RD SHARMA
Solutions
Class 9 Maths
Chapter 8
Ex 8.1

Q 1 : ***Write the complement of each of the following angles:***

$(i)20^\circ\ (ii)35^\circ\ (iii)90^\circ\ (iv)77^\circ\ (v)30^\circ$

Ans : ***(i)*** given angle is 20

Since, the sum of an angle and its compliment is 90

Hence, its compliment will be (90 – 20 = 70)

(ii) Given angle is 35

Since, the sum of an angle and its compliment is 90

Hence, its compliment will be (90 – 35 = 55)

(iii) Given angle is 90

Since, the sum of an angle and its compliment is 90

Hence, its compliment will be (90 – 90 = 0)

(iv) Given angle is 77

Since, the sum of an angle and its compliment is 90

Hence, its compliment will be (90 – 77 = 13)

(v) Given angle is 30

Since, the sum of an angle and its compliment is 90

Hence, its compliment will be (90 – 30 = 60)

Q 2 : Write the supplement of each of the following angles:

$(i)54^\circ\ (ii)132^\circ\ (iii)138^\circ$

Ans : ***(i)*** The given angle is 54,

Since the sum of an angle and its supplement is 180,

Hence, Its supplement will be (180 – 54 = 126)

(ii) The given angle is 132,

Since the sum of an angle and its supplement is 180,

Hence, its supplement will be 180 – 132 = 48

(iii) The given angle is 138,

Since the sum of an angle and its supplement is 180,

Hence, Its supplement will be 180 – 138 = 42

Q 3 : If an angle is 28° ***less than its complement, find its measure?***

Ans: Let the angle measured be ' x ' in degrees

Hence, Its complement will be $90 - x^\circ$

Angle = Complement – 28
x = (90 – x) – 28
2x = 62

x = 31

Therefore, angle measured is 31°

Q 4 : If an angle is 30° more than half of its complement, find the measure of the angle?

Ans : Let the measured angle be ' x '

Hence its complement will be (90-x)

It is given that,

Angle =30 + complement/2

x = 30 + (90 − x) / 2
$3\frac{x}{2} = 30 + 45$
3x = 150
x = 50

Therefore the angle is 50°

Q 5 : Two supplementary angles are in the ratio 4:5.Find the angles?

Ans : Supplementary angles are in the ratio 4:5

Let the angles be 4x and 5x

It is given that they are supplementary angles

Hence 4x + 5x = 180

9x = 180
x = 20

Hence, 4x = 4 (20) = 80

5(x) = 5 (20) = 100

Hence, angles are 80 and 100

Q 6 : Two supplementary angles differ by 48°.Find the angles ?

Ans : Given that two supplementary angles differ by 48°

Let the angle measured be x°

Therefore, Its supplementary angle will be $(180 - x)^\circ$

It is given that :

(180 − x) − x = 48
(180 − 48) = 2x
2 x = 132
x = 132/2
x = 66

Hence, 180 − x = 114°

Therefore, the angles are 66 and 114.

Q 7 : An angle is equal to 8 times its complement. Determine its measure?

Ans : It is given that required angle = 8 times its complement

Let ‘ x ‘ be the measured angle

angle = 8 times complement
angle = 8 (90 – x)
x = 8 (90 – x)
x = 720 – 8x
x + 8x = 720
9x = 720
x = 80

Therefore measured angle is 80.

Q 8 : If the angles $(2x - 10)^\circ$ and $(x - 5)^\circ$ are complementary, find x ?

Ans : Given that $(2x - 10)^\circ$ and $(x - 5)^\circ$ are complementary

Since angles are complementary, their sum will be 90

(2x – 10) + (x – 5) = 90
3x -15 = 90
3x = 90 + 15
3x = 105
x = 105/3
x = 35

Hence, the value of x = $(35)^\circ$

Q 9 : If the compliment of an angle is equal to the supplement of Thrice of itself, find the measure of the angle ?

Ans : Let the angle measured be ‘ x ‘ say.

Its complementary angle is (90 – x) and

Its supplementary angle is (180 – 3x)

Given that, Supplementary of 4 times the angle = (180 – 3x)

According to the given information;

(90 – x) = (180 – 3x)
3x – x = 180 – 90
2x = 90
x = 90/2
x = 45

Therefore, the measured angle x = $(45)^\circ$

Q 10 : If an angle differs from its complement by $(10)^\circ$, find the angle ?

Ans : Let the measured angle be ‘ x ‘ say

Given that,

The angles measured will differ by $(20)^\circ$

x – (90 – x) = 10

x – 90 + x = 10
2x = 90 + 10
2x = 100

x = 100/2
x = 50

Therefore the measure of the angle is $(50)^\circ$

Q 11 : If the supplement of an angle is 3 times its complement, find its angle ?

Ans : Let the angle in case be ‘ x ‘

Given that,

Supplement of an angle = 3 times its complementary angle

Supplementary angle = 180 – x

Complementary angle = 90 – x

Applying given data,

180 – x = 3 (90 –x)
3x – x = 270 – 180
2x = 90
x = 90/2
x = 45

Therefore, the angle in case is 45°

Q 12 : If the supplement of an angle is two third of itself. Determine the angle and its supplement?

Ans: Supplementary of an angle = $\frac{2}{3}\text{angle}$

Let the angle in case be ‘ x ’,

Supplementary of angle x will be (180 – x)

It is given that

180 – x = $\frac{2}{3}x$

(180 – x) 3 = 2x
540 -3x = 2x
5x = 540
x = 540/5
x = 108

Hence, supplementary angle = 180 – 108 = 72

Therefore, angles in case are $108^\circ \text{andsupplementaryangleis} 72^\circ$

Q 13 : An angle is 14° ***more than its complementary angle. What is its measure?***

Ans: Let the angle in case be ‘ x ’,

Complementary angle of ‘ x ’ is (90 – x)

From given data,

x – (90 – x) = 14

x – 90 +x = 14
2x = 90 + 14
2x = 104

$x = 104/2$
$x = 52$

Hence the angle in case is found to be 52°

Q 14 : The measure of an angle is twice the measure of its supplementary angle. Find the measure of the angles?

Ans : Let the angle in case be ‘ x ’

The supplementary of a angle x is (180 − x)

Applying given data:

$x = 2\,(180 - x)$

$x = 360 - 2x$
$3x = 360$
$x = 360/3$
$x = 120$

Therefore the value of the angle in case is 120°

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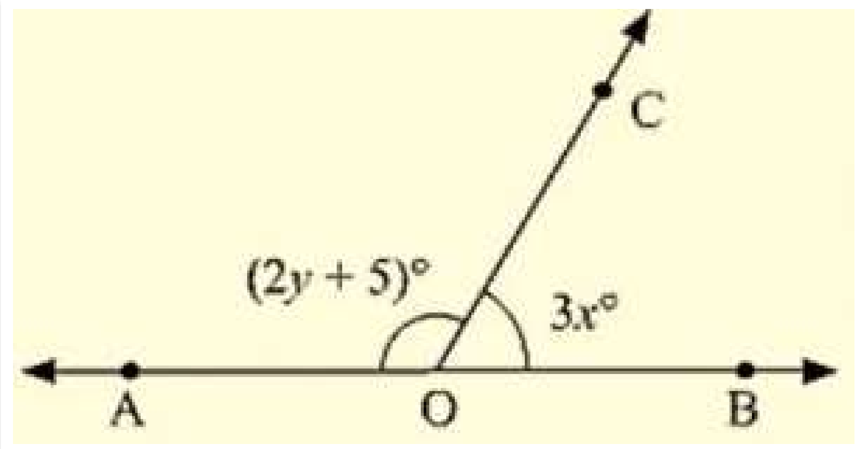
Ex 8.2

Q 1: In the below Fig. OA and OB are opposite rays:

(i) If x = 25, what is the value of y ?

(ii) If y = 35, what is the value of x ?



Ans :

(i) Given that,

x = 25

Since $\angle AOC$ and $\angle BOC$ form a linear pair

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

Given that $\angle AOC = 2y + 5$ and $\angle BOC = 3x$

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

(2y + 5) + 3x = 180

(2y +5) + 3 (25) = 180

2y + 5 + 75 = 180

2y + 80 = 180

2y = 180 – 80 = 100

y = 100/2 = 50

y = 50

(ii) Given that,

y = 35

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

(2y+5)+3x = 180

(2(35) + 5) + 3x = 180

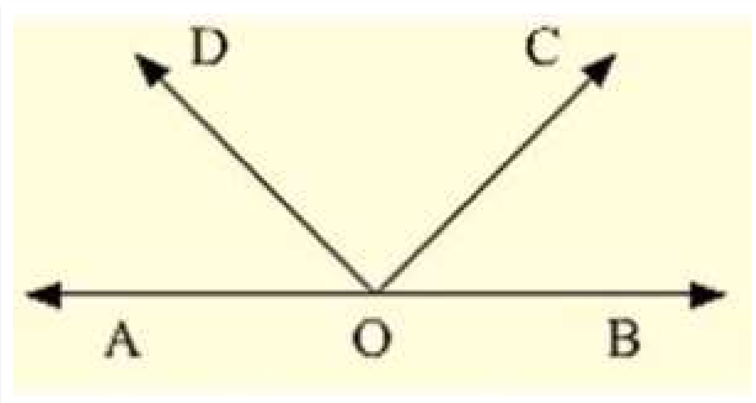
(70+5) + 3x = 180

3x = 180 – 75

3x = 105

x = 35

Q 2 : In the below figure, write all pairs of adjacent angles and all the linear pairs.



Ans : Adjacent angles are :

(i)$\angle AOC, \angle COB$

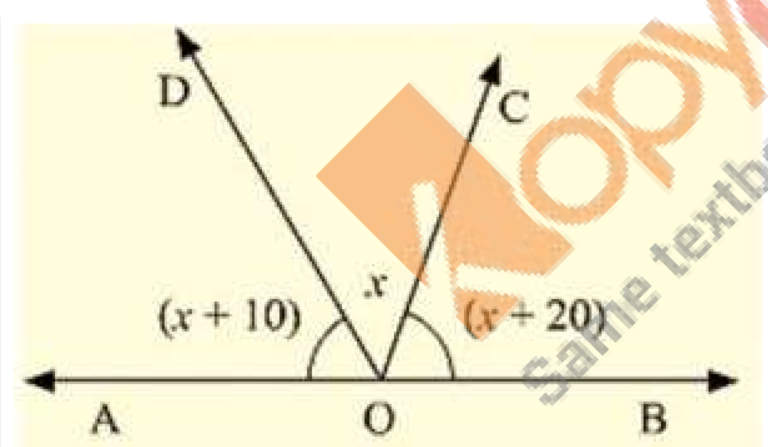
(ii)$\angle AOD \angle BOD$

(i)$\angle AOD, \angle COD$

(i)$\angle BOC, \angle COD$

Linear pairs : $\angle AOD, \angle BOD, \angle AOC, \angle BOC$

Q 3 : In the given below figure, find x. Further find $\angle COD, \angle AOD, \angle BOC$



Ans :Since $\angle AOD$ and $\angle BOD$ form a line pair,

$\angle AOD + \angle BOD = 180°$

$\angle AOD + \angle BOC + \angle COD = 180°$

Given that,

$\angle AOD = (x + 10)°, \ \angle COD = x°, \ \angle BOC = (x + 20)°$

(x + 10) + x + (x + 20) = 180
3x + 30 = 180
3x = 180 − 30
3x = 150/3
x = 50

Therefore, $\angle AOD = (x + 10)$

$= 50 + 10 = 60$

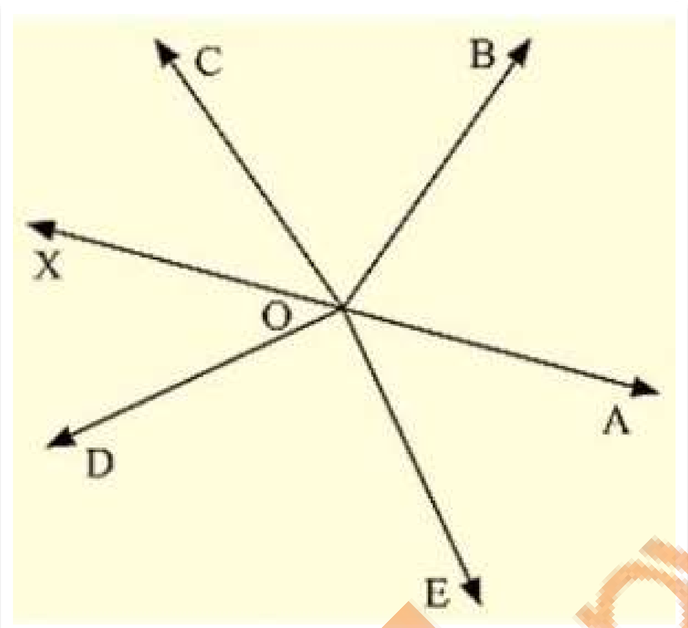
$\angle COD = x = 50^\circ$

$\angle COD = (x + 20)$

$= 50 + 20 = 70$

$\angle AOD = 60^\circ \ \angle COD = 50^\circ \ \angle BOC = 70^\circ$

Q 4 : In the Given below figure rays OA, OB, OC, OP and OE have the common end point O. Show that $\angle AOB + \angle BOC + \angle COD + \angle DOE + \angle EOA = 360^\circ$



Ans : Given that OA,OB,OD and OE have the common end point O.

