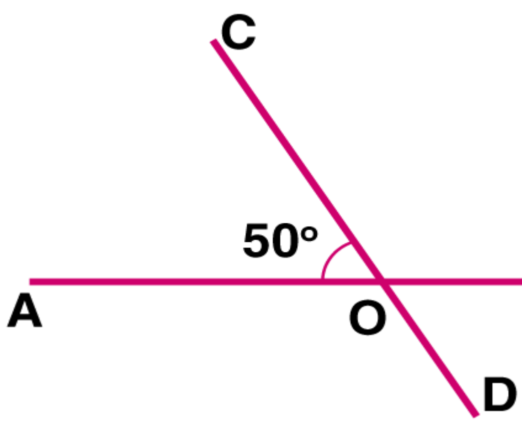
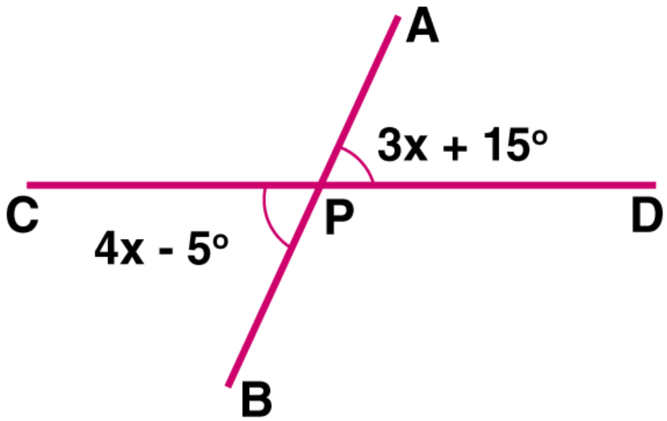
EXERCISE 25(A)

1. Two straight lines AB and CD intersect each other at a point O and angle AOC = 50^0; find:
(i) angle BOD
(ii) ∠AOD
(iii) ∠BOC



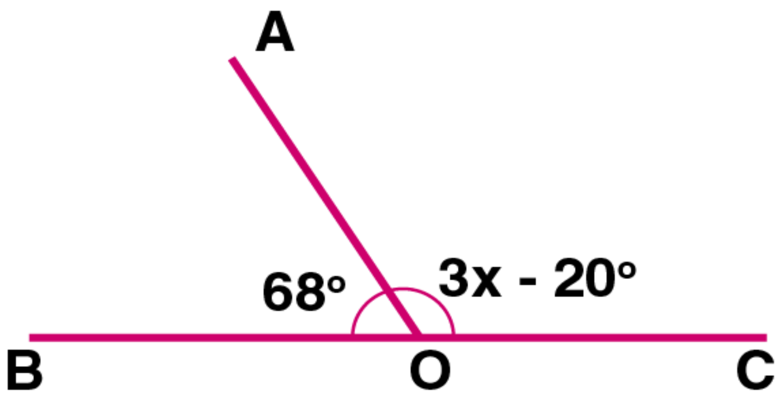
Solution:
(i) ∠BOD
Given ∠AOC = 50^0
We know that,
Vertically opposite angles are equal
So, ∠BOD = ∠AOC
Therefore, ∠BOD = 50^0
(ii) ∠AOD
∠AOD + ∠BOD = 180^0
∠AOD + 50^0 = 180^0 {From (i)}
∠AOD = $180^0 – 50^0$
We get,
∠AOD = 130^0
(iii) ∠BOC
We know that,
Vertically opposite angles are equal
So, ∠BOC = ∠AOD
Therefore, ∠BOC = 130^0

2. The adjoining figure, shows two straight lines AB and CD intersecting at P. If ∠BPC = $4x – 5^0$ and ∠APD = $3x + 15^0$; find:



(i) the value of x
(ii) ∠APD
(iii) ∠BPD
(iv) ∠BPC
Solution:
(i) The value of x is calculated as,
$3x + 15^0 = 4x – 5^0$
$3x – 4x = - 5^0 - 15^0$
$- x =- 20^0$
$x = 20^0$
(ii) the value of ∠APD is calculated as,
$\angle APD = 3x + 15^0$
$= 3 \times 20^0 + 15^0$
We get,
$= 60^0 + 15^0$
$= 75^0$
(iii) The value of ∠BPD is calculated as,
$\angle BPD = 180 – \angle BPC$
$= 180^0 – (4x - 5^0)$
$= 180^0 – (4 \times 20^0 – 5^0)$
$= 180^0 – 80^0 + 5^0$
We get,
$= 105^0$
(iv) The value of ∠BPC is calculated as,
$\angle BPC = (4x – 5^0)$
$= (4 \times 20^0 – 5^0)$
We get,
$= 80^0 - 5^0$
$= 75^0$

3. The given diagram, shows two adjacent angles AOB and AOC, whose exterior sides are along the same straight line. Find the value of x.



