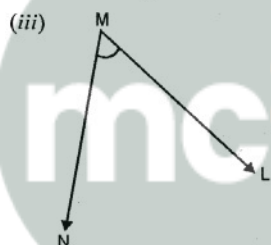
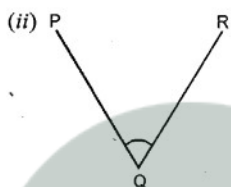
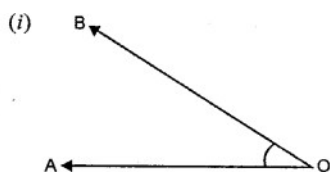


# Angles

## EXERCISE 24 (A)

### Question 1.

For each angle given below, write the name of the vertex, the names of the arms and the name of the angle.



**Solution:**

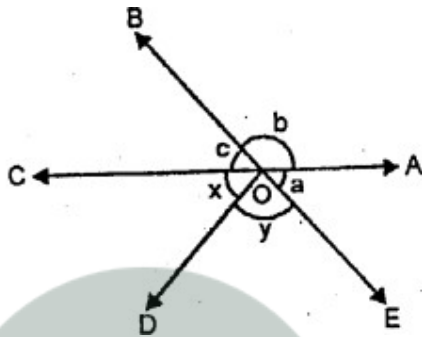
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(i) In figure (i) O is the vertex, OA, OB are its arms and name of the angle is  $\angle AOB$  or  $\angle BOA$  or simply  $\angle O$ .

(ii) In figure (ii) Q is the vertex, QP and QR its arms and the name of the angle is  $\angle PQR$  or  $\angle RQP$  or simply  $\angle Q$ .

(iii) In figure (iii), M is the vertex, MN and ML and its anus, and name of the angle is  $\angle LMN$  or  $\angle NML$  or simply  $\angle M$ .

**P .Q . Name the angles marked by letters a, b, c, x and y.**



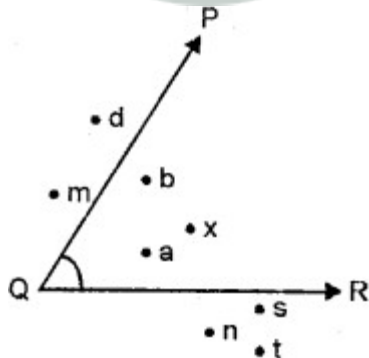
**Solution:**

$a = \angle AOE$ ,  $b = \angle AOB$ ,  $c = \angle BOC$   $d = \angle COD$   $e = \angle DOE$

**Question 2.**

Name the points :

- (i) in the interior of the angle PQR,
- (ii) in the exterior of the angle PQR.

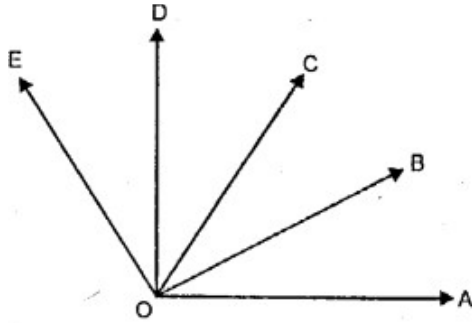


**Solution:**

- (i) a, b and x
- (ii) d, m, n, s, and t.

**Question 3.**

In the given figure, figure out the number of angles formed within the arms OA and OE.



**Solution:**

$\angle AOE$ ,  $\angle AOD$ ,  $\angle AOC$ ,  $\angle AOB$ ,  $\angle BOC$ ,  $\angle BOD$ ,  $\angle BOE$ ,  $\angle COD$ ,  $\angle COE$  and  $\angle DOE$ .

**Question 4.**

Add :

(i)  $29^\circ 16' 23''$  and  $8^\circ 27' 12''$

(ii)  $9^\circ 45' 56''$  and  $73^\circ 8' 15''$

(m)  $56^\circ 38'$  and  $27^\circ 42' 30''$

(iv)  $47^\circ$  and  $61^\circ 17' 4''$

**Solution:**

(i)  $29^\circ 16' 23''$  and  $8^\circ 27' 12''$

$$29^\circ 16' 23'' + 8^\circ 27' 12''$$

$$= 37^\circ 43' 35''$$

$$\begin{array}{r} 29^\circ 16' 23'' \\ + 8^\circ 27' 12'' \\ \hline \end{array}$$