A ray opposite to OA is drawn

Since $\angle AOB, \angle BOF$ are linear pairs,

$\angle AOB + \angle BOF = 180^\circ$

$\angle AOB + \angle BOC + \angle COF = 180^\circ$ --(1)

Also,

$\angle AOE$ and $\angle EOF$ are linear pairs

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

$\angle AOE + \angle DOF + \angle DOE = 180^\circ$ --(2)

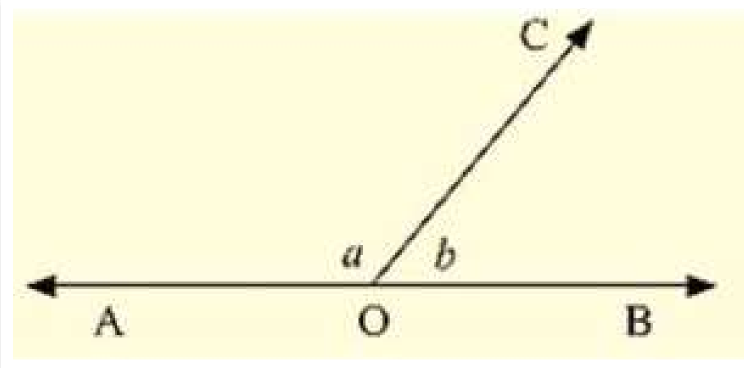
By adding (1) and (2) equations we get

$\angle AOB + \angle BOC + \angle COF + \angle AOE + \angle DOF + \angle DOE = 180^\circ$

$\angle AOB + \angle BOC + \angle COD + \angle DOE + \angle EOA = 180^\circ$

Hence proved.

Q 5 : In the Below figure, $\angle AOC$ and $\angle BOC$ ***form a linear pair. If a − 2b =*** 30°***, find a and b ?***



Ans : Given that,

$\angle AOC$ and $\angle BOC$ form a linear pair

If a − b = 30

$\angle AOC = a^\circ, \angle BOC = b^\circ$

Therefore, a +b =180 −−(1)

Given a − 2b = 30 −−(2)

By subtracting (1) and (2)

a+b-a+2b=180-30

3b = 150
b = 150/3
b = 50

Since a − 2b = 30

a − 2(50) = 30

a = 30 + 100

a = 130

Hence, the values of a and b are 130° and 50° respectively.

Q 6 : How many pairs of adjacent angles are formed when two lines intersect at a point ?

Ans : Four pairs of adjacent angles will be formed when two lines intersect at a point.

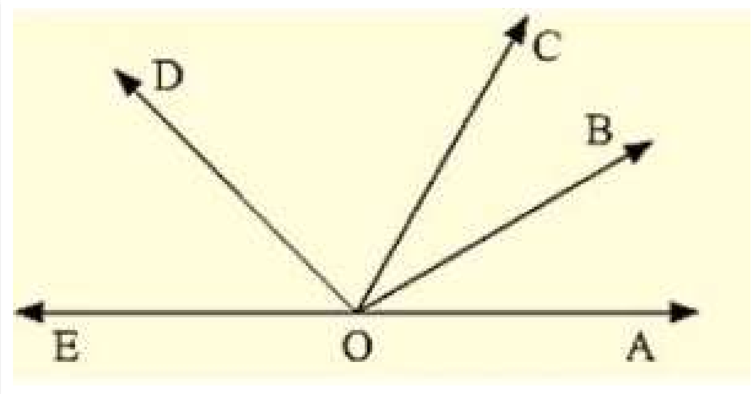
Considering two lines AB and CD intersecting at O

The 4 pairs are :

$(\angle AOD, \angle DOB), (\angle DOB, \angle BOC), (\angle COA, \angle AOD)$ and $(\angle BOC, \angle COA)$

Hence, 4 pairs of adjacent angles are formed when two lines intersect at a point.

Q 7 : How many pairs of adjacent angles , in all, can you name in the figure below ?



Ans : Pairs of adjacent angles are :

$\angle EOC, \angle DOC$

$\angle EOD, \angle DOB$

$\angle DOC, \angle COB$

$\angle EOD, \angle DOA$

$\angle DOC, \angle COA$

$\angle BOC, \angle BOA$

$\angle BOA, \angle BOD$

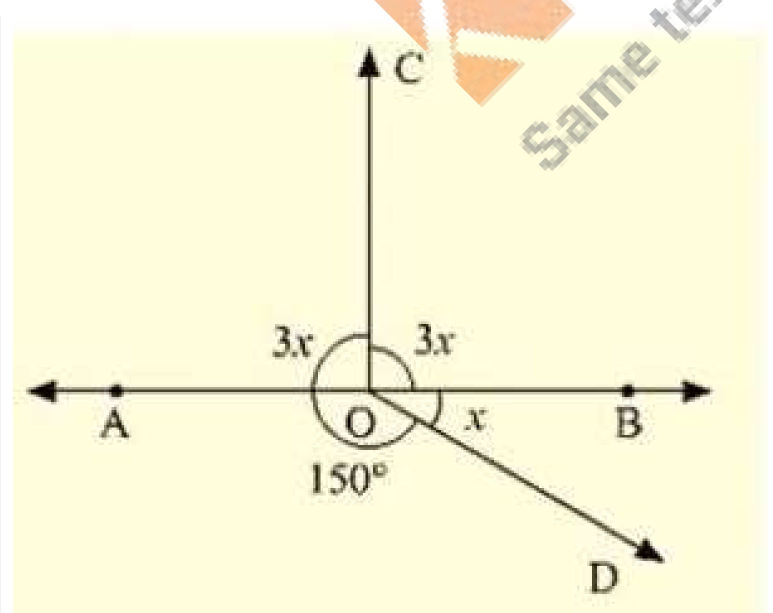
$\angle BOA, \angle BOE$

$\angle EOC, \angle COA$

$\angle EOC, \angle COB$

Hence, 10 pair of adjacent angles.

Q 8 : In the below figure, find value of x ?



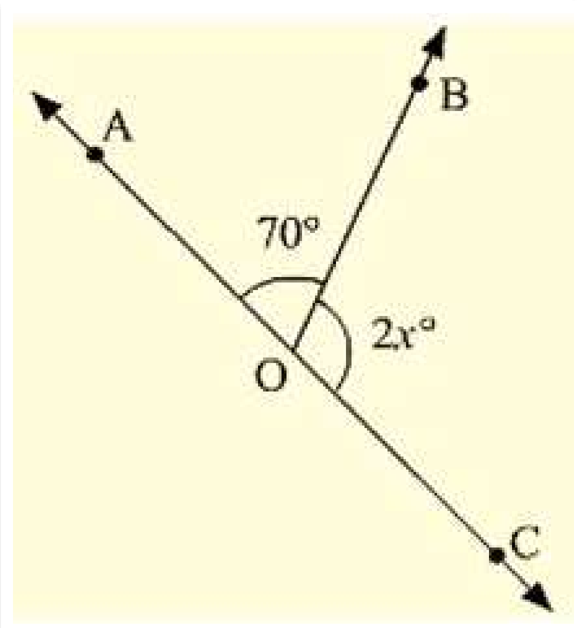
Ans : Since the sum of all the angles round a point is equal to 360°

3x + 3x + 150 + x = 360

7x = 360 − 150
7x = 210
x = 210/7
x = 30

Value of x is 30°

Q 9 : In the below figure, AOC is a line, find x.



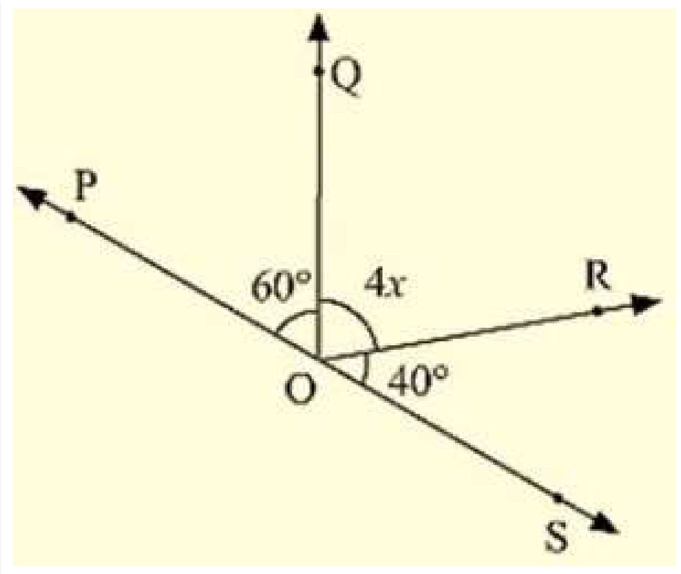
Ans : Since $\angle AOB$ and $\angle BOC$ are linear pairs,

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

70 + 2x = 180
2x = 180 − 70
2x = 110
x = 110/2
x = 55

Hence, the value of x is 55°

Q 10 : In the below figure, POS is a line, Find x ?



Ans : Since $\angle POQ$ and $\angle QOS$ are linear pairs

$\angle POQ + \angle QOS = 180^\circ$

$\angle POQ + \angle QOR + \angle SOR = 180^\circ$

60 + 4x +40 = 180

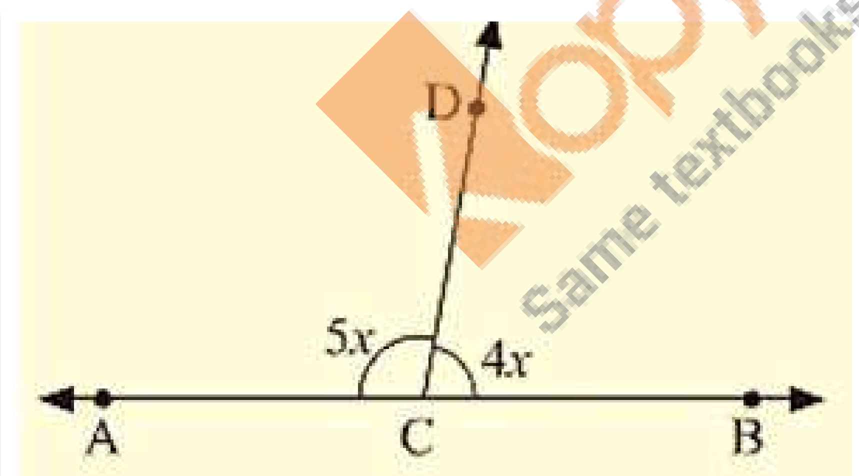
4x = 180 -100

4x = 80

x = 20

Hence, Value of x = 20

Q 11: In the below figure, ACB is a line such that $\angle DCA = 5x$ and $\angle DCB = 4x$. ***Find the value of x ?***



Ans: Here, $\angle ACD + \angle BCD = 180^\circ$

[Since they are linear pairs]

$\angle DCA = 5x$ and $\angle DCB = 4x$

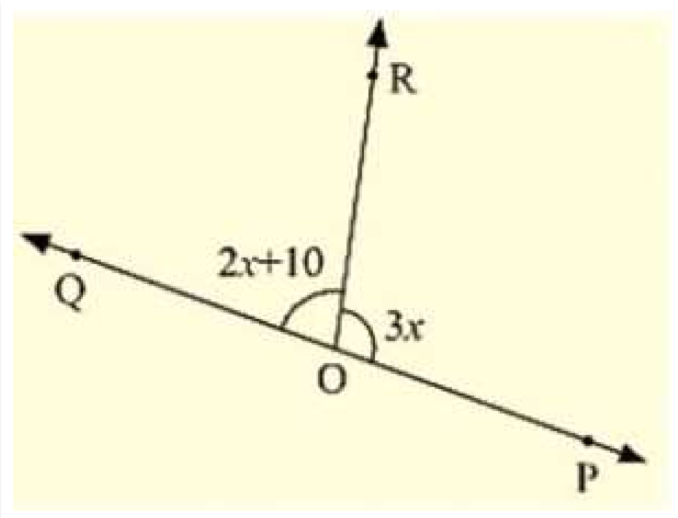
5x + 4x = 180

9x = 180

x = 20

Hence, the value of x is 20°

Q 12 : In the given figure, Given $\angle POR = 3x$ and $\angle QOR = 2x + 10$***, Find the value of x for which POQ will be a line ?***



Ans : For the case that POR is a line

$\angle POR$ and $\angle QOR are linear parts$

$\angle POR + \angle QOR = 180^{\circ}$

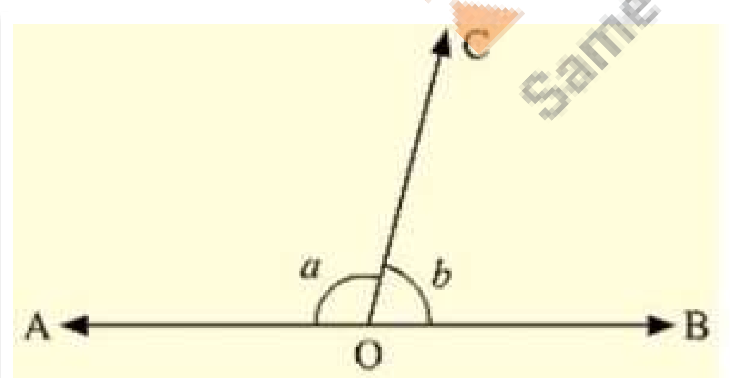
Also, given that,

$\angle POR = 3x$ and $\angle QOR = 2x + 10$

2x + 10 + 3x = 180
5x + 10 = 180
5x = 180 − 10
5x = 170
x = 34

Hence the value of x is 34°

Q 13 : In Fig : a is greater than b by one third of a right angle. Find the value of a and b ?