Solution:

Here, the exterior arms of the adjacent angles are in a straight line,

Hence, the adjacent angles are supplementary

$\angle AOB + \angle AOC = 180^0$

$68^0 + (3x - 20^0) = 180^0$

$68^0 + 3x – 20^0 = 180^0$

$3x = 180^0 + 20^0 - 68^0$

$3x = 200^0 - 68^0$

We get,

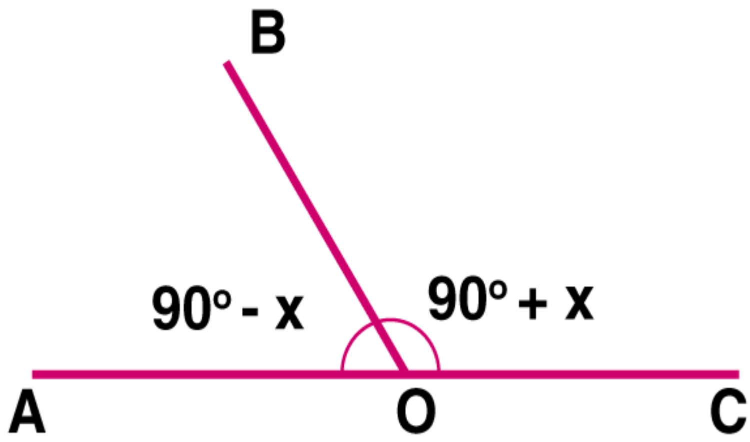
$3x = 132^0$

$x = 132^0 / 3$

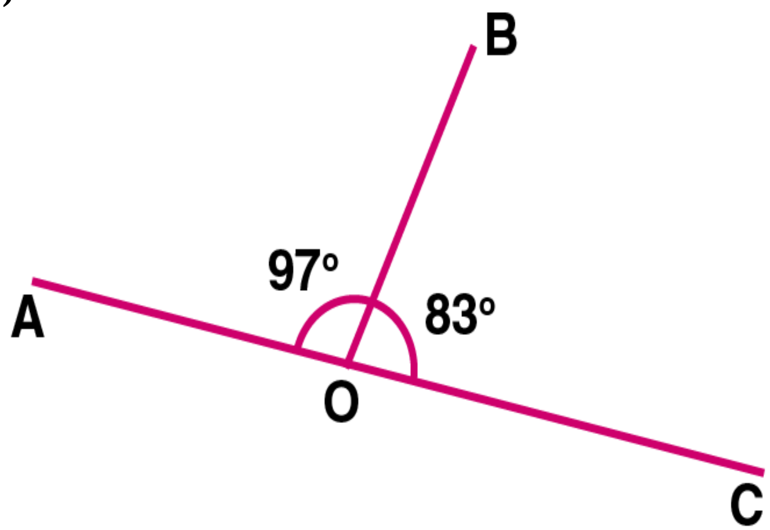
$x = 44^0$

4. Each figure given below shows a pair of adjacent angles AOB and BOC. Find whether or not the exterior arms OA and OC are in the same straight line.

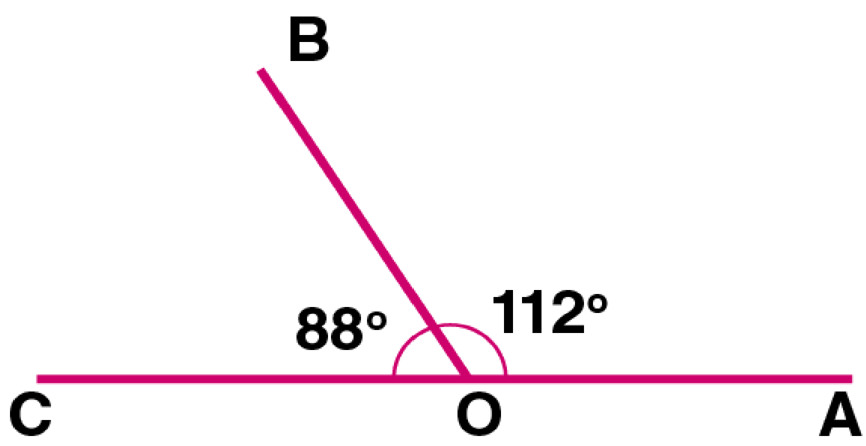
(i)