$$37^\circ 43' 35''$$

$$\hline$$

(ii)  $9^\circ 45' 56''$  and  $73^\circ 8' 15''$

$$9^\circ 45' 56''$$

$$+ 73^\circ 8' 15''$$

$$\hline 82^\circ 53' 71''$$

Since,  $60'' = 1'$   $\therefore 71'' = 1' 11''$

and  $\therefore 82^\circ 53' 71'' = 82^\circ 54' 11''$

(iii)  $56^\circ 38'$  and  $27^\circ 42' 30''$

$$56^\circ 38' + 27^\circ 42' 30''$$

$$= 84^\circ 20' 30''$$

( $1^\circ = 60'$ )

$$\begin{array}{r} 56^\circ 38' 0'' \\ + 27^\circ 42' 30'' \\ \hline \end{array}$$

$$84^\circ 80' 30''$$

$$\hline 84^\circ 80' 30''$$

$$\hline 20'$$

(iv)  $47^\circ$  and  $61^\circ 17' 4''$

$$47^\circ 0' 0''$$

$$+ 61^\circ 17' 4''$$

$$\hline 108^\circ 17' 4''$$

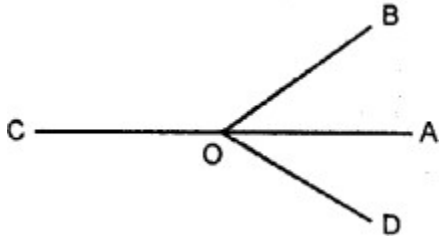
$$\hline$$

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**Question 5.**

In the figure, given below name :

- (i) three pairs of adjacent angles.
- (ii) two acute angles,
- (iii) two obtuse angles
- (iv) two reflex angles.



**Solution:**

(i) Three pairs of adjacent angles are

$\angle AOB$  and  $\angle BOC$ ;  
 $\angle BOC$  and  $\angle COD$ ;  
 $\angle COD$  and  $\angle DOA$ .

(ii) Two acute angles are  
 $\angle AOB$  and  $\angle AOD$ .

(iii) Two obtuse angles are  
 $\angle BOC$  and  $\angle COD$ .

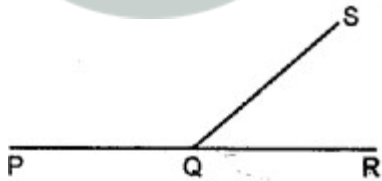
(iv) Two reflex angles are  
 $\angle AOB$  and  $\angle COD$ .

**Question 6.**

In the given figure ; PQR is a straight line. If :

(i)  $\angle SQR = 75^\circ$  ; find  $\angle PQS$ .

(ii)  $\angle PQS = 110^\circ$ ; find  $\angle RQS$



**Solution:**

(i) From figure,

$\angle PQS + \angle SQR = 180^\circ$  [Linear pair of angles]

$\Rightarrow \angle PQS + 75^\circ = 180^\circ$

$\Rightarrow \angle PQS = 180^\circ - 75^\circ$

$\Rightarrow \angle PQS = 105^\circ$

(ii) From figure again,

$\angle PQS + \angle RQS = 180^\circ$

$\Rightarrow 110^\circ + \angle RQS = 180^\circ$

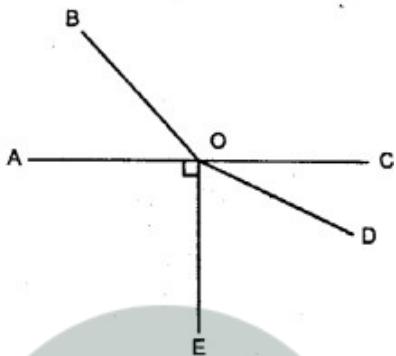
$\angle RQS = 180^\circ - 110^\circ$

$\angle RQS = 70^\circ$

**Question 7.**

In the given figure ; AOC-is a straight line. If angle AOB =  $50^\circ$ , angle AOE =  $90^\circ$  and angle COD =  $25^\circ$  ; find the measure of :

- (i) angle BOC
- (ii) angle EOD
- (iii) obtuse angle BOD
- (iv) reflex angle BOD
- (v) reflex angle COE.



