}{-\sec(270^\circ+\theta)+\operatorname{cosec}(-\theta)}=\frac{181}{338}$.

Answer Key

Que.1: Measurement of Angles

1. (i) $\frac{\pi}{12}$ (ii) $\frac{4\pi}{3}$ (iii) $\frac{53\pi}{18}$ (iv) $-\frac{27\pi}{4}$
2. (i) 135° (ii) −720° (iii) 300° (iv) 210°
3. (i) $-\frac{\sqrt{3}}{2}$ (ii) $-\frac{1}{\sqrt{2}}$ (iii) $-\frac{1}{\sqrt{3}}$ (iv) 1
   (v) $\frac{1}{\sqrt{2}}$ (vi) 2 (vii) $\sqrt{3}$ (viii) $\frac{\sqrt{3}}{2}$
   (ix) 1 (x) $-\frac{\sqrt{3}}{2}$ (xi) $\frac{\sqrt{3}}{2}$ (xii) $\frac{1}{2}$

Que.2: Solve the following questions

1 (C) **2** (C) **3** (C) **4** (A) **5** (A) **6** (A) **7** (A) **8** (C) **9** (D) **10** (A)
11 (D) **12** (A) **13** (B) **14** (D) **15** (A) **16** (B) **17** (C)