(ii)



(iii)



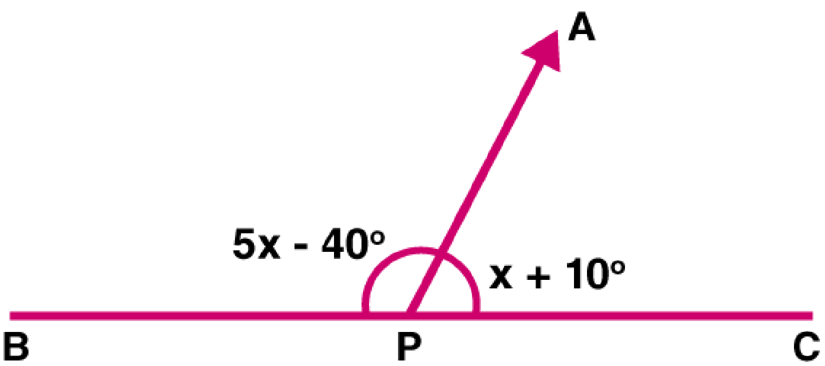
Solution:

(i) We know that,

The sum of adjacent angles AOB and COB = 180^0

Hence,
$\angle AOB + \angle COB = 180^0$
$(90^0 - x) + (90^0 + x) = 180^0$
$90^0 - x + 90^0 + x = 180^0$
We get,
$180^0 = 180^0$
The exterior arms OA and OC are in the same straight line
(ii) $\angle AOB + \angle BOC = 97^0 + 83^0$
$= 180^0$
The sum of adjacent angles AOB and BOC is 180^0
Hence, the exterior arms OA and OC are in the same straight line
(iii) $\angle COB + \angle AOB = 88^0 + 112^0$
We get,
$= 200^0$ [which is not equal to 180^0]
Hence, the exterior arms OA and OC are not in the same straight line

5. A line segment AP stands at point P of a straight line BC such that $\angle APB = 5x - 40^0$ and $\angle APC = x + 10^0$; find the value of x and angle APB.
Solution:
Given
A line segment AP stands at P and
$\angle APB = 5x - 40^0$
$\angle APC = x + 10^0$



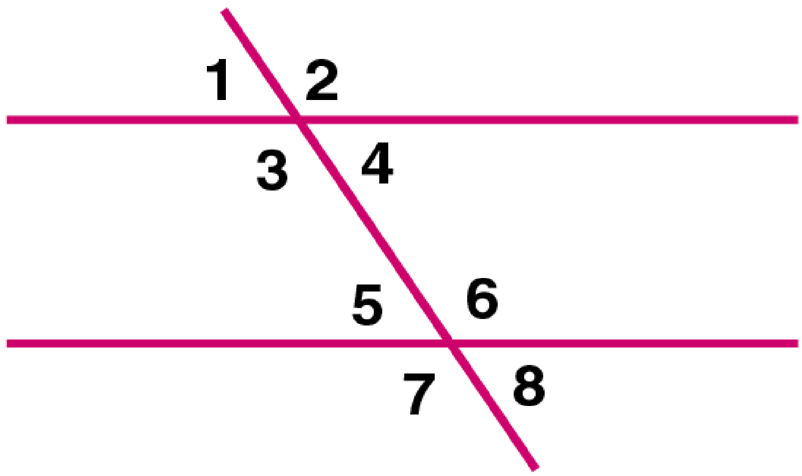
(i) BPC is a straight line
$\angle APB + \angle APC = 180^0$
$5x - 40^0 + x + 10^0 = 180^0$
$6x - 30^0 = 180^0$
$6x = 180^0 + 30^0$
We get,
$6x = 210^0$

$x = 210^0 / 6$
$x = 35^0$
(ii) $\angle APB = 5x - 40^0$
$= 5 \times 35^0 - 40^0$
We get,
$= 175^0 – 40^0$
$= 135^0$

