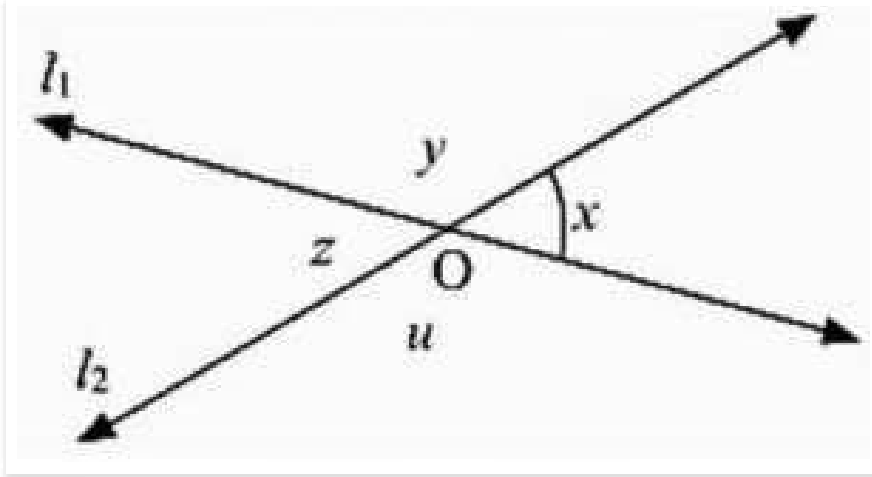


Q 1: In the below fig, lines l_1 and l_2 intersect at O, forming angles as shown in the figure. If $x = 45$. Find the values of x , y , z and u .



Ans : Given that

$X = 45^\circ$, $y = ?$, $Z = ?$, $u = ?$

Vertically opposite angles are equal

Therefore $z = x = 45$

z and u are angles that are a linear pair

Therefore, $z + u = 180$

$z = 180 - u$

$$u = 180 - x$$

$$u = 180 - 45$$

$$u = 135$$

x and y angles are a linear pair

$$x + y = 180$$

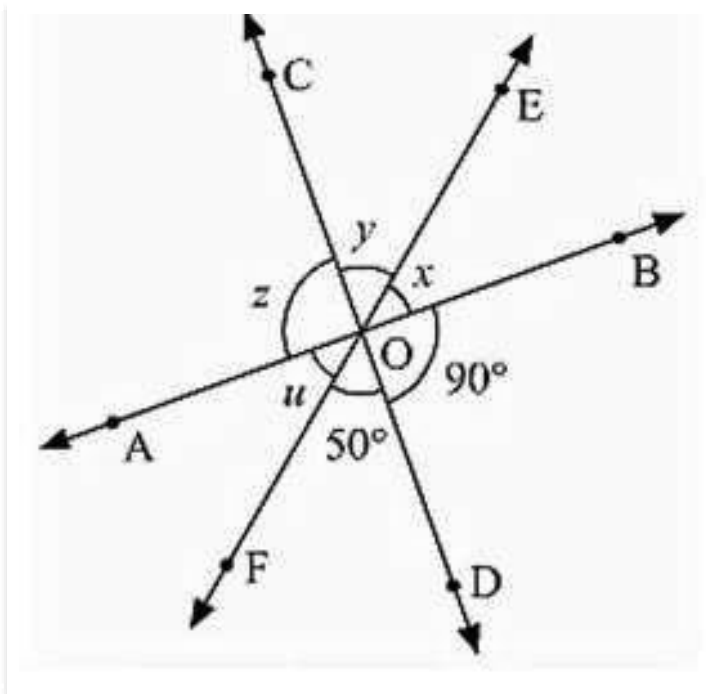
$$y = 180 - x$$

$$y = 180 - 45$$

$$y = 135$$

Hence, $x = 45$, $y = 135$, $z = 45$ and $u = 135$

Q 2 : In the below fig. three coplanar lines intersect at a point O, forming angles as shown in the figure. Find the values of x , y , z and u .



