

### EXERCISE 3.1

1. Find the radian measures corresponding to the following degree measures:
- (i)  $25^\circ$       (ii)  $-47^\circ 30'$       (iii)  $240^\circ$       (iv)  $520^\circ$

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

(Use  $\pi = \frac{22}{7}$ ).

(i)  $\frac{11}{16}$

(ii)  $-4$

(iii)  $\frac{5\pi}{3}$

(iv)  $\frac{7\pi}{6}$

3. A wheel makes 360 revolutions in one minute. Through how many radians does it turn in one second?
4. Find the degree measure of the angle subtended at the centre of a circle of radius 100 cm by an arc of length 22 cm (Use  $\pi = \frac{22}{7}$ ).
5. In a circle of diameter 40 cm, the length of a chord is 20 cm. Find the length of minor arc of the chord.
6. If in two circles, arcs of the same length subtend angles  $60^\circ$  and  $75^\circ$  at the centre, find the ratio of their radii.
7. Find the angle in radian through which a pendulum swings if its length is 75 cm and the tip describes an arc of length
- (i) 10 cm                      (ii) 15 cm                      (iii) 21 cm

### EXERCISE 3.2

Find the values of other five trigonometric functions in Exercises 1 to 5.

1.  $\cos x = -\frac{1}{2}$ ,  $x$  lies in third quadrant.
2.  $\sin x = \frac{3}{5}$ ,  $x$  lies in second quadrant.
3.  $\cot x = \frac{3}{4}$ ,  $x$  lies in third quadrant.
4.  $\sec x = \frac{13}{5}$ ,  $x$  lies in fourth quadrant.
5.  $\tan x = -\frac{5}{12}$ ,  $x$  lies in second quadrant.

Find the values of the trigonometric functions in Exercises 6 to 10.

6.  $\sin 765^\circ$
7.  $\operatorname{cosec} (-1410^\circ)$
8.  $\tan \frac{19\pi}{3}$
9.  $\sin \left(-\frac{11\pi}{3}\right)$
10.  $\cot \left(-\frac{15\pi}{4}\right)$

### EXERCISE 3.3

Prove that:

1.  $\sin^2 \frac{\pi}{6} + \cos^2 \frac{\pi}{3} - \tan^2 \frac{\pi}{4} = -\frac{1}{2}$

2.  $2\sin^2 \frac{\pi}{6} + \operatorname{cosec}^2 \frac{7\pi}{6} \cos^2 \frac{\pi}{3} = \frac{3}{2}$

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

4.  $2\sin^2 \frac{3\pi}{4} + 2\cos^2 \frac{\pi}{4} + 2\sec^2 \frac{\pi}{3} = 10$

5. Find the value of:

(i)  $\sin 75^\circ$

(ii)  $\tan 15^\circ$

Prove the following:

6.  $\cos\left(\frac{\pi}{4} - x\right)\cos\left(\frac{\pi}{4} - y\right) - \sin\left(\frac{\pi}{4} - x\right)\sin\left(\frac{\pi}{4} - y\right) = \sin(x+y)$

7.  $\frac{\tan\left(\frac{\pi}{4} + x\right)}{\tan\left(\frac{\pi}{4} - x\right)} = \left(\frac{1 + \tan x}{1 - \tan x}\right)^2$

8.  $\frac{\cos(\pi+x)\cos(-x)}{\sin(\pi-x)\cos\left(\frac{\pi}{2}+x\right)} = \cot^2 x$

9.  $\cos\left(\frac{3\pi}{2} + x\right)\cos(2\pi+x)\left[\cot\left(\frac{3\pi}{2}-x\right) + \cot(2\pi+x)\right] = 1$

10.  $\sin(n+1)x \sin(n+2)x + \cos(n+1)x \cos(n+2)x = \cos x$

11.  $\cos\left(\frac{3\pi}{4} + x\right) - \cos\left(\frac{3\pi}{4} - x\right) = -\sqrt{2} \sin x$

12.  $\sin^2 6x - \sin^2 4x = \sin 2x \sin 10x$

13.  $\cos^2 2x - \cos^2 6x = \sin 4x \sin 8x$

14.  $\sin 2x + 2 \sin 4x + \sin 6x = 4 \cos^2 x \sin 4x$

15.  $\cot 4x (\sin 5x + \sin 3x) = \cot x (\sin 5x - \sin 3x)$

16.  $\frac{\cos 9x - \cos 5x}{\sin 17x - \sin 3x} = -\frac{\sin 2x}{\cos 10x}$

17.  $\frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \tan 4x$

18.  $\frac{\sin x - \sin y}{\cos x + \cos y} = \tan \frac{x-y}{2}$

19.  $\frac{\sin x + \sin 3x}{\cos x + \cos 3x} = \tan 2x$

20.  $\frac{\sin x - \sin 3x}{\sin^2 x - \cos^2 x} = 2 \sin x$

21.  $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$

**22.**  $\cot x \cot 2x - \cot 2x \cot 3x - \cot 3x \cot x = 1$

**23.**  $\tan 4x = \frac{4 \tan x (1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$

**24.**  $\cos 4x = 1 - 8 \sin^2 x \cos^2 x$

**25.**  $\cos 6x = 32 \cos^6 x - 48 \cos^4 x + 18 \cos^2 x - 1$

### *Miscellaneous Exercise on Chapter 3*

Prove that:

1.  $2 \cos \frac{\pi}{13} \cos \frac{9\pi}{13} + \cos \frac{3\pi}{13} + \cos \frac{5\pi}{13} = 0$
2.  $(\sin 3x + \sin x) \sin x + (\cos 3x - \cos x) \cos x = 0$
3.  $(\cos x + \cos y)^2 + (\sin x - \sin y)^2 = 4 \cos^2 \frac{x+y}{2}$

4.  $(\cos x - \cos y)^2 + (\sin x - \sin y)^2 = 4 \sin^2 \frac{x-y}{2}$
5.  $\sin x + \sin 3x + \sin 5x + \sin 7x = 4 \cos x \cos 2x \sin 4x$
6.  $\frac{(\sin 7x + \sin 5x) + (\sin 9x + \sin 3x)}{(\cos 7x + \cos 5x) + (\cos 9x + \cos 3x)} = \tan 6x$
7.  $\sin 3x + \sin 2x - \sin x = 4 \sin x \cos \frac{x}{2} \cos \frac{3x}{2}$

Find  $\sin \frac{x}{2}$ ,  $\cos \frac{x}{2}$  and  $\tan \frac{x}{2}$  in each of the following :

8.  $\tan x = -\frac{4}{3}$ ,  $x$  in quadrant II
9.  $\cos x = -\frac{1}{3}$ ,  $x$  in quadrant III
10.  $\sin x = \frac{1}{4}$ ,  $x$  in quadrant II