Ans : Since a and b are linear

a + b = 180
a = 180 − b −−(1)

From given data, a is greater than b by one third of a right angle

a = b + 90/3
a = b + 30

a − b = 30 −−(2)

Equating (1) and (2)

180 − b = b + 30

180 − 30 = 2b
b = 150 / 2
b = 75

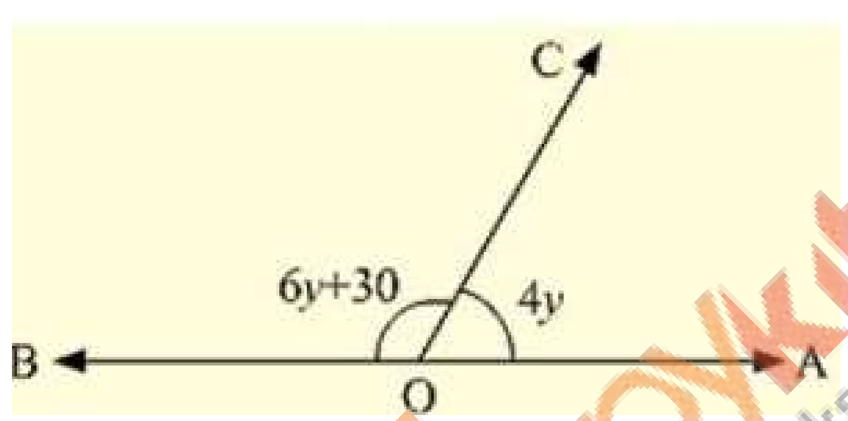
From (1)

a = 180 − b

a = 180 − 75
a = 105

Hence the values of a and b are 105° and 75° respectively.

Q 14 :What value of y would make AOB a line in the below figure, If $\angle AOB = 4y$ and $\angle BOC = (6y + 30)$ ***?***



Ans : Since, $\angle AOC$ and $\angle BOC$ are linear pairs

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

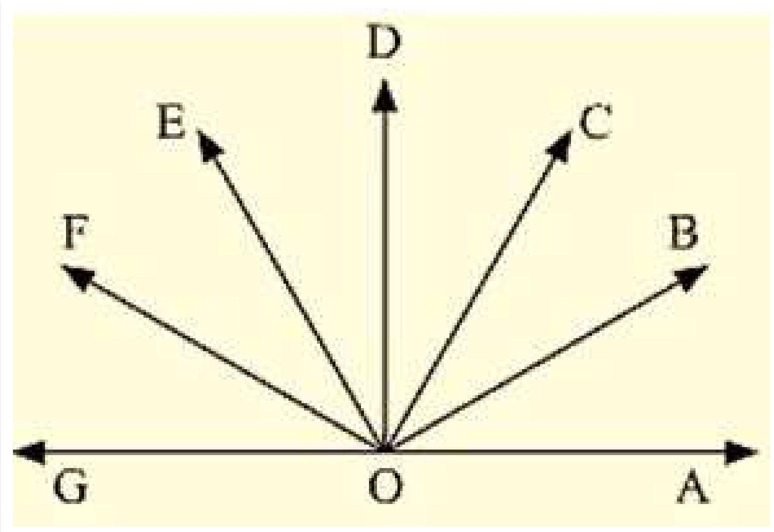
6y + 30 + 4y = 180
10y + 30 = 180
10y = 180 − 30
10y = 150
y = 150/10
y = 15

Hence value of y that will make AOB a line is 15°

Q 15 : If the figure below forms a linear pair,

$\angle EOB = \angle FOC = 90$ and $\angle DOC = \angle FOG = \angle AOB = 30$

Find the measure of $\angle FOE, \angle COB$ and $\angle DOE$
Name all the right angles
Name three pairs of adjacent complementary angles
Name three pairs of adjacent supplementary angles
Name three pairs of adjacent angles



Ans :(i) $\angle FOE = x, \angle DOE = y$ and $\angle BOC = z$

Since $\angle AOF, \angle FOG$ is a linear pair

$\angle AOF$ + 30 = 180
$\angle AOF$ = 180 − 30
$\angle AOF$ = 150
$\angle AOB + \angle BOC + \angle COD + \angle DOE + \angle EOF = 150$
30 + z + 30 + y + x = 150
x + y + z =150 − 30 − 30
x + y + z =90 −−(1)

$\angle FOC = 90^{\circ}$

$\angle FOE + \angle EOD + \angle DOC = 90^{\circ}$
x + y +30 = 90
x + y = 90 − 30
x + y =60 −−(2)

Substituting (2) in (1)

x + y + z = 90

60 + z = 90
z = 90 − 60 = 30

Given BOE = 90

$\angle BOC + \angle COD + \angle DOE = 90^{\circ}$
30 + 30 +DOE = 90
DOE = 90 − 60 = 30
DOE = x = 30

We also know that,

x + y = 60

y = 60 − x
y = 60 − 30
y = 30

Thus we have $\angle FOE = 30, \angle COB = 30$ and $\angle DOE = 30$

(ii) Right angles are $\angle DOG, \angle COF, \angle BOF, \angle AOD$

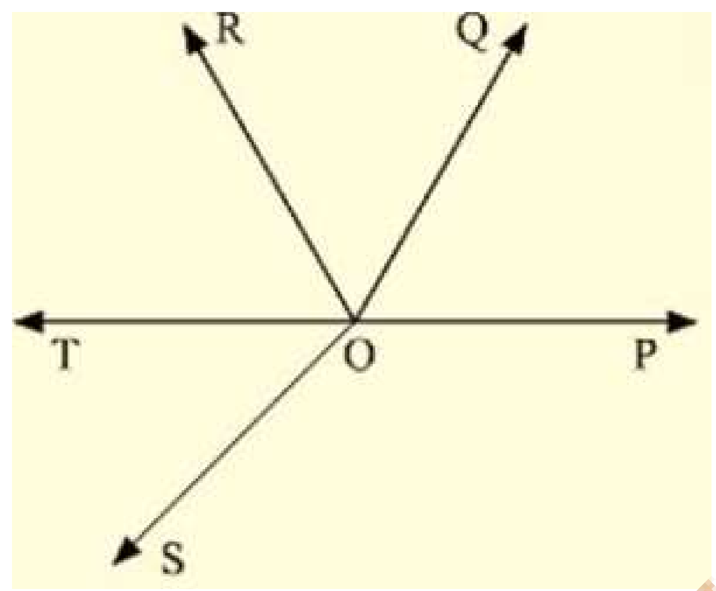
(iii) Adjacent complementary angles are $(\angle AOB, \angle BOD); (\angle AOC, \angle COD); (\angle BOC, \angle COE);$

(iv) Adjacent supplementary angles are $(\angle AOB, \angle BOG); (\angle AOC, \angle COG); (\angle AOD, \angle DOG);$

(v) Adjacent angles are $(\angle BOC, \angle COD); (\angle COD, \angle DOE); (\angle DOE, \angle EOF);$

Q16: ***In below fig. OP, 0Q, OR and OS are four rays. Prove that:***

$\angle POQ + \angle QOR + \angle SOR + \angle POS = 360^\circ$



Ans: Given that

OP, 0Q, OR and OS are four rays

You need to produce any of the ray OP, 0Q, OR and OS backwards to a point in the figure.

Let us produce ray 0Q backwards to a point T

So that TOQ is a line

Ray OP stands on the TOQ

Since $\angle TOP, \angle POQ$ is a linear pair

$\angle TOP + \angle POQ = 180^\circ$ --(1)

Similarly,

Ray OS stands on the line TOQ

$\angle TOS + \angle SOQ = 180^\circ$ --(2)

But $\angle SOQ = \angle SOR + \angle QOR$ --(3)

So, eqn (2) becomes

$\angle TOS + \angle SOR + \angle OQR = 180^\circ$

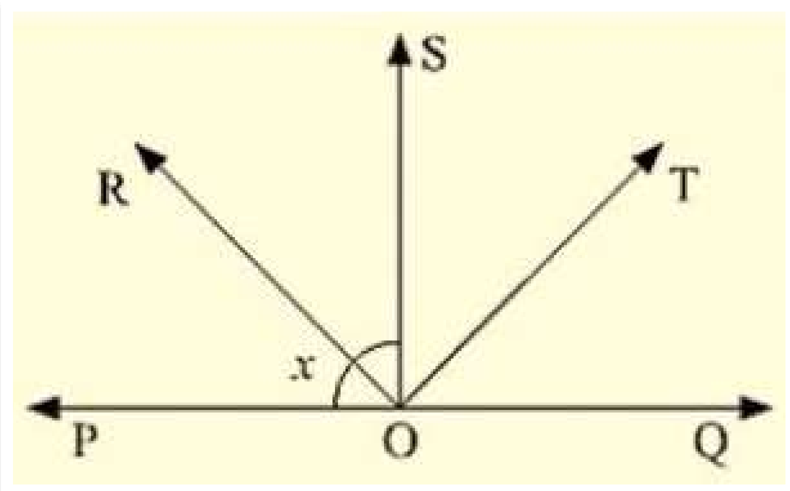
Now, adding (1) and (3) you get $\angle TOP + \angle POQ + \angle TOS + \angle SOR + \angle QOR = 360^\circ$ --(4)

$\angle TOP + \angle TOS = \angle POS$

Eqn: (4)becomes

$\angle POQ + \angle QOR + \angle SOR + \angle POS = 360^\circ$

Q 17 : In below fig, ray OS stand on a line POQ. Ray OR and ray OT are angle bisectors of $\angle POS$ and $\angle SOQ$ ***respectively. If*** $\angle POS$ ***= x, find*** $\angle ROT$ ***?***



Ans : Given,

Ray OS stand on a line POQ

Ray OR and Ray OT are angle bisectors of $\angle POS$ and $\angle SOQ$ respectively

$\angle POS = x$

$\angle POS$ and $\angle SOQ$ is linear pair

$\angle POS + \angle QOS = 180^\circ$

x + QOS = 180

QOS = 180 – x

Now, ray or bisector POS

$\angle ROS = \frac{1}{2}\angle POS$

x/2

ROS = x/2 [Since POS = x]

Similarly ray OT bisector QOS

$\angle TOS = \frac{1}{2}\angle QOS$

= (180 – x)/2 [QOS = 180 – x]

= 90 – x/2

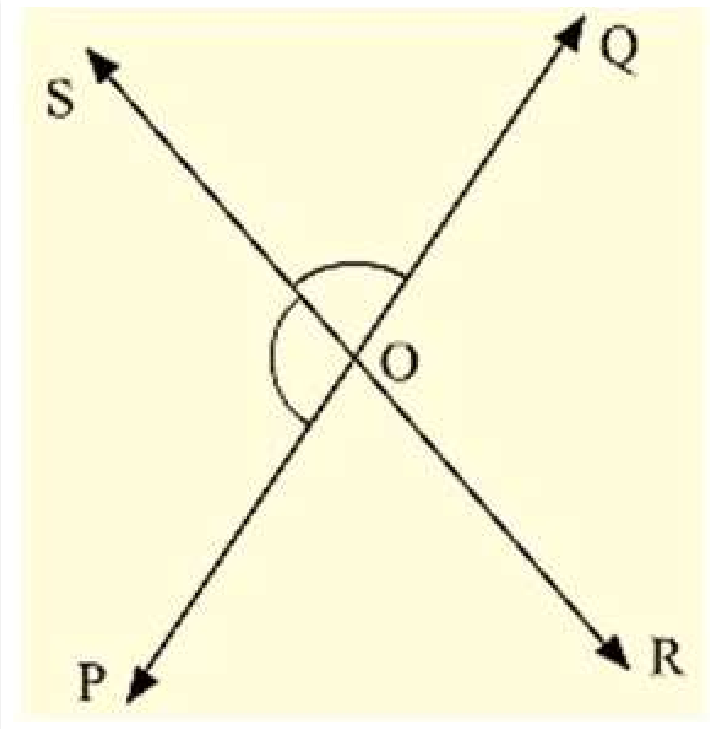
Hence, $\angle ROT = \angle ROS + \angle ROT$

= x/2 + 90 – x/2

= 90

$\angle ROT = 180^\circ$

Q 18 : In the below fig, lines PQ and RS intersect each other at point O. If $\angle POR : \angle ROQ = 5 : 7$ ***. Find all the angles.***



Ans : Given

$\angle POR$ and $\angle ROP$ is linear pair

$\angle POR + \angle ROP = 180^\circ$

Given that

$\angle POR : \angle ROQ = 5 : 7$

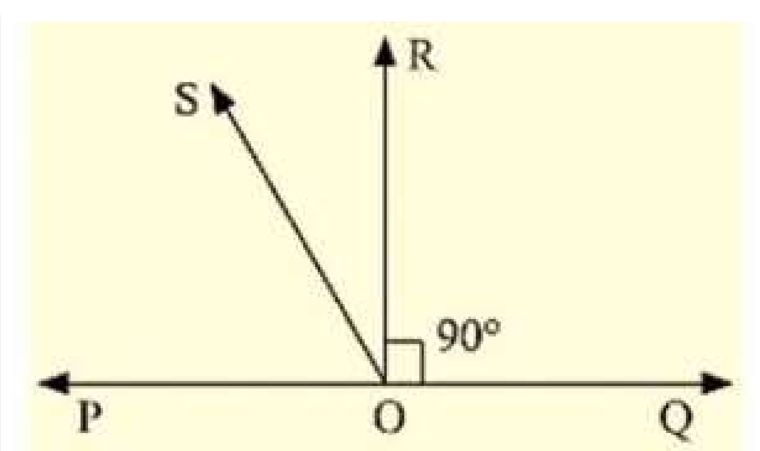
Hence, POR =(5/12)x180=75

Similarly ROQ=(7/7+5) 180 = 105

Now POS = ROQ = 105° [Vertically opposite angles]

Also, SOQ = POR = 75° [Vertically opposite angles]

Q 19 : In the below fig. POQ is a line. Ray OR is perpendicular to line PQ. OS is another ray lying between rays OP and OR. Prove that $\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$.