Ans : Vertically opposite angles are equal

$$\text{So } \angle \text{SOD} = z = 90^\circ$$

$$\angle \text{DOF} = y = 50^\circ$$

Now, $x + y + z = 180$ [Linear pair]

$$x + y + z = 180$$

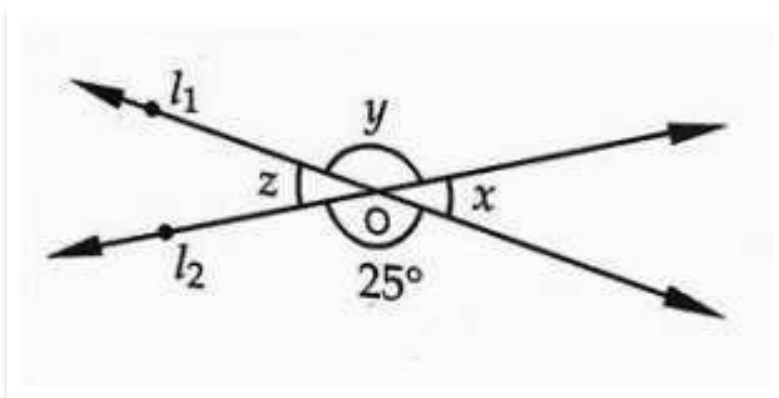
$$90 + 50 + x = 180$$

$$x = 180 - 140$$

$$x = 40$$

Hence values of x , y , z and u are 40, 50, 90 and 40 respectively in degrees.

Q 3 : In the given fig, find the values of x , y and z .



Ans : From the given figure

$$y = 25 \quad [\text{Vertically opposite angles are equal}]$$

$$\text{Now } \angle x + \angle y = 180^\circ$$

[Linear pair of angles]

$$x = 180 - 25$$

$$x = 155$$

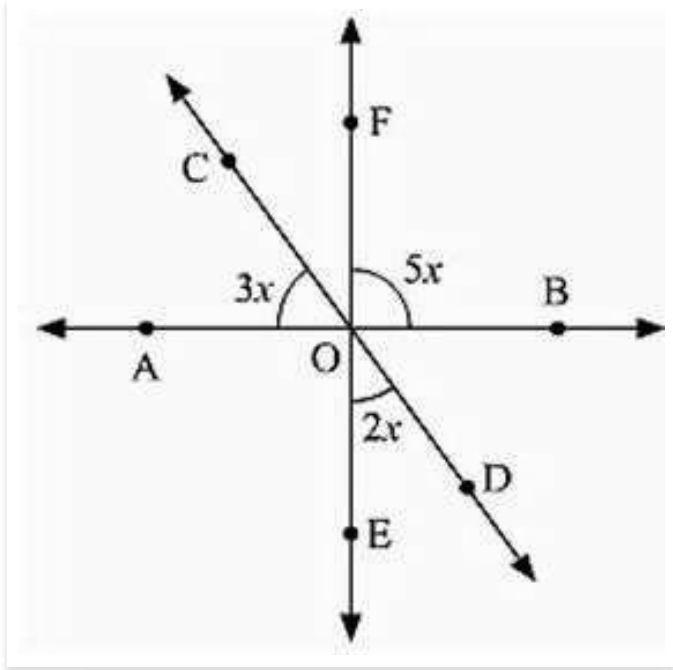
Also,

$$z = x = 155 \quad [\text{Vertically opposite angles}]$$

$$y = 25$$

$$z = 155$$

Q 4 : In the below fig. find the value of x ?



