Exercise 7.1

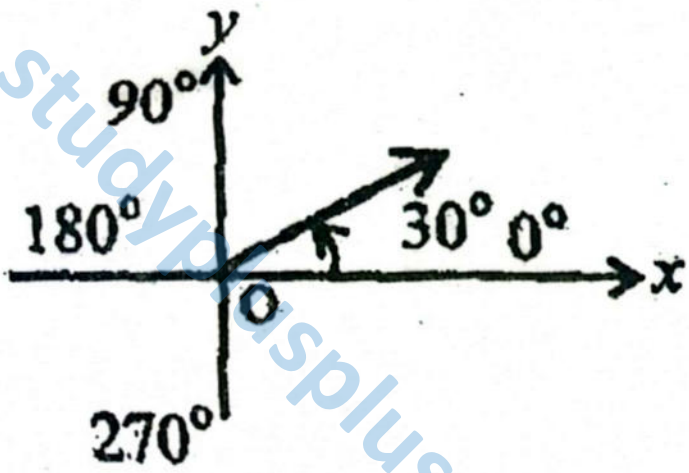
Q.1 Locate the following angles.

(i) $30°$ (ii) $22\frac{1}{2}°$ (iii) $135°$ (iv) $225°$

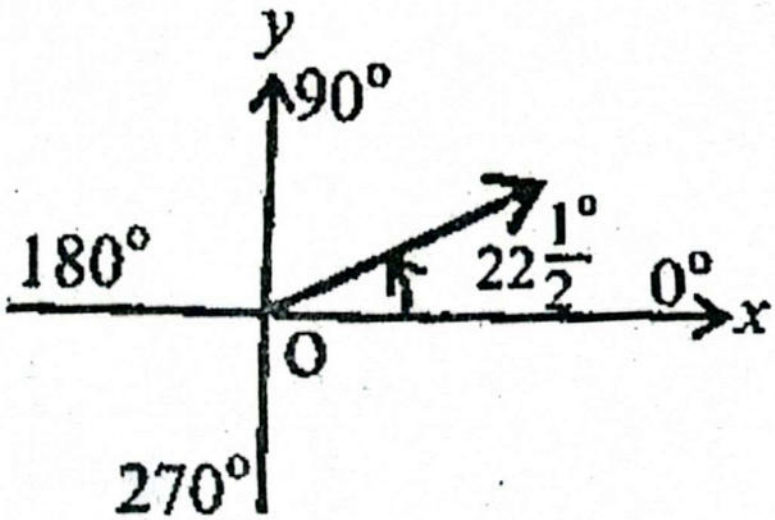
(v) $-60°$ (vi) $-120°$ (vii) $-150°$ $(viii)$ $-225°$

Solution:

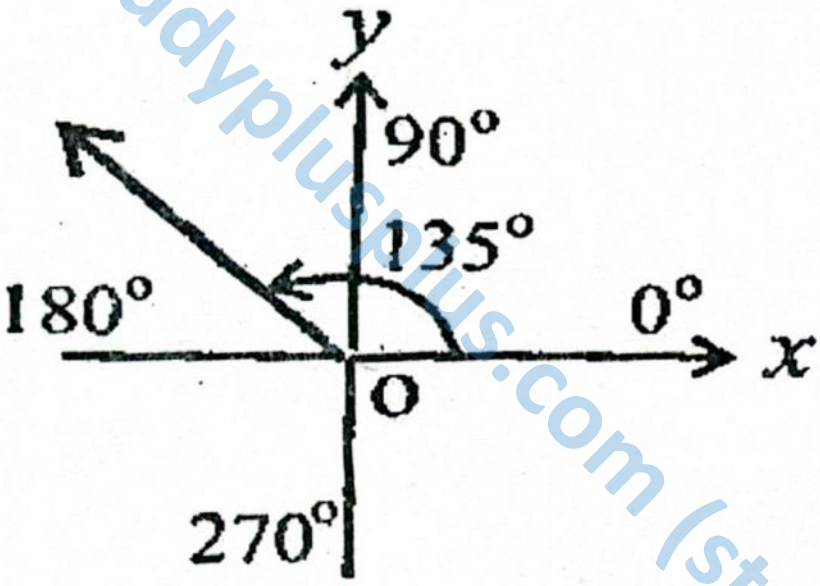
(i) $30°$



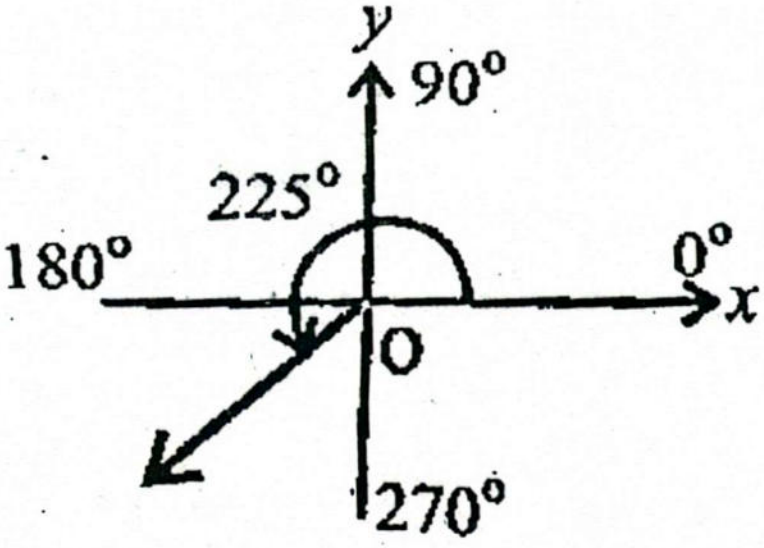
(*ii*) $22\frac{1}{2}^\circ$



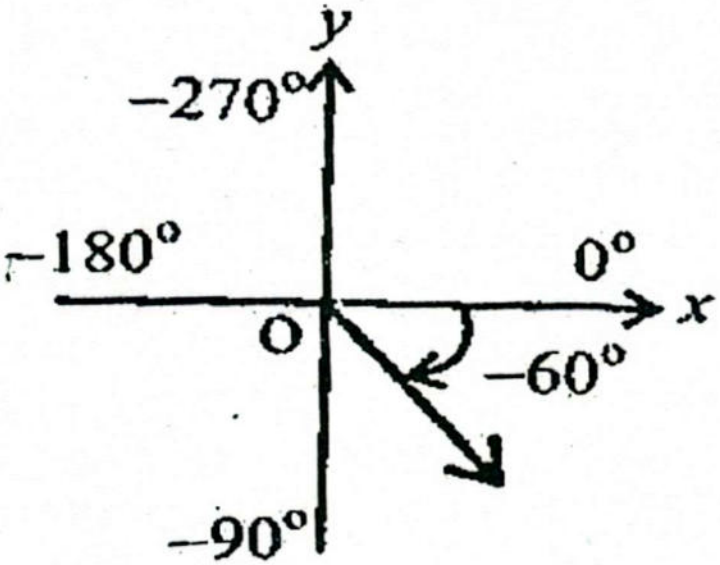
(*iii*) 135°



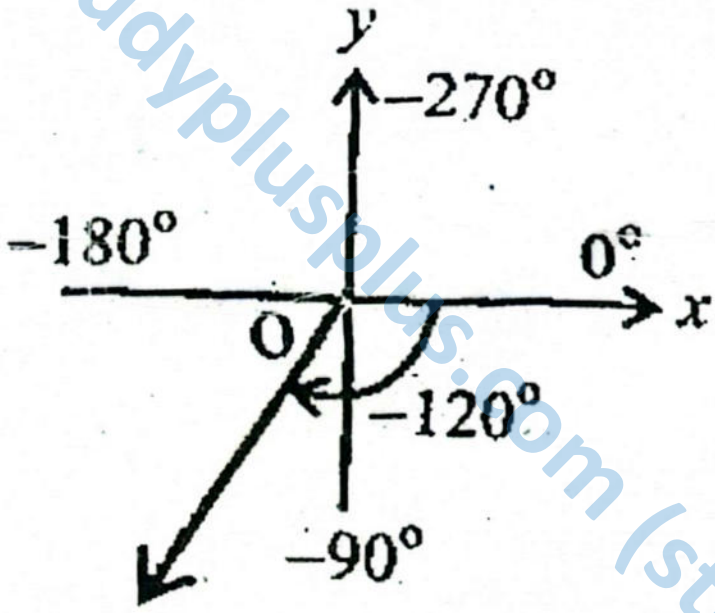
(*iv*) 225°



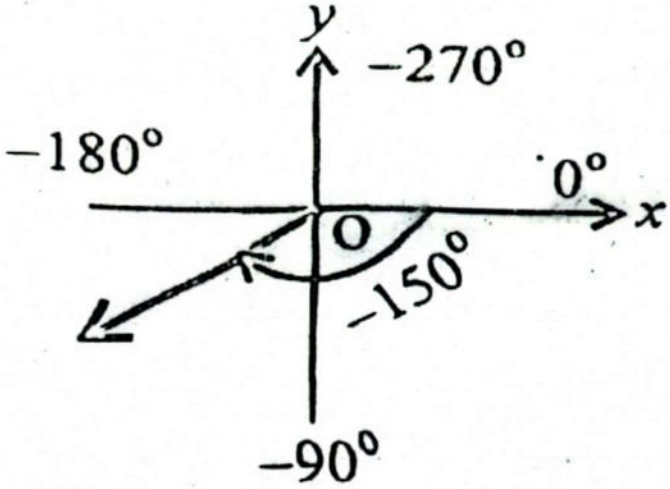
(v) $-60°$



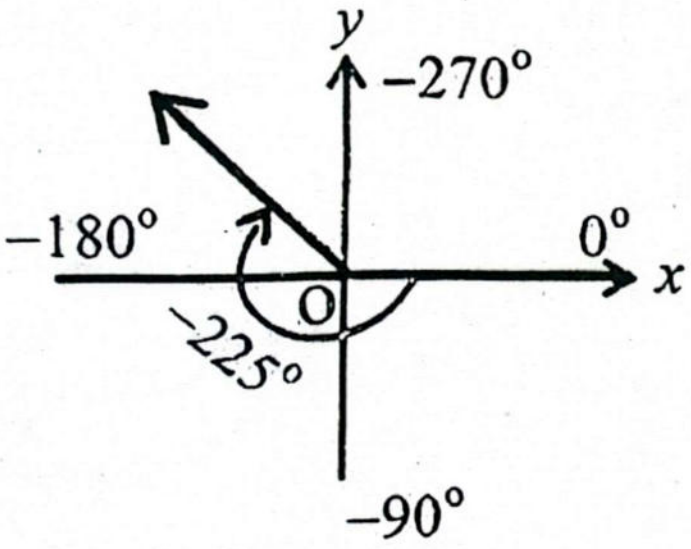
(vi) $-120°$



(vii) $-150°$



$(viii)$ $-225°$



Q.2 Express the following sexagesimal measures of angles in decimal form.

(i) $45°30'$ (ii) $60°30'30''$

(iii) $125°22'50''$

Solution:

(i) $45°30'$

Since 60 seconds (60″)make one minute (1′)

$$= 45° + \left(\frac{30}{60}\right)°$$

$$= 45° + .5°$$

$$= 45.5°$$

(ii) $60°30'30''$

Since 60 seconds (60″)make one minute (1′)

$$= 60° + \left(\frac{30}{60}\right)° + \left(\frac{30}{60\times60}\right)°$$

$$= 60 + \left(\frac{1}{2}\right)° + \left(\frac{1}{120}\right)°$$

$$= 60° + .5° + .0083°$$

$$= 60.5083°$$

(iii) $125°22'50''$

since 60 seconds (60″)make one minute (1′)

$$= 125° + \left(\frac{22}{60}\right)° + \left(\frac{50}{60\times60}\right)°$$

$$= 125° + 0.37 + 0.0139°$$

$$= 125.3805°$$

Q.3 Express the following into $D^\circ M' S''$ form.