Ans : Given that

OR perpendicular

$\therefore \angle POR = 90^\circ$

$\angle POS + \angle SOR = 90$ $\quad [\because \angle POR = \angle POS + \angle SOR]$

$\angle ROS = 90^\circ - \angle POS$ $\quad$ --(1)

$\angle QOR = 90$ ($\because$ OR $\perp$ PQ)

$\angle QOS - \angle ROS = 90^\circ$

$\angle ROS = \angle QOS - 90^\circ$

By adding (1) and (2) equations, we get

$2\angle ROS = \angle QOS - \angle POS$

$\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$

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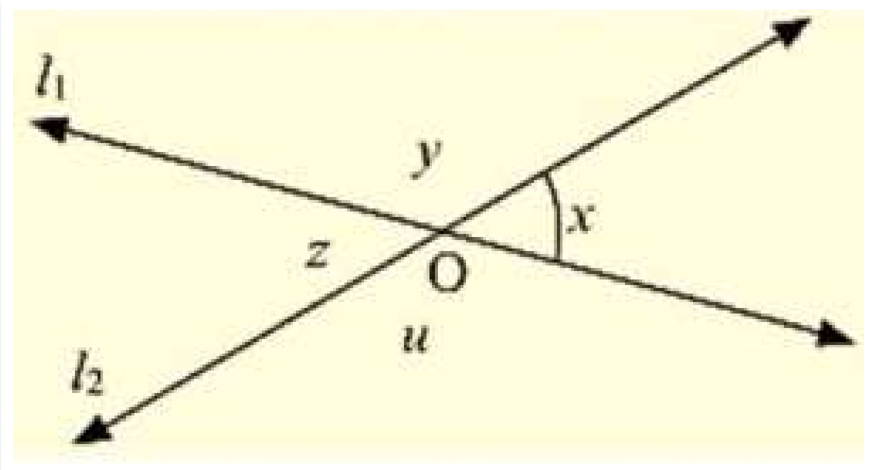
Chapter 8
Ex 8.3

Q 1: In the below fig, lines l1, and l2 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°, 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

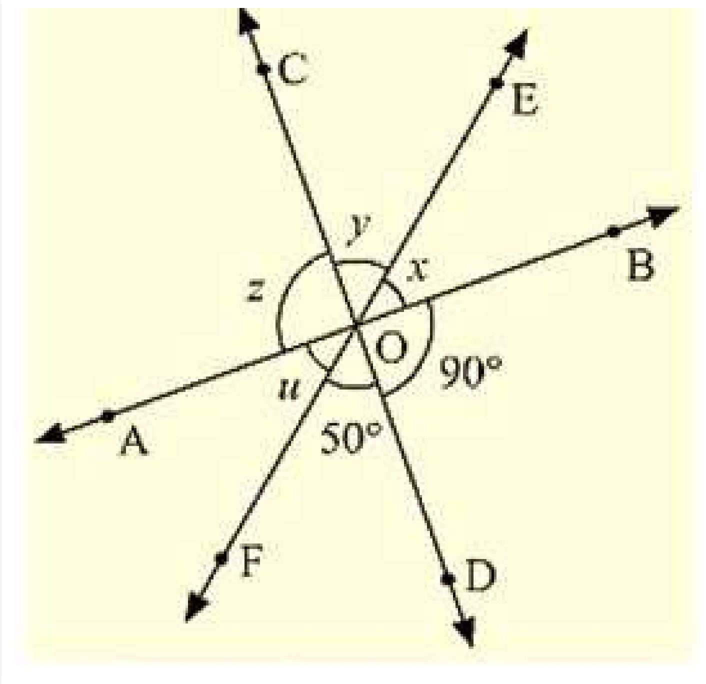
u = 180 − x
u = 180 − 45
u = 135

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 = 135 and u = 45

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

$So\angle SOD = z = 90^\circ$

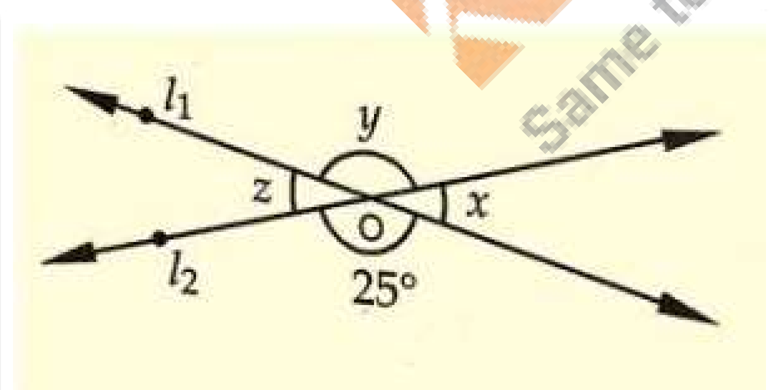
$\angle DOF = y = 50^\circ$

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 [Vertically opposite angles are equal]

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

[Linear pair of angles]

x = 180 − 25
x = 155

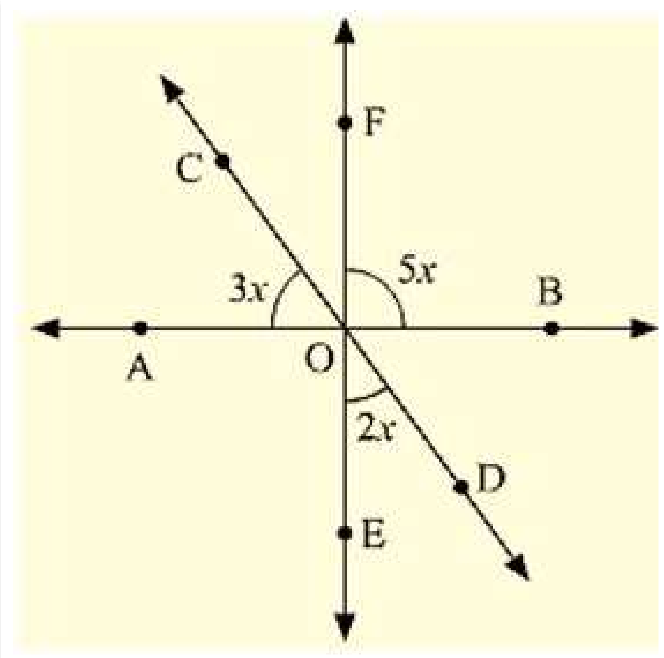
Also,

z = x = 155 [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

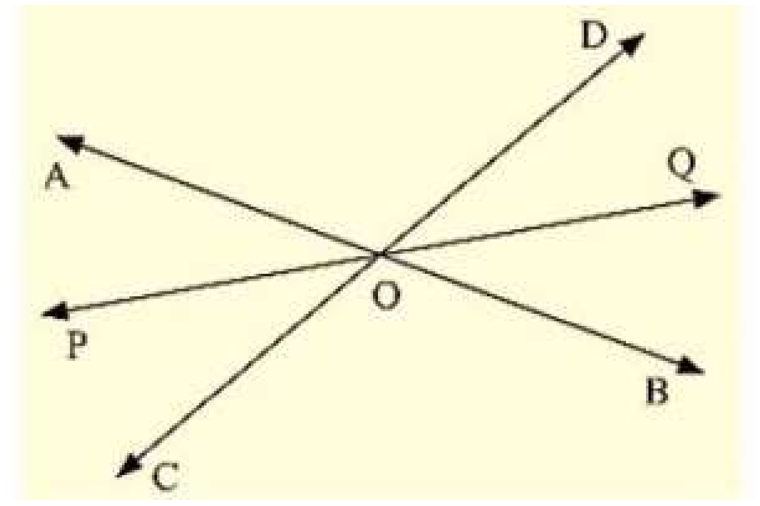
Linear pair

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

3x + 5x + 2x = 180
10x = 180
x = 180/10
x = 18

Hence, the value of x = 18°

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



Ans : Given,

Lines A0B and COD intersect at point O, such that

/AOC – /BOO

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

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

AOD = BOC = 5x −−(1)

Also ,

AOC +BOD

2 AOD = 2 DOF −−(2)

We know,

Sum of the angles around a point is 360

2 AOD + 2 AOE + 2 DOF = 360
AOD + AOE + DOF = 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: AOF = DOF

Proof: OE bisects COB

COE = EOB = x

Vertically opposite angles are equal

BOE = AOF = x −− (1)
COE = DOF= x −− (2)

From (1) and (2),

$\angle AOF = \angle DOF = x$

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 —–(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,

that is : AOC = DOB ` —–(ii)

AOP and BOQ are vertically opposite angles.

Therefore, AOP = BOQ

Similarly, POC = DOQ

We know that : AOP + AOD + DOQ + POC + BOC + BOQ = 360°

2 AOP + AOD +2 D0Q+ BOC =360°

2 AOP + 2 AOD + 2 DOQ = 360°

2(AOP + AOD + DOQ) = 360°

AOP + AOD +DOQ = 360 /2

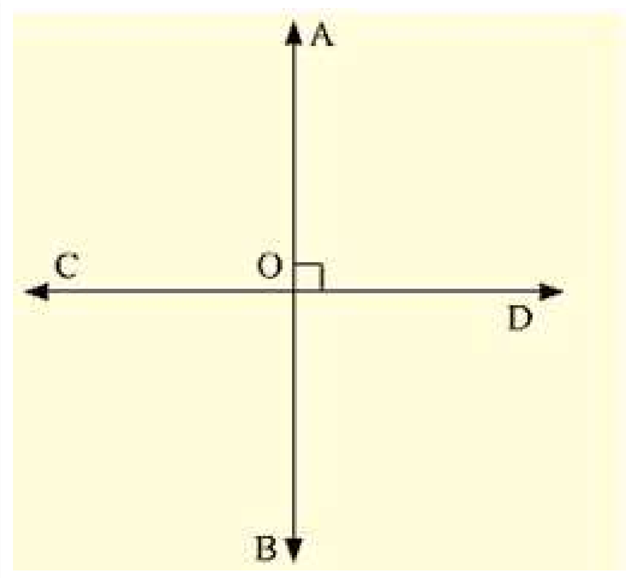
AOP + AOD + DOQ = I 80°

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

$\angle BOC = 90, \angle AOC = 90 \angle AOD = 90° and \angle BOD = 90$

{figure}

Proof :

Given that BOC = 90

Vertically opposite angles are equal

BOC = AOD = 90

AOC, BOC are a Linear pair of angles

$\angle AOC + \angle BOC = 180°$

[Linear pair]

AOC +90 = 180
AOC = 90

Vertically opposite angles

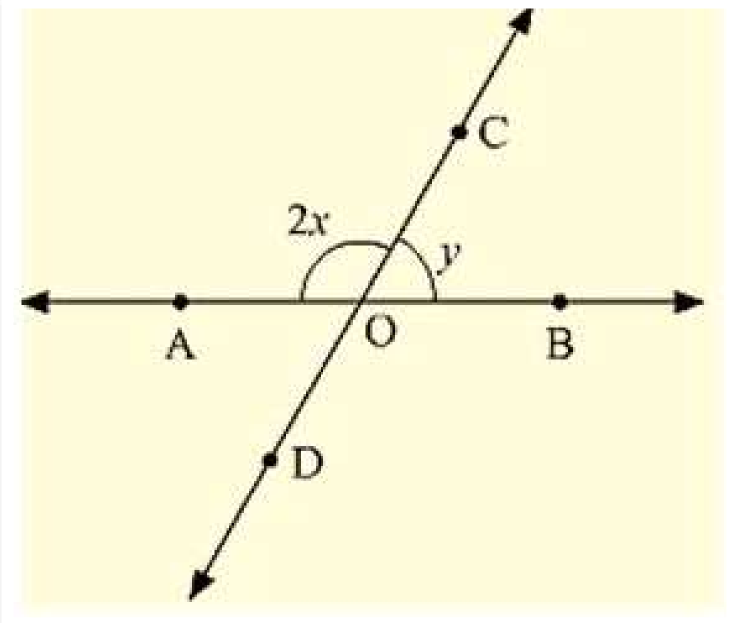
Therefore, AOC = BOD = 90

Hence, AOC = BOC = BOD = AOD = 90

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

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

=> 2x + y = 180

=> 2 (60)+ y = 180 [since x = 60]

=> y = 60

(ii) Given y = 40

AOC and BOC are linear pair of angles

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

=> 2x + y = 180

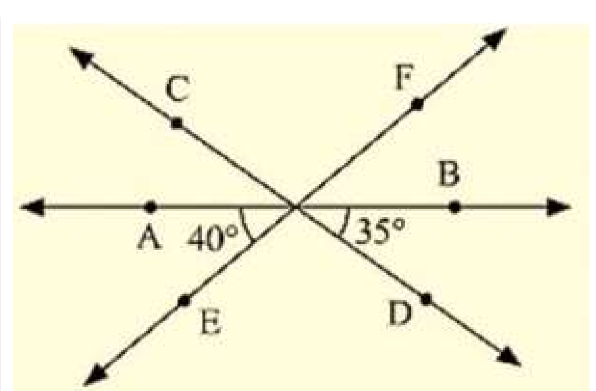
=> 2x + 40 = 180

=> 2x =180 − 140

=> 2x = 140

=> 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

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

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

=> DOE = 180 − 40 − 35 = 105

Vertically opposite side angles are equal

DOE = COF =105

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

[Linear pair]

AOE + AOC + COF = 180

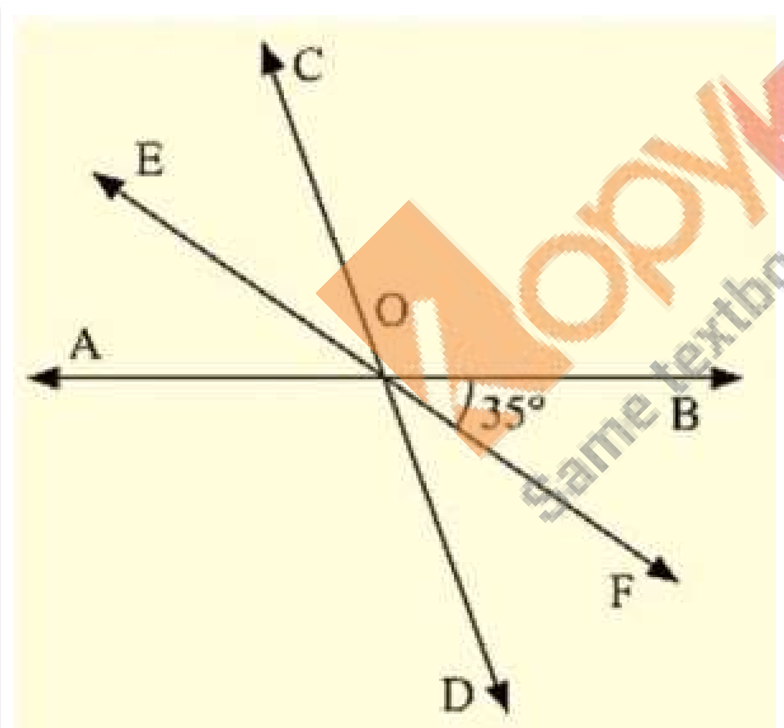
=> 40 + AOC +105 = 180

=> AOC = 180 − 145

=> AOC = 35

Also, BOF = 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 BOF = 35. Find BOC and AOD.