Ans : Vertically opposite angles are equal

$$AOE = BOF = 5x$$

Linear pair

$$\angle COA + \angle AOE + \angle EOD = 180^\circ$$

$$3x + 5x + 2x = 180$$

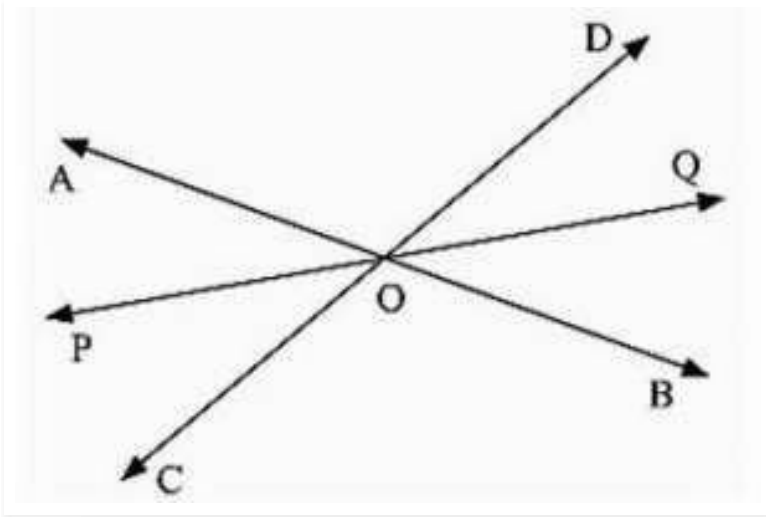
$$10x = 180$$

$$x = 180/10$$

$$x = 18$$

Hence, the value of $x = 18^\circ$

Q 5 : Prove that bisectors of a pair of vertically opposite angles are in the same straight line.



Ans : Given,

Lines AOB and COD intersect at point O, such that

$$\angle AOC = \angle BOD$$

Also OE is the bisector of AOC and OF is the bisector of BOD

To prove: EOF is a straight line, vertically opposite angles are equal

$$\angle AOC = \angle BOD = 5x \quad \text{---(1)}$$

Also ,

$$\angle AOC + \angle BOD$$

$$2 \angle AOC = 2 \angle BOD \quad \text{---(2)}$$

We know,

Sum of the angles around a point is 360

$$2 \angle AOC + 2 \angle EOF + 2 \angle BOD = 360$$

$$\angle AOC + \angle EOF + \angle BOD = 180$$

From this we can conclude that EOF is a straight line.

Given that: – AB and CD intersect each other at O

OE bisects COB

To prove: AOE = BOE

Proof: OE bisects COB

$$\angle COE = \angle EOB = x$$

Vertically opposite angles are equal

$$\angle BOE = \angle AOE = x \quad \text{--- (1)}$$

$$\angle COE = \angle DOF = x \quad \text{--- (2)}$$

From (1) and (2),

$$\angle AOE = \angle DOF = x$$

Hence Proved.

Q 6 : If two straight lines intersect each other, prove that the ray opposite to the bisector of one of the angles thus formed bisects the vertically opposite angle.

Ans : Let AB and CD intersect at a point O

Also, let us draw the bisector OP of AOC

Therefore,

$$AOP = POC \quad \text{---(i)}$$

Also, let's extend OP to Q.

We need to show that, OQ bisects BOD

Let us assume that OQ bisects BOD, now we shall prove that POQ is a line.

We know that,

AOC and DOB are vertically opposite angles. Therefore, these must be equal,

$$\text{that is : } AOC = DOB \quad \text{---(ii)}$$

AOP and BOQ are vertically opposite angles.