**Solution:**

(i)  $\angle AOB + \angle BOC = 180^\circ$  (Linear pairs of angle)

$\Rightarrow 50^\circ + \angle BOC = 180^\circ$

$\Rightarrow \angle BOC = 180^\circ - 50^\circ = 130^\circ$

$\Rightarrow \angle BOC = 130^\circ$

(ii)  $\angle EOD + \angle COD = 90^\circ$  ( $\because \angle AOE = 90^\circ$ )

$\Rightarrow \angle EOD + 25^\circ = 90^\circ$

$\Rightarrow \angle EOD + 25^\circ = 90^\circ$

$\Rightarrow \angle EOD = 90^\circ - 25^\circ$

$\Rightarrow \angle EOD = 65^\circ$

(iii)  $\angle BOD = \angle BOC + \angle COD$

$= 130^\circ + 25^\circ = 155^\circ$

(iv) Reflex  $\angle BOD = 360^\circ - \angle BOD$

$= 360^\circ - 155^\circ = 205^\circ$

(v) Reflex  $\angle COE = 360^\circ - \angle COE$

$= 360^\circ (\angle COD + \angle EOD)$

$= 360^\circ - (25^\circ + 65^\circ)$

$= 360^\circ - 90^\circ = 270^\circ$

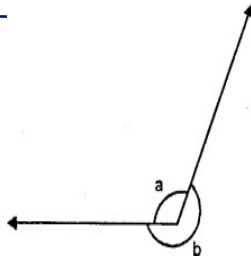
**Question 8.**

In the given figure if :

(i)  $a = 130^\circ$  ; find b.

(ii)  $b = 200$  ; find a.

(iii)  $a = \frac{5}{3}$  right angle, find b



**Solution:**

(i) From figure,  $a + b = 360^\circ$

$$\Rightarrow 130^\circ + b = 360^\circ$$

$$\Rightarrow b = 360^\circ - 130^\circ$$

$$\Rightarrow b = 230^\circ$$

(ii) From figure,

$$a + b = 360^\circ$$

$$\Rightarrow a + 200^\circ = 360^\circ$$

$$\Rightarrow a = 360^\circ - 200^\circ$$

$$\Rightarrow a = 160^\circ$$

(iii) Here,  $a = \frac{5}{3}$  right angle

$$= \frac{5}{3} \times 90^\circ = 150^\circ$$

$$a = 150^\circ$$

$$\text{Here, } a + b = 360^\circ$$

$$\Rightarrow 150^\circ + b = 360^\circ (\because a = 150^\circ)$$

$$\Rightarrow b = 360^\circ - 150^\circ$$

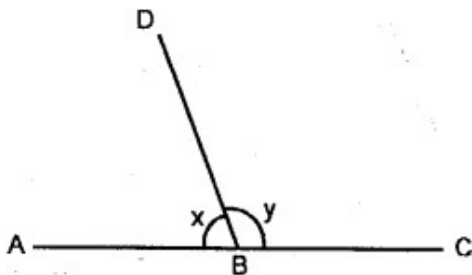
$$b = 210^\circ$$

**Question 9.**

In the given diagram, ABC is a straight line.

(i) If  $x = 53^\circ$ , find  $y$ .

(ii) If  $y = 1\frac{1}{2}$  right angles ; find  $x$ .



**Solution:**

(i) From the figure,

$$\angle ABD + \angle DBC = 180^\circ \text{ (Linear pair of angles)}$$

$$\Rightarrow x + y = 180^\circ$$

$$\Rightarrow 53^\circ + y = 180^\circ (\because x = 53^\circ)$$

$$\Rightarrow y = 180^\circ - 53^\circ$$

$$\Rightarrow y = 127^\circ$$

(ii) From figure again,

$$x + y = 180^\circ$$

$$1 + \frac{3}{2} \times 90 = 180^\circ$$

$$\Rightarrow x + 1\frac{1}{2} \text{ right angles} = 180^\circ$$

$$\Rightarrow x + \frac{3}{2} \times 90 = 180^\circ$$

$$\Rightarrow x + 135^\circ = 180^\circ$$

$$\Rightarrow x = 180^\circ - 135^\circ$$

$$\Rightarrow x = 45^\circ$$

### Question 10.

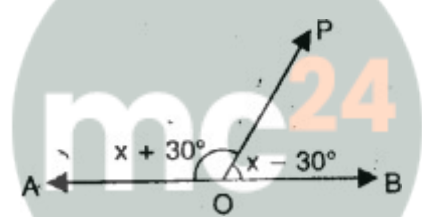
In the given figure, AOB is a straight line. Find the value of  $x$  and also answer each of the following :

(i)  $\angle AOP = \dots\dots\dots$

(ii)  $\angle BOP = \dots\dots\dots$

(iii) which angle is obtuse ?