Ans : Given

OF bisects BOD

BOF = 35

Angles BOC and AOD are unknown

BOD = 2 BOF = 70 [since BOD is bisected]

BOD = AOC = 70 [BOD and AOC are vertically opposite angles]

Now,

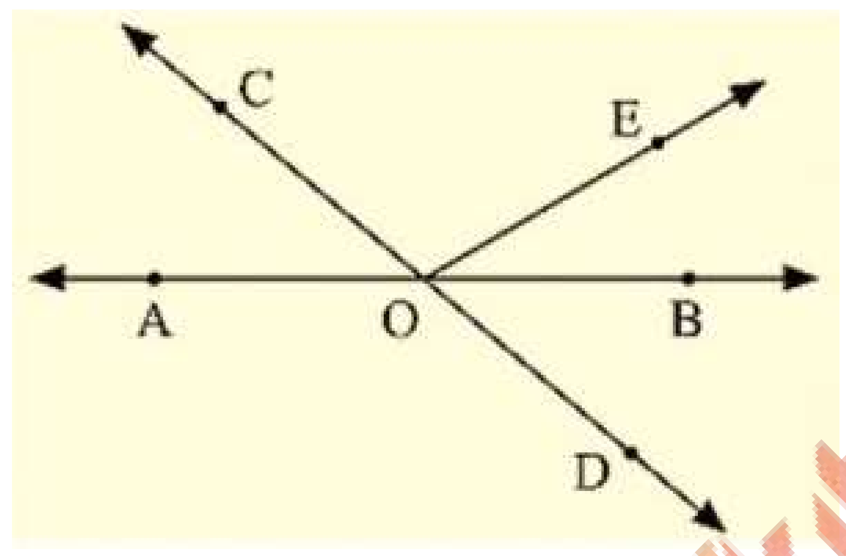
BOC + AOC = 180

BOC +70 = 180

BOC =110

AOD = BOC = 110 (Vertically opposite angles]

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



Ans : Given that

AOC + BOE = 70 and BOD = 40

To find BOE

Here , BOD and AOC an vertically opposite angles

BOD = AOC = 40

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

=> 40 + BOF = 70

=> BOF = 70 – 40

=> BOE = 30

AOC and BOC are lines pair of angles

=> AOC + COF + BOE = 180

=> COE = 180 – 30 – 40

=> 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 Inc 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

RD SHARMA

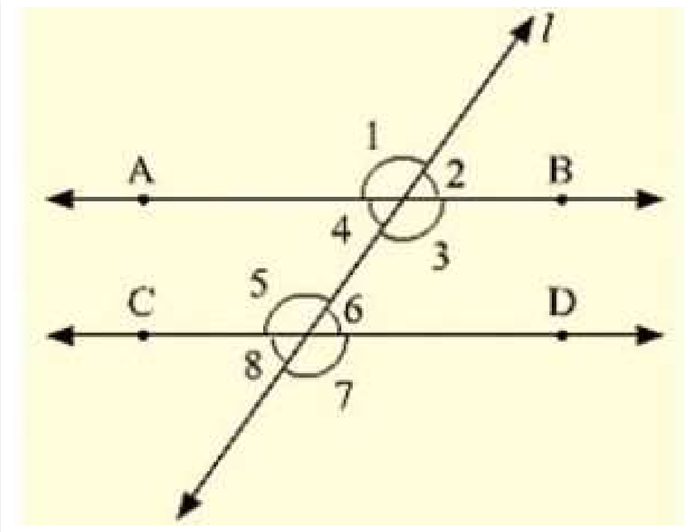
Solutions

Class 9 Maths

Chapter 8

Ex 8.4

Q 1: In below fig. AB CD and $\angle 1$ and $\angle 2$ are in the ratio 3 : 2. Determine all angles from 1 to 8.



Ans : Let $\angle 1$ = 3x and $\angle 2$ = 2x

$\angle 1$ and $\angle 2$ are linear pair of angle

Now, $\angle 1$ and $\angle 2$

=> 3x + 2x = 180

=> 5x = 180

=> x = 180 / 5

=> x = 36

$\angle 1 = 3x = 108^\circ$, $\angle 2 = 2x = 72^\circ$

We know, Vertically opposite angles are equal

$\angle 1 = \angle 3 = 108^\circ$

$\angle 2 = \angle 4 = 72^\circ$

$\angle 6 = \angle 7 = 108^\circ$

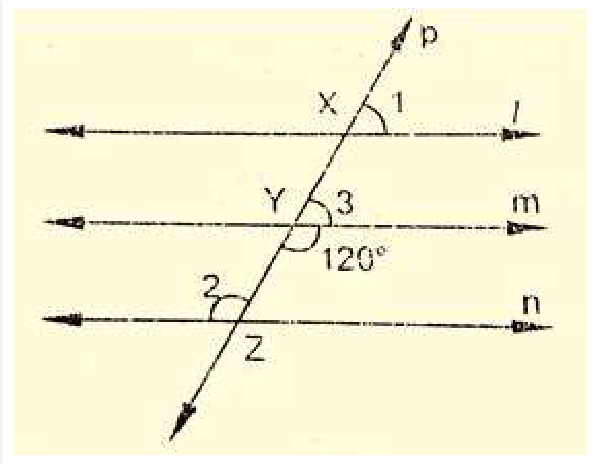
$\angle 5 = \angle 8 = 72^\circ$

We also know, corresponding angles are equal

$\angle 1 = \angle 5 = 108^\circ$

$\angle 2 = \angle 6 = 72^\circ$

Q 2: In the below fig, l, m and n are parallel lines intersected by transversal p at X. Y and Z respectively. Find $\angle 1, \angle 2$ and $\angle 3$



Ans : From the given figure :

$\angle 3 + \angle mYZ = 180^\circ$ [Linear pair]

=> $\angle 3 = 180 - 120$

=> $\angle 3 = 60^\circ$

Now line l parallel to m

$\angle 1 = \angle 3$ [Corresponding angles]

$\angle 1 = 60^\circ$

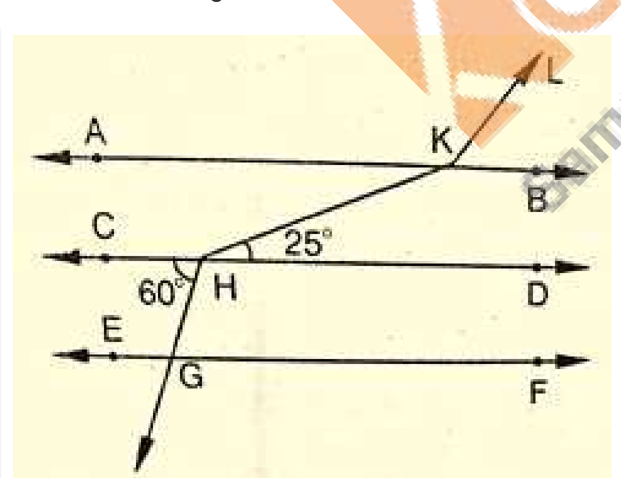
Also m parallel to n

=> $\angle 2 = 120^\circ$ [Alternative interior angle]

Hence, $\angle 1 = \angle 3 = 60^\circ$

$\angle 2 = 120^\circ$

3. In the below fig, AB || CD || EF and GH || KL Find $\angle HKL$



Ans : Produce LK to meet GF at N.

Now, alternative angles are equal

$\angle CHG = \angle HGN = 60^\circ$

$\angle HGN = \angle KNF = 60^\circ$ [Corresponding angles]

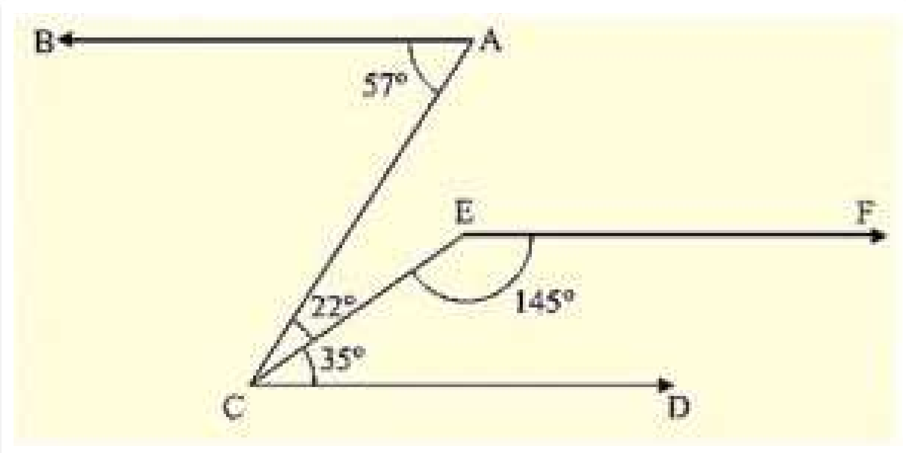
Hence, $\angle KNG = 180 - 60 = 120$

=> $\angle GNK = \angle AKL = 120^\circ$ [Corresponding angles]

$\angle AKH = \angle KHD = 25^\circ$ [alternative angles]

Therefore, $\angle HKL = \angle AKH + \angle AKL = 25 + 120 = 145^\circ$

Q 4 : In the below fig, show that AB || EF



Ans : Produce EF to intersect AC at K.

Now, $\angle DCE + \angle CEF = 35 + 145 = 180^\circ$

Therefore, EF || CD (Since Sum of Co-interior angles is 180) ---(1)

Now, $\angle BAC = \angle ACD = 57^\circ$

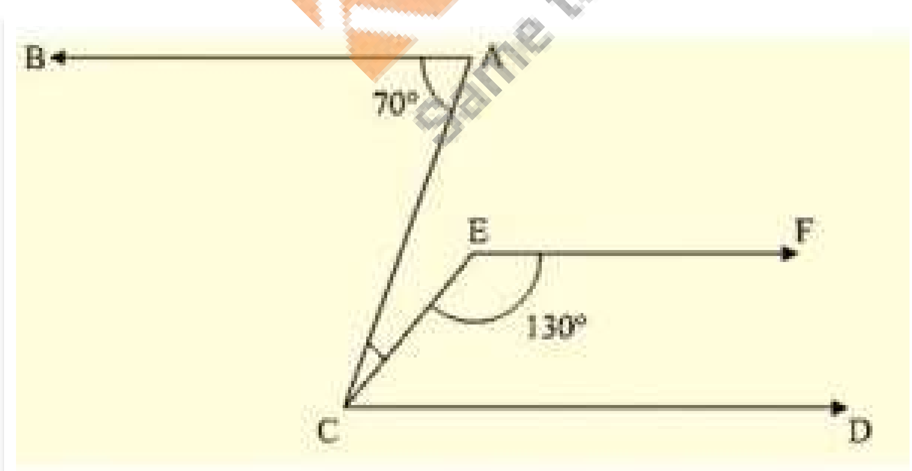
=>BA || EF [Alternative angles are equal] ---(2)

From (1) and (2)

AB || EF [Since, Lines parallel to the same line are parallel to each other]

Hence proved.

Q 5 : If below fig.if AB || CD and CD || EF, find $\angle ACE$.