Therefore, $AOP = BOQ$

Similarly, $POC = DOQ$

We know that : $AOP + AOD + DOQ + POC + BOC + BOQ = 360^\circ$

$$2 AOP + AOD + 2 DOQ + BOC = 360^\circ$$

$$2 AOP + 2 AOD + 2 DOQ = 360^\circ$$

$$2(AOP + AOD + DOQ) = 360^\circ$$

$$AOP + AOD + DOQ = 360 / 2$$

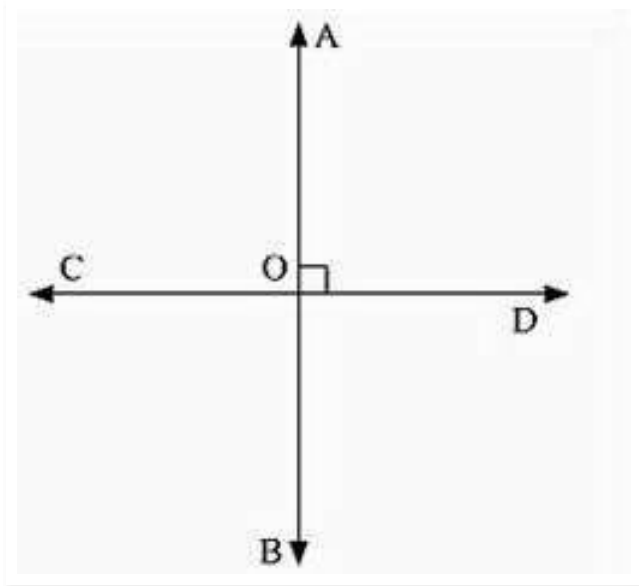
$$AOP + AOD + DOQ = 180^\circ$$

Thus, POQ is a straight line.

Hence our assumption is correct. That is,

We can say that if the two straight lines intersect each other, then the ray opposite to the bisector of one of the angles thus formed bisects the vertically opposite angles.

Q 7 : If one of the four angles formed by two intersecting lines is a right angle. Then show that each of the four angles is a right angle.



Ans : Given,

AB and CD are two lines intersecting at O, such that

$\angle BOC = 90^\circ$, $\angle AOC = 90^\circ$, $\angle AOD = 90^\circ$ and $\angle BOD = 90^\circ$

{figure}

Proof :

Given that $\angle BOC = 90^\circ$

Vertically opposite angles are equal

$\angle BOC = \angle AOD = 90^\circ$

$\angle AOC$, $\angle BOC$ are a Linear pair of angles

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

[Linear pair]

$$\angle AOC + 90 = 180$$

$$\angle AOC = 90$$

Vertically opposite angles

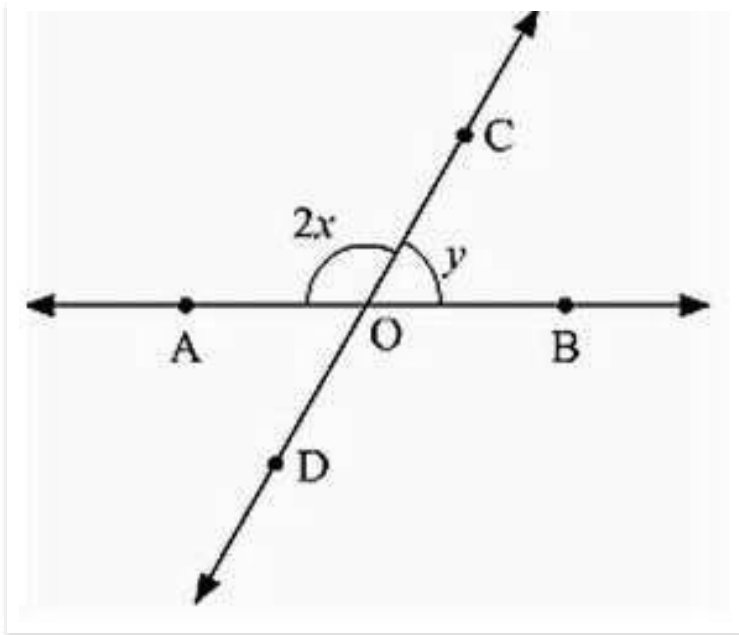
Therefore, $\angle AOC = \angle BOD = 90^\circ$

Hence, $\angle AOC = \angle BOC = \angle BOD = \angle AOD = 90^\circ$

Q 8 : In the below fig. rays AB and CD intersect at O.