(iv) which angle is acute ?



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### Solution:

$$\angle AOP = x + 30^\circ$$

$$\angle BOP = x - 30^\circ$$

But  $\angle AOP + \angle BOP = 180^\circ$  ( $\because \angle AOB$  is a straight angle)

$$\Rightarrow x + 30^\circ + x - 30^\circ = 180^\circ$$

$$\Rightarrow 2x = 180^\circ$$

$$\Rightarrow x = 90^\circ$$

(i)  $\angle AOP = x + 30^\circ = 90^\circ + 30^\circ = 120^\circ$

(ii)  $\angle BOP = x - 30^\circ = 90^\circ - 30^\circ = 60^\circ$

(iii)  $\angle AOP$  is an obtuse angle

(iv)  $\angle BOP$  is an acute angle

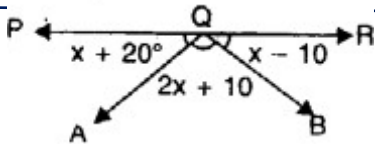
### Question 11.

In the given figure, PQR is a straight line. Find  $x$ . Then complete the following:

(i)  $\angle AQB = \dots\dots\dots$

(ii)  $\angle BQP = \dots\dots\dots$

(iii)  $\angle AQR = \dots\dots\dots$



**Solution:**

PQR is a straight line

$$\angle AQP = x + 20^\circ$$

$$\angle AQB = 2x + 10^\circ$$

$$\angle BQR = x - 10^\circ$$

$$\text{But } \angle AQP + \angle AQB + \angle BQR = 180^\circ$$

$$\Rightarrow x + 20^\circ + 2x + 10^\circ + x - 10^\circ = 180^\circ$$

$$\Rightarrow 4x + 20^\circ = 180^\circ$$

$$\Rightarrow 4x = 180^\circ - 20^\circ = 160^\circ$$

$$\Rightarrow x = \frac{160}{4} = 40^\circ$$

$$\text{(i) } \angle AQB = 2x + 10^\circ = 2 \times 40^\circ + 10^\circ = 80^\circ + 10^\circ = 90^\circ$$

$$\angle AQP = x + 20^\circ = 40^\circ + 20^\circ = 60^\circ$$

$$\angle BQR = x - 10^\circ = 40^\circ - 10^\circ = 30^\circ$$

$$\text{(ii) } \angle BQP = \angle AQP + \angle AQB = 60^\circ + 90^\circ = 150^\circ$$

$$\text{(iii) } \angle AQR = \angle AQB + \angle BQR = 90^\circ + 30^\circ = 120^\circ$$

**Question 12.**

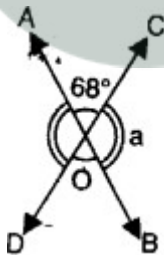
In the given figure, lines AB and CD intersect at point O.

(i) Find the value of  $\angle a$ .

(ii) Name all the pairs of vertically opposite angles.

(iii) Name all the pairs of adjacent angles.

(iv) Name all the reflex angles formed and write the measure of each.



**Solution:**

Two lines AB and CD intersect each other at O

$$\angle AOC = 68^\circ$$

(i)  $\because$  AOB is a line

$$\angle AOC + \angle BOC = 180^\circ$$

$$\Rightarrow 68^\circ + a = 180^\circ$$

$$\Rightarrow a = 180^\circ - 68^\circ = 112^\circ$$

(ii)  $\angle AOC$  and  $\angle BOD$  and  $\angle BOC$  and  $\angle AOD$  are the two pairs of vertically opposite angles.