Ans : Since EF || CD

Therefore, EFC + ECD = 180 [co-interior angles are supplementary]

=> ECD = 180 − 130 = 50

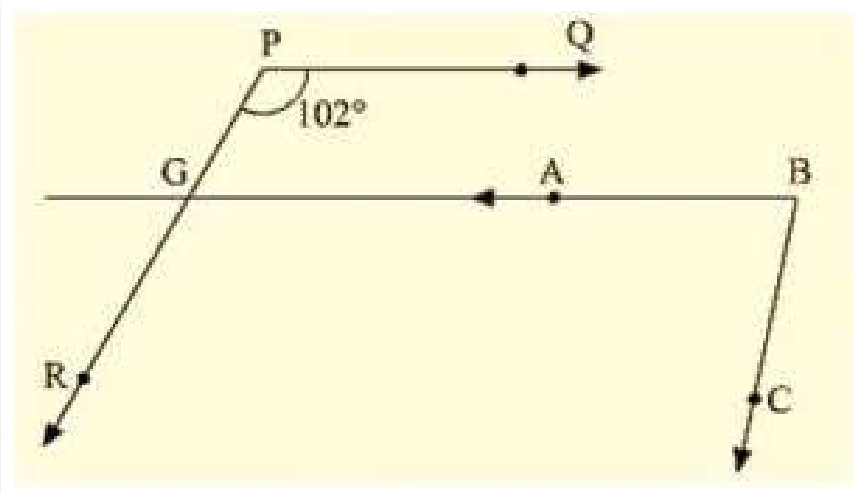
Also BA || CD

=> BAC = ACD = 70 [alternative angles]

But, ACE + ECD =70

=> ACE = 70 – 50 = 20

Q 6 : In the below fig, PQ || AB and PR || BC. If $\angle QPR = 102^\circ$, determine $\angle ABC$ Give reasons.



Ans : AB is produce to meet PR at K

Since PQ || AB

$\angle QPR = \angle BKR = 102^\circ$ [corresponding angles]

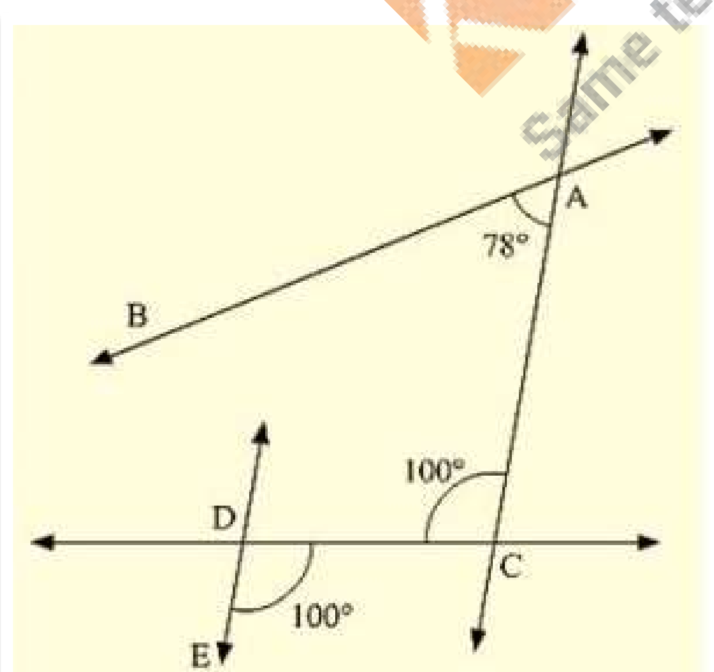
Since PR || BC

$\angle RKB + \angle CBK = 180^\circ$ [Since Corresponding angles are supplementary]

$\angle CKB = 180 – 102 = 78$

$\therefore \angle CKB = 78^\circ{}^\circ$

Q 7 : In the below fig, state Which lines are parallel and why?



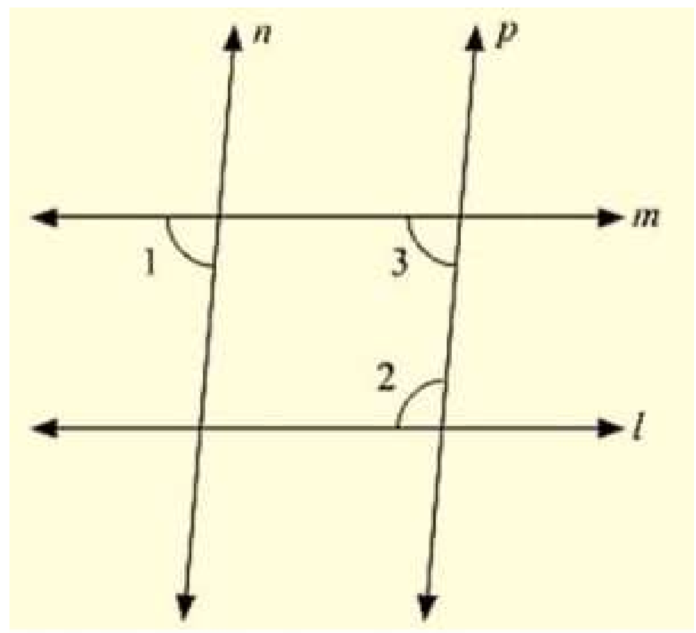
Ans : Vertically opposite angles are equal

=> $\angle EOC = \angle DOK = 100^\circ$

$\angle DOK = \angle ACO = 100^\circ$

Here two lines EK and CA cut by a third line and the corresponding angles to it are equal Therefore, EK || AC.

8. In the below fig. if l||m, n || p and $\angle 1$ = 85°. find $\angle 2$.



Ans : Corresponding angles are equal

=> $\angle 1 = \angle 3 = 85^\circ$

By using the property of co-interior angles are supplementary

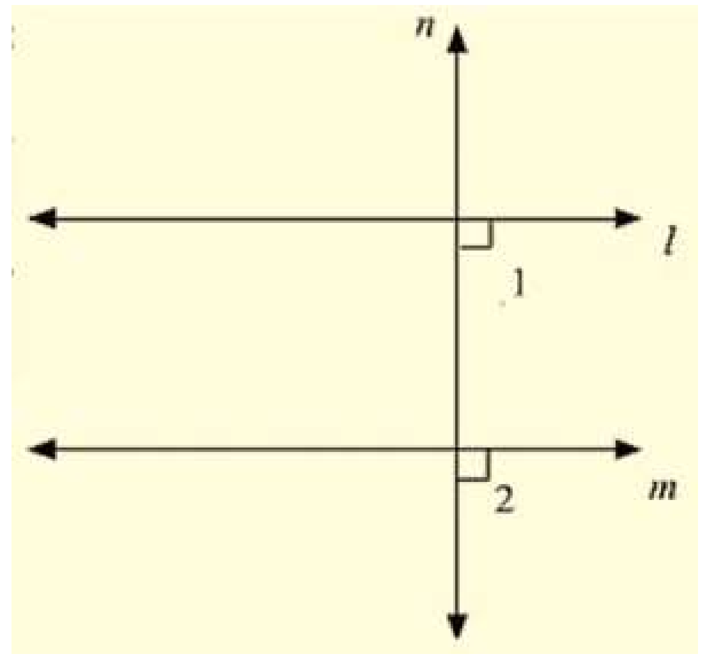
$\angle 2 + \angle 3 = 180^\circ$

$\angle 2 + 55 = 180$

$\angle 2 = 180 - 85$

$\angle 2 = 95^\circ$

Q 9 : If two straight lines are perpendicular to the same line, prove that they are parallel to each other.



Ans : Given m perpendicular t and l perpendicular to t

$\angle 1 = \angle 2 = 90^\circ$

Since, l and m are two lines and it is transversal and the corresponding angles are equal

L || M

Hence proved

Q 10 : Prove that if the two arms of an angle are perpendicular to the two arms of another angle. then the angles are either equal or supplementary.

Ans : Consider be angles AOB and ACB

Given 0A perpendicular to A0, also 0B perpendicular to BO

To prove : $\angle AOB + \angle ACB = 180^\circ$ (or) $\angle AOB + \angle ACB = 180^\circ$

Proof : In a quadrilateral = $\angle A + \angle O + \angle B + \angle C = 360^\circ$

[Sum of angles of quadrilateral is 360]

=> 180+ O +B + C = 360

=> O+ C = 360 −180

Hence AOB + ACB = 180 −−(1)

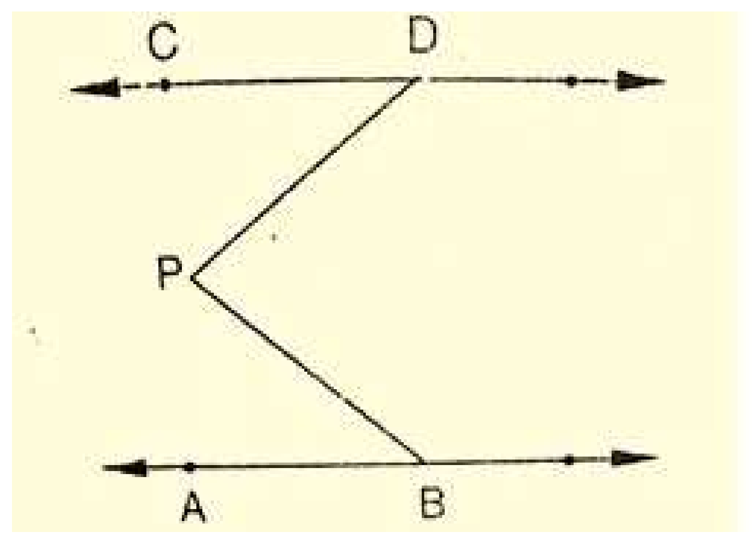
Also, B + ACB = 180

=> ACB =180 – 90 = ACES = 90° --(2)

From (i) and (ii), ACB = A0B = 90

Hence, the angles are equal as well as supplementary.

Q 11 : In the below fig, lines AB and CD are parallel and P is any point as shown in the figure. Show that $\angle ABP + \angle CDP = \angle DPB$.



Ans :

Given that AB ||CD

Let EF be the parallel line to AB and CD which passes through P

It can be seen from the figure

Alternative angles are equal

$\angle ABP = \angle BPF$

Alternative angles are equal

$\angle CDP = \angle DPF$

$\angle ABP + \angle CDP = \angle BPF + \angle DPF$

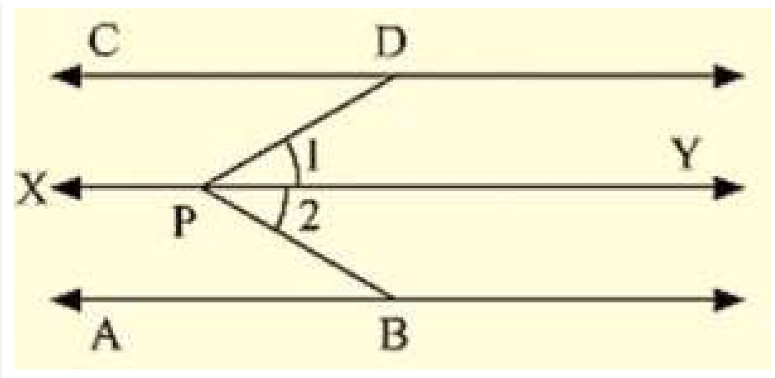
$\angle ABP + \angle CDP = \angle DPB$

Hence proved

AB parallel to CD, P is any point

To prove: $\angle ABP + \angle BPD + \angle CDP = 360^{\circ}$

Construction : Draw EF || AB passing through P



Proof : Since AB ||EF and AB || CD, Therefore EF || CD [Lines parallel to the same line are parallel to each other)

$\angle ABP + \angle EPB = 180^\circ$ [Sum of co-interior angles is180)

$\angle EPD + \angle COP = 180^\circ$ $--(1)$ [Sum of co-interior angles is180)

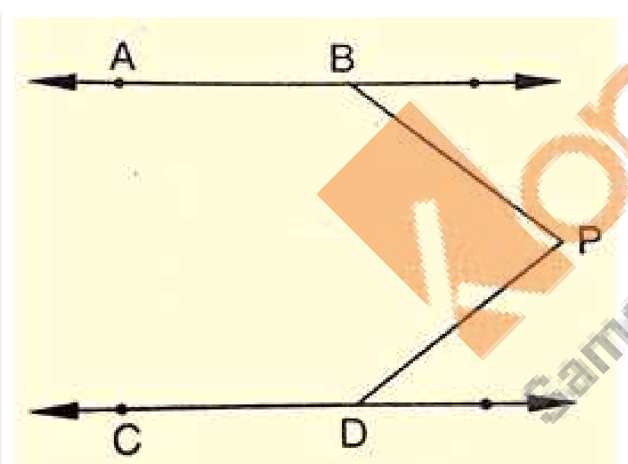
$\angle EPD + \angle CDP = 180^\circ$ $--(2)$

By adding (1) end (2)

$\angle ABP + \angle EPB + \angle EPD + \angle CDP = (180 + 180)^\circ$

$\angle ABP + \angle EPB + \angle COP = 360^\circ$

Q 12 : In the below fig, AB || CD and P is any point shown in the figure. Prove that :
$\angle ABP + \angle BPD + \angle CDP = 360^\circ$



Ans : Through P, draw a line PM parallel to AB or CD.

Now,

A8 || PM => ABP + BPM = 180

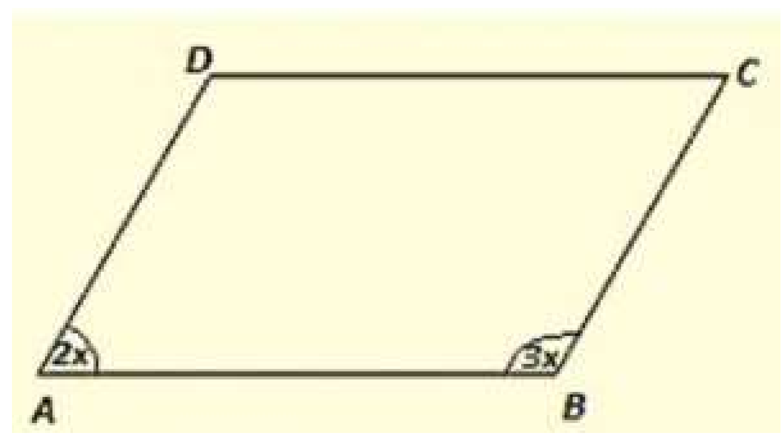
And

CD||PM = MPD + CDP = 180

Adding (i) and (ii), we get A8P + (BPM + MPD) CDP = 360

=> ABP + BPD + CDP = 360

Q 13 : Two unequal angles of a parallelogram are in the ratio 2 : 3. Find all its angles in degrees.