(I) Determine y when $x = 60$

(ii) Determine x when $y = 40$



Ans : (i) Given $x = 60$

AOC, BOC are linear pair of angles

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

$$\Rightarrow 2x + y = 180$$

$$\Rightarrow 2(60) + y = 180 \text{ [since } x = 60 \text{]}$$

$$\Rightarrow y = 60$$

(ii) Given $y = 40$

AOC and BOC are linear pair of angles

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

$$\Rightarrow 2x + y = 180$$

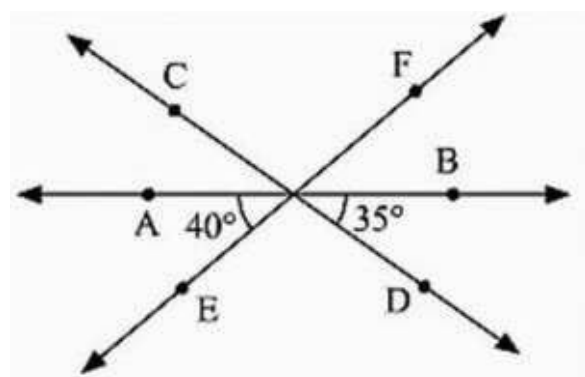
$$\Rightarrow 2x + 40 = 180$$

$$\Rightarrow 2x = 180 - 40$$

$$\Rightarrow 2x = 140$$

$$\Rightarrow x = 70$$

Q 9 : In the below fig. lines AB, CD and EF intersect at O. Find the measures of $\angle AOC$, $\angle COF$, $\angle DOE$ and $\angle BOF$.



Ans : AOE and EOB are linear pair of angles

$$\angle AOE + \angle EOB = 180^\circ$$

$$\angle AOE + \angle DOE + \angle BOD = 180^\circ$$

$$\Rightarrow \angle DOE = 180 - 40 - 35 = 105$$

Vertically opposite side angles are equal

$$\angle DOE = \angle COF = 105$$

$$\text{Now, } \angle AOE + \angle AOF = 180^\circ$$

[Linear pair]

$$\angle AOE + \angle AOC + \angle COF = 180$$

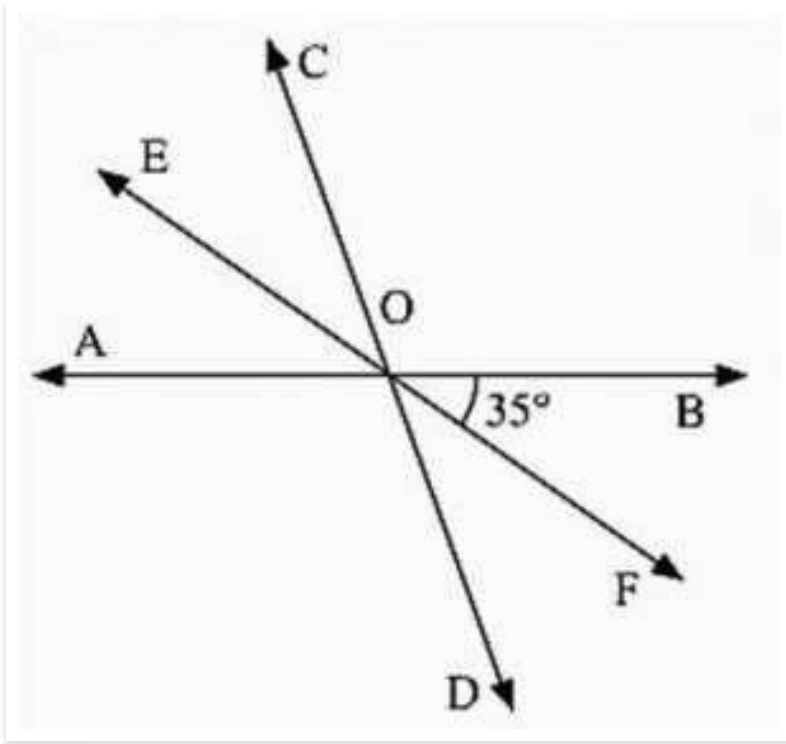
$$\Rightarrow 40 + \angle AOC + 105 = 180$$

$$\Rightarrow \angle AOC = 180 - 145$$

$$\Rightarrow \angle AOC = 35$$

Also, $\angle BOF = \angle AOE = 40$ (Vertically opposite angles are equal)

Q 10 : AB, CD and EF are three concurrent lines passing through the point O such that OF bisects BOD. If $\angle BOF = 35$. Find $\angle BOC$ and $\angle AOD$.