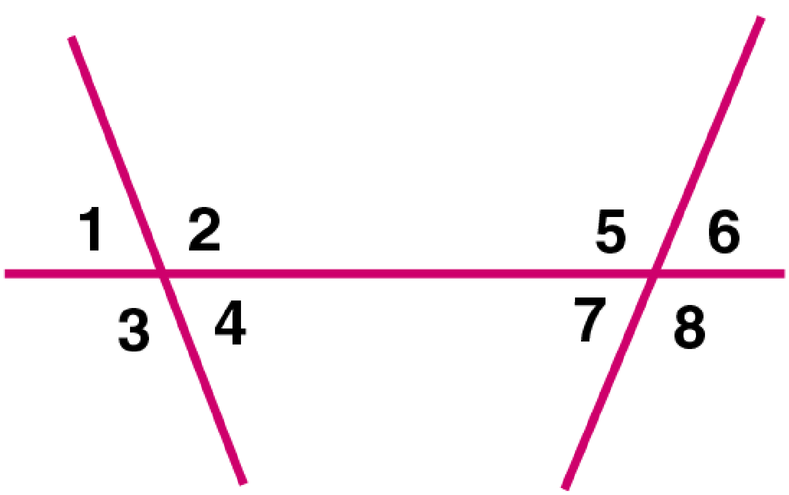
EXERCISE 25(B)

1. Identify the pair of angles in each of the figure given below:
adjacent angles, vertically opposite angles, interior alternate angles, corresponding angles or exterior alternate angles.

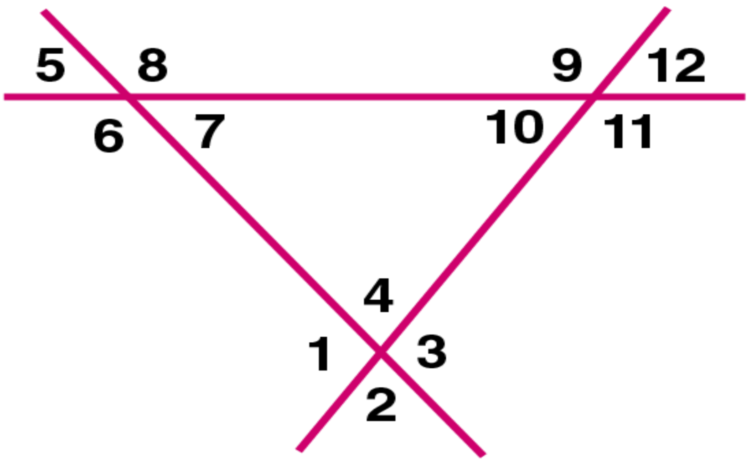
(a) (i) ∠2 and ∠4
(ii) ∠1 and ∠8
(iii) ∠4 and ∠5
(iv) ∠1 and ∠5
(v) ∠3 and ∠5



(b) (i) ∠2 and ∠7
(ii) ∠4 and ∠8
(iii) ∠1 and ∠8
(iv) ∠1 and ∠5
(v) ∠4 and ∠7

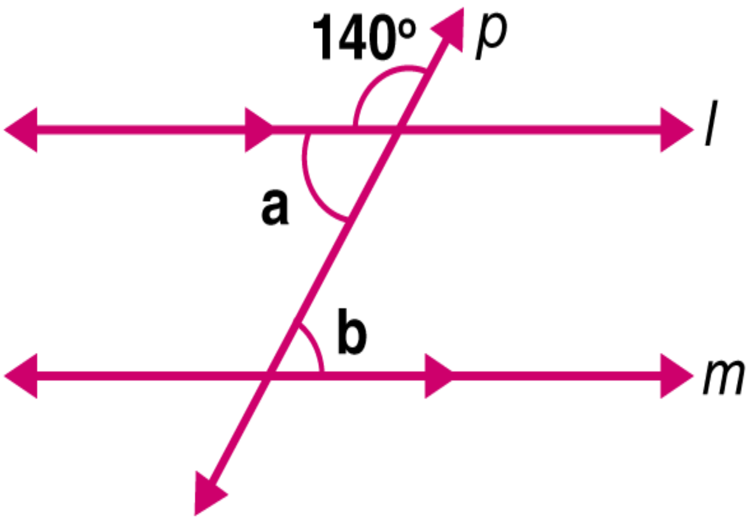


(c) (i) ∠1 and ∠10
(ii) ∠6 and ∠12
(iii) ∠8 and ∠10
(iv) ∠4 and ∠11
(v) ∠2 and ∠8
(vi) ∠5 and ∠7