Ans : Let A = 2x and B = 3x

Now, A +B = 180 [Co-interior angles are supplementary]

2x + 3x – 180 [AD II BC and AB is the transversal)

=> 5x = 180

x = 180/5

x = 36

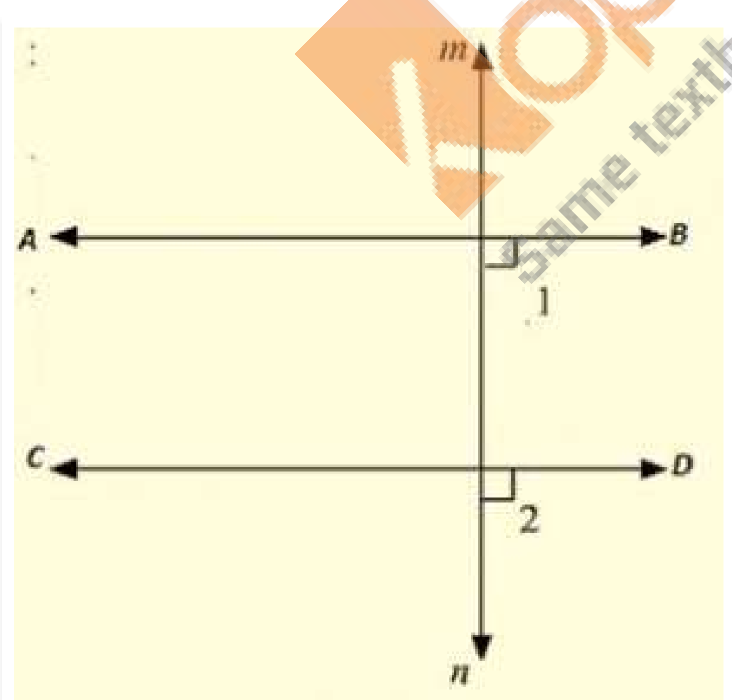
Therefore, A = 2 x 36 = 72

b = 3 x 36 = 108

Now, A = C = 72 [Opposite side angles of a parallelogram are equal)

B = D = 108

Q 14 : If each of the two lines is perpendicular to the same line, what kind of lines are they to each other?



Ans :

Let AB and CD be perpendicular to MN

ABD = 90 [AB perpendicular to MN] -- (i)

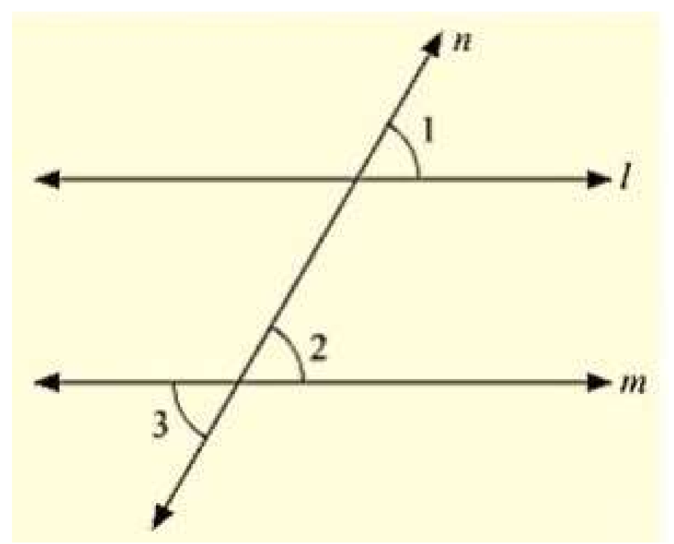
CON = 90 [CO perpendicular to MN] -- (ii)

Now, ABD = CDN = 90 (From (i) and (ii))

AB parallel to CD,

Since corresponding angles are equal

Q 15 : In the below fig, $\angle 1 = 60^\circ$ and $\angle 2 = (\frac{2}{3})$rd of a right angle. Prove that l|| m.



Ans : Given :

$\angle 1 = 60^\circ$ and $\angle 2 = (\frac{2}{3})$rd of a right angle

To prove : parallel Drawn to m

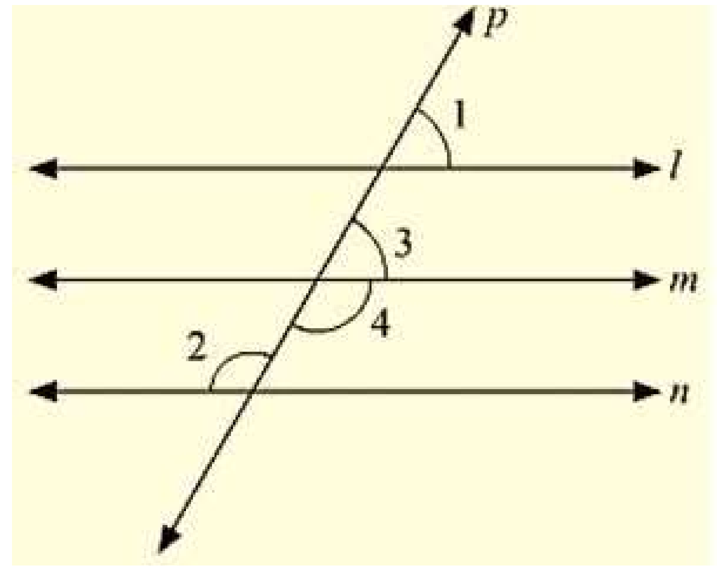
Proof $\angle 1$ = 60

$\angle 2 = (\frac{2}{3}) \times 90 \;=\; 60$

Since $\angle 1 = \angle 1 = 60^\circ$

Therefore, Parallel to m as pair of corresponding angles are equal.

16. In the below fig, if l||m||n and $\angle 1 = 60^\circ$. Find $\angle 2$.



Ans : Since l parallel to m and p is the transversal

Therefore, Given: l||m||n

$\angle 1 = 60^\circ$

To find $\angle 2$

$\angle 1 = \angle 3 = 60^\circ$ [Corresponding angles]

Now, $\angle 3 \text{and} \angle 4$ are linear pair of angles

$\angle 3 + \angle 4 = 180^\circ$

60 + $\angle 4$ = 180

$\angle 4$ = 180 – 60

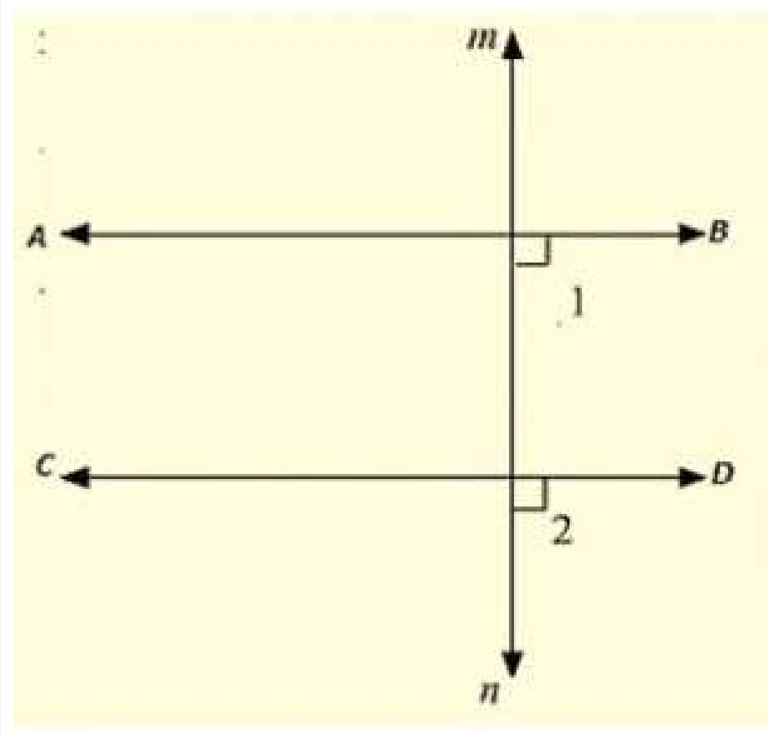
=> 120

Also, m||n and P is the transversal

Therefore $\angle 4$ = $\angle 2$ =120 (Alternative interior angle]

Hence 2 $\angle 2$ = 120

Q 17 : Prove that the straight lines perpendicular to the same straight line are parallel to one another.



Ans : Let AB and CD be drawn perpendicular to the Line MN

$\angle ABD = 90^\circ$ [AB is perpendicular to MN] --(i)

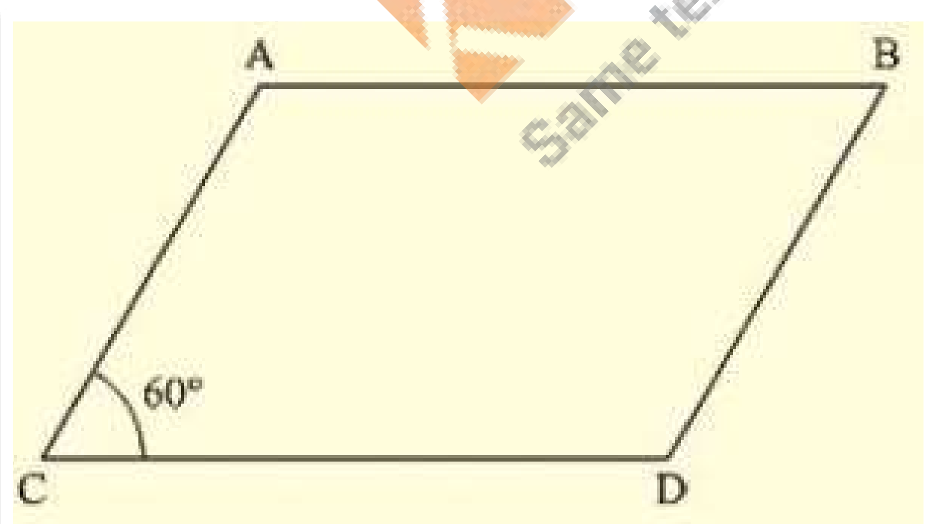
$\angle CON = 90^\circ$ [CD is perpendicular to MN] --(ii)

Now,

$\angle ABD = \angle CDN = 90^\circ$ [From (i) and (ii)]

Therefore, AB||CD, Since corresponding angles are equal.

Q 18 : The opposite sides of a quadrilateral are parallel. If one angle of the quadrilateral is 601. Find the other angles.



Ans : Given AB || CD

AD|| BC

Since AB || CD and AD is the transversal

Therefore, A + D = 180 (Co-interior angles are supplementary)

60 + D = 180

D = 180 – 60

D = 120

Now. AD || BC and AB is the transversal

A + B = 180   (Co-interior angles are supplementary)

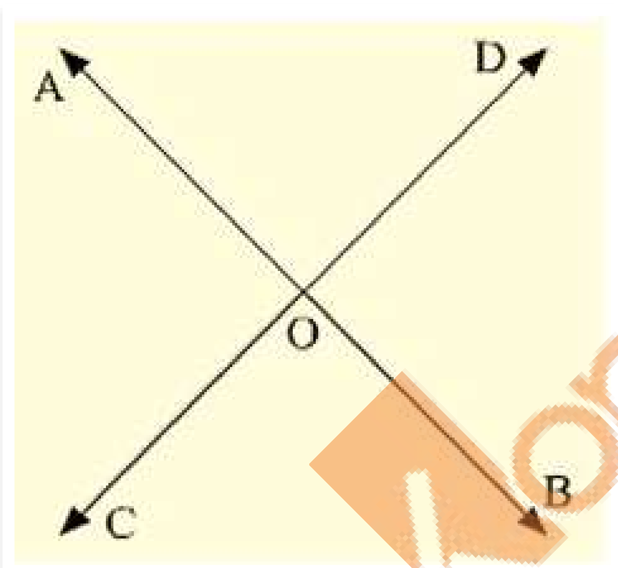
60 +B = 180

B = 180 – 60

= 120

Hence, $\angle A = \angle C = 60^\circ$ and $\angle B = \angle D = 120^\circ$

Q 19 : Two lines AB and CD intersect at O. If $\angle AOC + \angle COB + \angle BOD = 270^\circ$, find the measures of $\angle AOC, \angle COB, \angle BOD, \angle DOA$



Ans :

Given : $\angle AOC + \angle COB + \angle BOD = 270^\circ$

To find : $\angle AOC, \angle COB, \angle BOD, \angle DOA$

Here, $\angle AOC + \angle COB + \angle BOD = 270^\circ$ [Complete angle]

=>   270 + AOD = 360

=>   AOD = 360 – 270

=>   AOD = 90

Now, AOD + BOD = 180   [Linear pair]

90 + BOD = 180

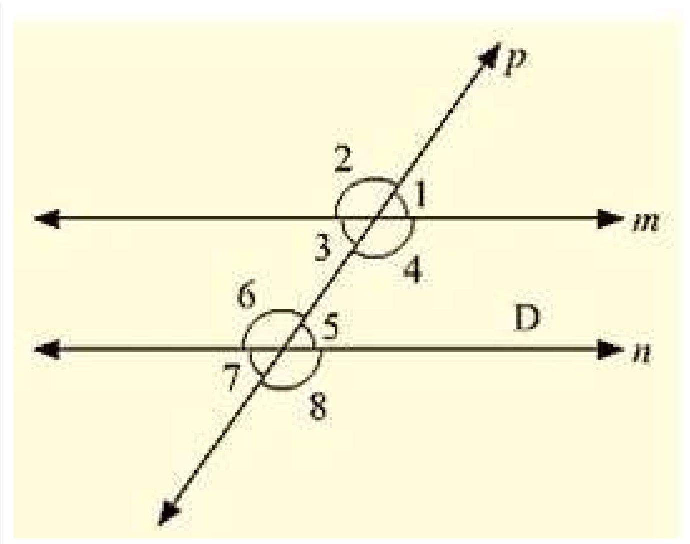
=> BOD = 180 – 90

=> BOD = 90

AOD = BOC = 90 [Vertically opposite angles]

BOD = AOC = 90 [Vertically opposite angles]

Q 20. In the below figure, p is a transversal to lines m and n, $\angle 2 = 120^\circ$ and $\angle 5 = 60^\circ$. Prove that m|| n.