Ans : Given

OF bisects BOD

$$\angle BOF = 35$$

Angles BOC and AOD are unknown

$$\angle BOD = 2 \angle BOF = 70 \quad [\text{since BOD is bisected}]$$

$$\angle BOD = \angle AOC = 70 \quad [\angle BOD \text{ and } \angle AOC \text{ are vertically opposite angles}]$$

Now,

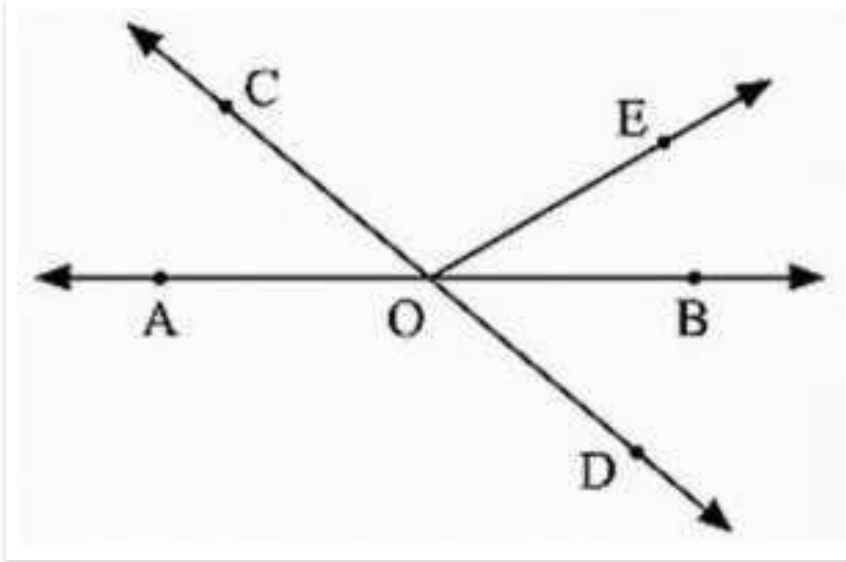
$$\text{BOC} + \text{AOC} = 180$$

$$\text{BOC} + 70 = 180$$

$$\text{BOC} = 110$$

$$\text{AOD} = \text{BOC} = 110 \quad (\text{Vertically opposite angles})$$

Q 11 : In below figure, lines AB and CD intersect at O. If $\angle \text{AOC} + \angle \text{BOE} = 70^\circ$ and $\angle \text{BOD} = 40^\circ$, find $\angle \text{BOE}$ and reflex $\angle \text{COE}$?



Ans : Given that

$$\text{AOC} + \text{BOE} = 70 \text{ and } \text{BOD} = 40$$

To find BOE

Here, BOD and AOC are vertically opposite angles

$$\text{BOD} = \text{AOC} = 40$$

$$\text{Given, } \angle \text{AOC} + \angle \text{BOE} = 70^\circ,$$

$$\Rightarrow 40 + \text{BOE} = 70$$

$$\Rightarrow \text{BOE} = 70 - 40$$

$$\Rightarrow \text{BOE} = 30$$

AOC and BOC are linear pair of angles

$$\Rightarrow \text{AOC} + \text{COE} + \text{BOE} = 180$$

$$\Rightarrow \text{COE} = 180 - 30 - 40$$

$$\Rightarrow \text{COE} = 110$$

Hence, Reflex COE = $360 - 110 = 250$.

Q 12 : Which of the following statements are true (T) and which are false (F)?

(i) Angles forming a linear pair are supplementary.

(ii) If two adjacent angles are equal and then each angle measures 90°

(iii) Angles forming a linear pair can both acute angles.

(iv) If angles forming a linear pair are equal, then each of the angles have a measure of 90°

Ans : (i) True

(ii) False

(iii) False

(iv) true

Q 13 : Fill in the blanks so as to make the following statements true:

(i) If one angle of a linear pair is acute then its other angle will be _____

(ii) A ray stands on a line, then the sum of the two adjacent angles so formed is _____

(iii) If the sum of two adjacent angles is 180° , then the _____ arms of the two angles are opposite rays.

Ans :

(i) Obtuse angle

(ii) 180° degrees

(iii) Uncommon