(iii)  $\angle AOC$  and  $\angle BOC$ ;  $\angle BOC$  and  $\angle BOD$ ;  $\angle BOD$  and  $\angle DOA$ ;

$\angle DOA$  and  $\angle AOC$  are the pairs of adjacent angles

(iv)  $\angle BOC$  and  $\angle DOA$  are reflex angles and also  $\angle AOC$  and  $\angle BOD$  are also reflex angles

$$\text{Ref. } \angle BOC = 180^\circ + 68^\circ = 248^\circ$$

$$\text{Ref. } \angle DOA = 180^\circ + 68^\circ = 248^\circ$$

$$\text{Ref. } \angle AOC = 180^\circ + 112^\circ = 292^\circ$$

$$\text{and ref. } \angle BOD = 180^\circ + 112^\circ = 292^\circ$$

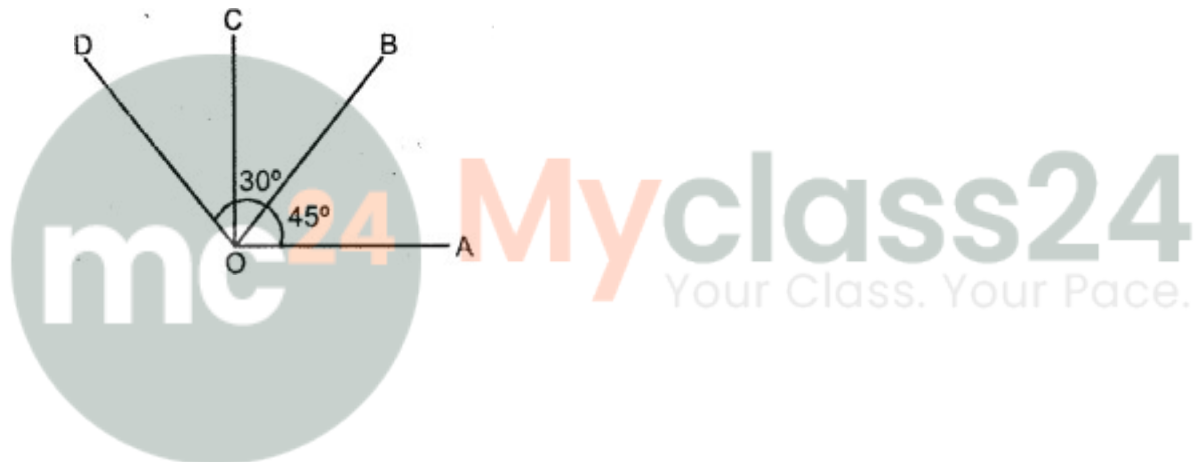
**Question 13.**

In the given figure :

(i) If  $\angle AOB = 45^\circ$ ,  $\angle BOC = 30^\circ$  and  $\angle AOD = 110^\circ$ ;  
find : angles  $\angle COD$  and  $\angle BOD$ .

(ii) If  $\angle BOC = \angle DOC = 34^\circ$  and  $\angle AOD = 120^\circ$  ;  
find : angle  $\angle AOB$  and angle  $\angle AOC$ .

(iii) If  $\angle AOB = \angle BOC = \angle COD = 38^\circ$   
find : reflex angle  $\angle AOC$  and reflex angle  $\angle AOD$ .



**Solution:**

$$\begin{aligned} \text{(i) } \angle COD &= \angle AOD - \angle AOC \\ &= \angle AOD - (\angle AOB + \angle BOC) \\ &= 110^\circ - (45^\circ + 30^\circ) \\ &= 110^\circ - 75^\circ = 35^\circ \end{aligned}$$

$$\begin{aligned} \angle BOD &= \angle AOD - \angle AOB \\ &= 110^\circ - 45^\circ \\ &= 65^\circ \end{aligned}$$

$$\begin{aligned} \text{(ii) } \angle AOB &= \angle AOD - \angle BOD \\ &= \angle AOD - (\angle BOC + \angle COD) \\ &= 120^\circ - (34^\circ + 34^\circ) \\ &= 120^\circ - 68^\circ \\ &= 52^\circ \end{aligned}$$

$$\begin{aligned} \angle AOC &= \angle AOB + \angle BOC \\ &= 52^\circ + 34^\circ \\ &= 86^\circ \end{aligned}$$

$$\begin{aligned} \text{(iii) Reflex } \angle AOC &= 360^\circ - \angle AOC \\ &= 360^\circ - (\angle AOB + \angle BOC) \\ &= 360^\circ - (38^\circ + 38^\circ) \\ &= 360^\circ - 76^\circ = 284^\circ \end{aligned}$$

$$\begin{aligned} \text{Reflex } \angle AOD &= 360^\circ - \angle AOD \\ &= 360^\circ - (\angle AOB + \angle BOC + \angle COD) \\ &= 360^\circ - (38^\circ + 38^\circ + 38^\circ) \\ &= 360^\circ - 114^\circ \\ &= 246^\circ \end{aligned}$$