(i) 47.36° (ii) 125.45°

(iii) 225.75° (iv) -22.5°

(v) -67.58° (vi) 315.18°

Solution:

(i) 47.36°

$= 47^\circ + (0.36)^\circ$

$= 47^\circ + \left(\frac{36}{100} \times 60\right)'$

$= 47^\circ + (21.6)'$

$= 47^\circ + 21' + 0.6'$

$= 47^\circ + 21' + \left(\frac{6}{10} \times 60\right)''$

$= 47^\circ + 21' + 36''$

$= 47^\circ 21' 36''$

(ii) 125.45°

$= 125^\circ + (0.45)^\circ$

$= 125^\circ + \left(\frac{45}{100}\right)^\circ$

$= 125^\circ + \left(\frac{45}{100} \times 60\right)'$

$= 125^\circ + 27' = 125^\circ 27'$

(iii) 225.75°

$= 225^\circ + (0.75)^\circ$

$= 225^\circ + \left(\frac{75}{100}\right)^\circ$

$= 225^\circ + \left(\frac{75}{100} \times 60\right)'$

$= 225^\circ + 45' = 225^\circ 45'$

(iv) -22.5°

$= -22^\circ - 0.5^\circ$

$= -22^\circ - \left(\frac{5}{10} \times 60\right)'$

$= -22^\circ - 30' = -22^\circ 30'$

(v) -67.58°

$= -67^\circ - (0.58)^\circ$

$= -67^\circ - \left(\frac{58}{100} \times 60\right)'$

$= -67^\circ - 34.8'$

$= -67^\circ - 34' - (0.8 \times 60)''$

$= -67^\circ - 34' - (48)''$

$= -67^\circ 34' 48''$

(vi) $\mathbf{315.18^\circ}$

$= 315^\circ + 0.18^\circ$

$= 315^\circ + \left(\frac{18}{100} \times 60\right)'$

$= 315^\circ + 10.8'$

$= 315^\circ + 10' + \left(\frac{8}{10} \times 60\right)''$

$= 315^\circ + 10' + 48''$

$= 315^\circ 10' 48''$

Q.4 Express the following angles into radians.

(i) 30° (ii) $(60)^\circ$ (iii) 135°

(iv) 225° (v) -150° (vi) -225°

(vii) 300° $(viii)$ 315°

Solution:

(i) $\mathbf{30^\circ}$

since $180^\circ = \pi$ radian

$= 30\left(\frac{\pi}{180}\right)$

$= \frac{\pi}{6} radians$

(ii) $\mathbf{60^\circ}$

since $180^\circ = \pi$ radian

$= 60\left(\frac{\pi}{180}\right)$

$= \frac{\pi}{3} radians$

(iii) $\mathbf{135^\circ}$

since $180^\circ = \pi$ radian

$135^\circ = 135 \times \frac{\pi}{180}$

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

(iv) $\mathbf{225^\circ}$

since $180^\circ = \pi$ radian

$$= 225 \times \frac{\pi}{180}$$

$$= -\frac{5\pi}{4}\ radians$$

(v) -150°

since $180^\circ = \pi$ radian

$$= -150 \times \frac{\pi}{180}$$

$$= -\frac{5\pi}{6}\ radians$$

(vi) -225°

since $180^\circ = \pi$ radian

$$= -225 \times \frac{\pi}{180}$$

$$= -225 \times \frac{\pi}{180}$$

$$= -\frac{5\pi}{4}\ radians$$

(vii) 300°

since $180^\circ = \pi$ radian

$$= 300 \times \frac{\pi}{180}$$

$$= \frac{5\pi}{3}\ radians$$

$(viii)$ 315°

since $180^\circ = \pi$ radian

$$= 315 \times \frac{\pi}{180}$$

$$= \frac{7\pi}{4}\ radians$$

Q.5 Convert each of the following radians to degrees

(i) $\frac{3\pi}{4}$ (ii) $\frac{5\pi}{6}$ (iii) $\frac{7\pi}{8}$

(iv) $\frac{13\pi}{16}$ (v) 3 (vi) 4.5

(vii) $\frac{-7\pi}{8}$ $(viii)$ $-\frac{13}{16}\pi$

Solution: since π *radians* $= 180^\circ$

(i) $\frac{3\pi}{4}$ ***radians*** *since* 1 *radian* $= \left(\frac{180}{\pi}\right)^\circ$

$= \frac{3\pi}{4}\left(\frac{180}{\pi}\right)$

$= \frac{3\times180}{4}$

$= 135^\circ$

(ii) $\frac{5\pi}{6}$ *since* 1 *radian* $= \left(\frac{180}{\pi}\right)^\circ$

$= \frac{5\pi}{6} \times \frac{180}{\pi}$

$= \frac{5\times180}{6}$

$= 150^\circ$

(iii) $\frac{7\pi}{8}$ *since* 1 *radian* $= \left(\frac{180}{\pi}\right)^\circ$

$= \frac{7\pi}{8} \times \frac{180}{\pi}$

$= \frac{7\times180}{8}$

$= 157.75^\circ$

(iv) $\frac{13\pi}{16}$ *since* 1 *radian* $= \left(\frac{180}{\pi}\right)^\circ$

$= \frac{13\pi}{16} \times \frac{180}{\pi}$

$= \frac{13}{16} \times 180$

$= 146.25^\circ$

(v) $\mathbf{3}$ ***radians*** *since* 1 *radian* $= \left(\frac{180}{\pi}\right)^\circ$

$= 3 \times \frac{180}{\pi}$

$= 3 \times \frac{180}{22} \times 7$

$= \frac{1890}{11}$

$= 171.8869^\circ$

(vi) $4.5\ radians$ since $1\ radian = \left(\frac{180}{\pi}\right)^{\circ}$

$= 4.5 \times \frac{180}{\pi}$

$= \frac{45}{10} \times \frac{180}{22} \times 7$

$= \frac{9 \times 45 \times 7}{11}$

$= \frac{2835}{11}$

$= 257.83^{\circ}$

(vii) $\frac{-7\pi}{8}$ since $1\ radian = \left(\frac{180}{\pi}\right)^{\circ}$

$= \frac{-7\pi}{8} \times \frac{180}{\pi}$

$= -\frac{315}{2} = -157.5^{\circ}$

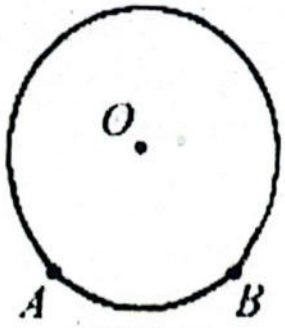
(viii) $-\frac{13}{16}\pi$ since $1\ radian = \left(\frac{180}{\pi}\right)^{\circ}$

$= -\frac{13}{16}\pi \times \frac{180}{\pi}$

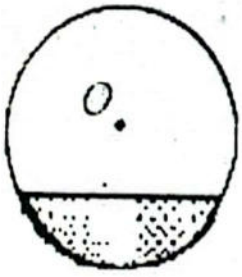
$= -\frac{13 \times 180}{16} = -\frac{585}{4}$

$= -146.25^{\circ}$

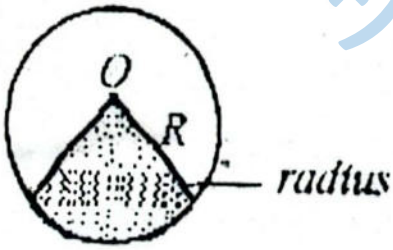
Important Figures of the Chapter



an arc



a segment



a sector