Ans :

Given that

$\angle 2 = 120^\circ$ and $\angle 5 = 60^\circ$

To prove,

$\angle 2 + \angle 1 = 180^\circ$ [Linear pair]

$120 + \angle 1 = 180$

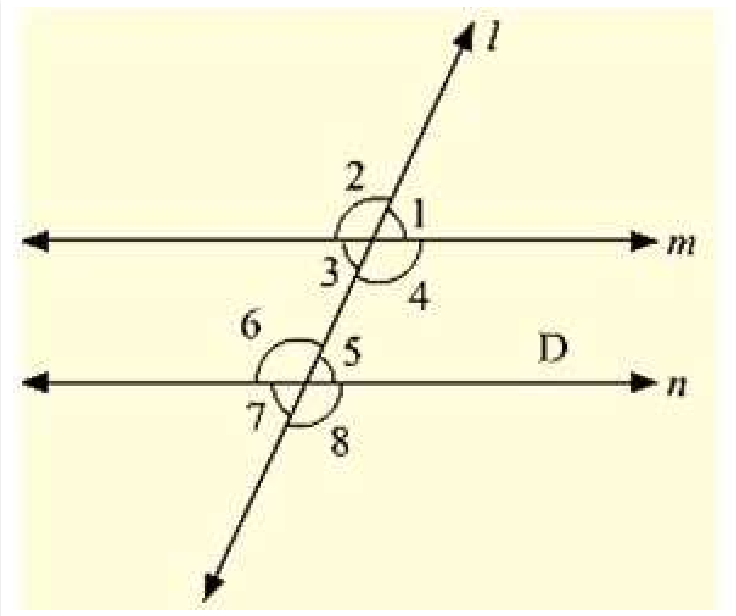
$\angle 1 = 180 - 120$

$\angle 1 = 60^\circ$

Since $\angle 1 = \angle 5 = 60^\circ$

Therefore, m||n [As pair of corresponding angles are equal]

Q 21 : In the below fig. transversal t intersects two lines m and n, $\angle 4 = 110^\circ$ and $\angle 7 = 65^\circ$ Is m||n ?



Ans : Given :

$\angle 4 = 110^\circ$ and $\angle 7 = 65^\circ$

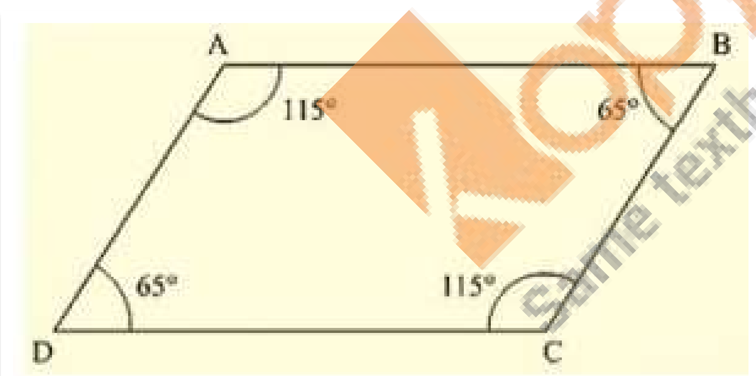
To find : Is m||n

Here. $\angle 7 = \angle 5 = 65^\circ$ [Vertically opposite angle]

Now. $\angle 4 + \angle 5 = 110 + 65 = 175^\circ$

Therefore, m is not parallel to n as the pair of co interior angles is not supplementary.

Q 22 : Which pair of lines in the below fig. is parallel ? give reasons.



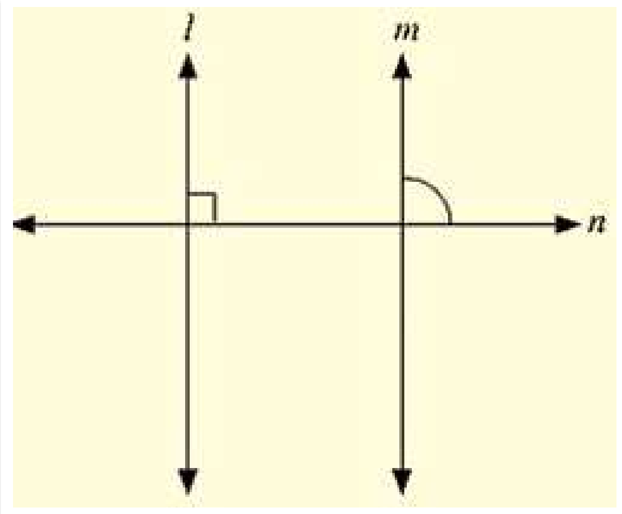
Ans : $\angle A + \angle B = 115 + 65 = 180^\circ$

Therefore, AB || BC [As sum of co interior angles are supplementary]

$\angle B + \angle C = 65 + 115 = 180^\circ$

Therefore, AB || CD (As sum of interior angles are supplementary]

Q 23 : If l, m, n are three lines such that l|| m and n perpendicular to l, prove that n perpendicular to m.



Ans :

Given, l||m, n perpendicular to l

To prove: n perpendicular to m

Since l||m and n intersects

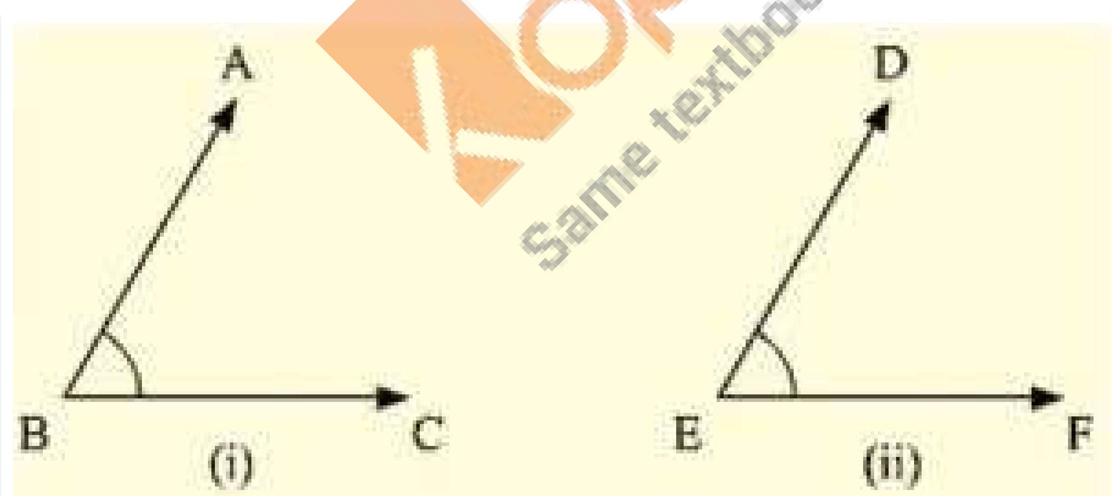
$\therefore \angle 1 = \angle 2$ [Corresponding angles]

But, U = 90

=> $\angle 2 = 90^{\circ}$

Hence n is perpendicular to m

Q 24 : In the below fig, arms BA and BC of $\angle ABC$ are respectively parallel to arms ED and EF of $\angle DEF$. Prove that $\angle ABC = \angle DEF$.



Ans :

Given

AB || DE and BC || EF

To prove : $\angle ABC = \angle DEF$

Construction: Produce BC to x such that it intersects DE at M.

Proof : Since AB || DE and BX is the transversal

ABC = DMX [Corresponding angle] −−(i)

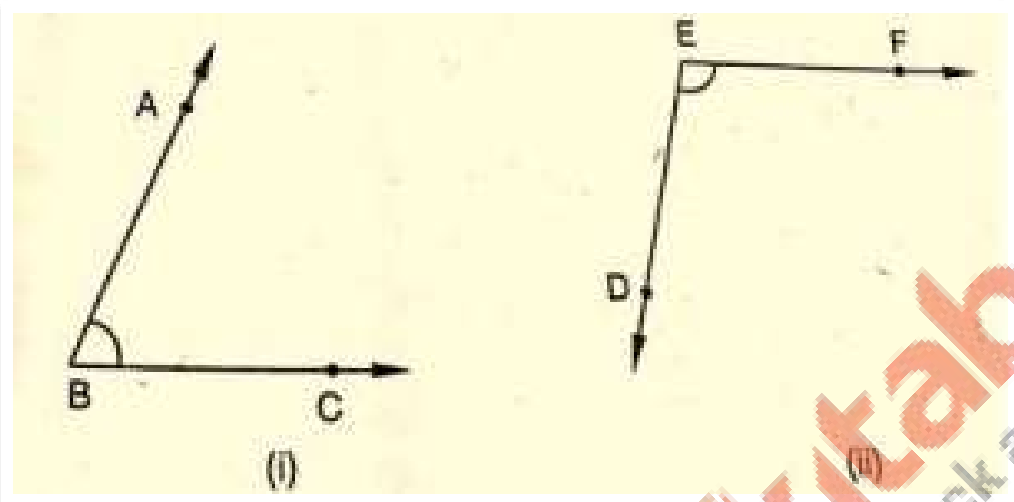
Also, BX || EF and DE Is the transversal

DMX = DEF [Corresponding angles] −−(ii)

From (i) and (ii)

$\angle ABC = \angle DEF$

Q 25: In the below fig, arms BA and BC of ABC are respectively parallel to arms ED and EF of DEF Prove that $\angle ABC + \angle DEP = 180^\circ$



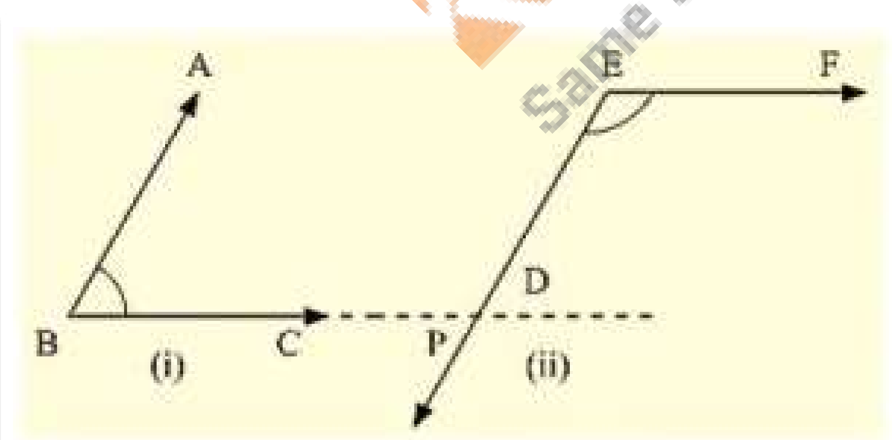
Ans :

Given:

AB II DE, BC II EF

To prove: $\angle ABC + \angle DEF = 180^\circ$

Construction: Produce BC to intersect DE at M



Proof :

Since AB || EM and BL is the transversal

$\angle ABC = \angle EML$ [Corresponding angle] −−(i)

Also,

EF || ML and EM is the transversal

By the property of co-interior angles are supplementary

$\angle DEF + \angle EML = 180^\circ$ (ii)

From (i) and (ii) we have

Therefore $\angle DEF + \angle ABC = 180^\circ$

Q 26 : With of the following statements are true (T) and which are false (F)? Give reasons.

(1) If two lines are intersected by a transversal, then corresponding angles are equal.

(ii) If two parallel lines are intersected by a transversal, then alternate interior angles are equal.

(ii) Two lines perpendicular to the same line are perpendicular to each other.

(iv) Two lines parallel to the same line are parallel to each other.

(v) If two parallel lines are intersected by a transversal, then the interior angles on the same side of the transversal are equal.

Ans :

(i) False

(ii)True

(iii) False

(iv) True

(v) False

Q 27: Fill in the blanks in each of the following to make the statement true:

(i) If two parallel lines are intersected by a transversal, then each pair of corresponding angles are ___________

(ii) If two parallel lines are intersected by a transversal, then interior angles on the same side of the transversal are ____________

(iii) Two lines perpendicular to the same line are ______ to each other

(Iv) Two lines parallel to the same line are _________ to each other.

(v) If a transversal intersects a pair of lines in such a way that a pair of alternate angles we equal. then the lines are __________

(vi) If a transversal intersects a pair of lines in such a way that the sum of interior angles on the seine side of transversal is 180'. then the lines are ____________

Ans :

(i) Equal

(ii) Parallel

(iii) Supplementary

(iv) Parallel

(v) Parallel

(vi) Parallel