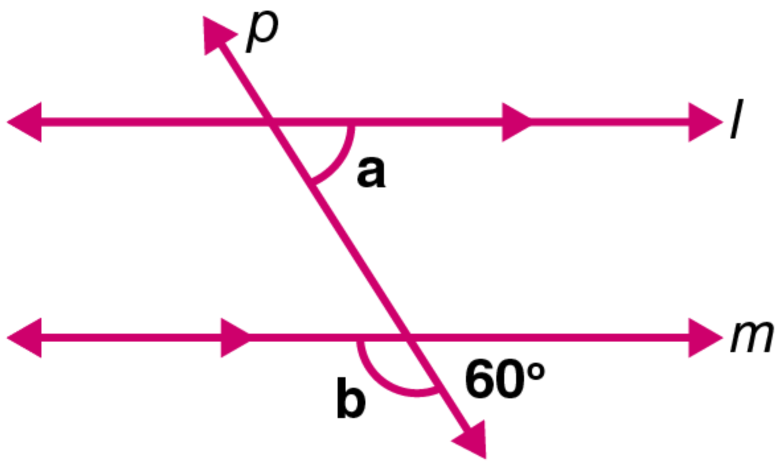


Solution:
(a) (i) ∠2 and ∠4 = Adjacent angles
(ii) ∠1 and ∠8 = Alternate exterior angles
(iii) ∠4 and ∠5 = Alternate interior angles
(iv) ∠1 and ∠5 = Corresponding angles
(v) ∠3 and ∠5 = Allied angles
(b) (i) ∠2 and ∠7 = Alternate interior angles
(ii) ∠4 and ∠8 = Corresponding angles
(iii) ∠1 and ∠8 = Alternate exterior angles
(iv) ∠1 and ∠5 =Corresponding angles
(v) ∠4 and ∠7 = Allied angles
(c)(i) ∠1 and ∠10 = Corresponding angles
(ii) ∠6 and ∠12 = Alternate exterior angles
(iii) ∠8 and ∠10 = Alternate interior angles
(iv) ∠4 and ∠11 = Alternate interior angles
(v) ∠2 and ∠8 = Alternate exterior angles
(vi) ∠5 and ∠7 = Vertically opposite angles

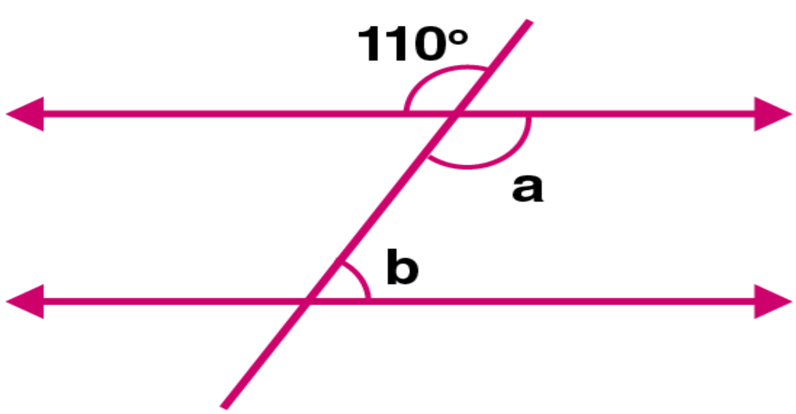
2. Each figure given below shows a pair of parallel lines cut by a transversal. For each case, find a and b, giving reasons.
(i)



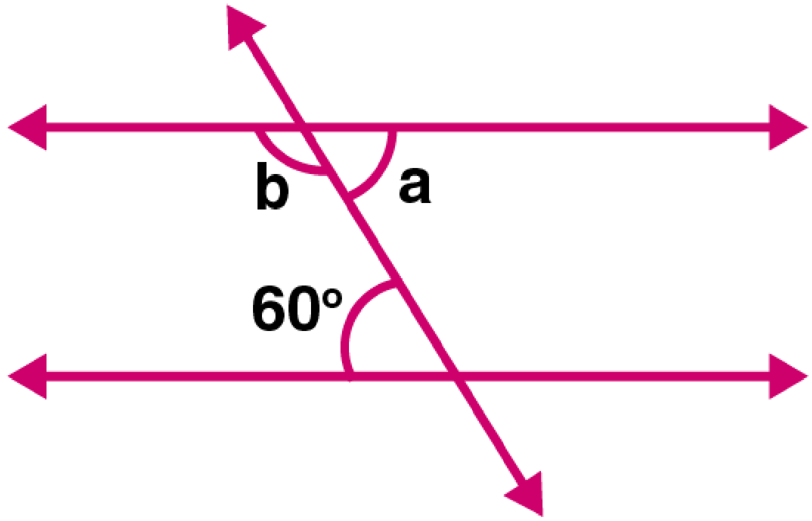
(ii)



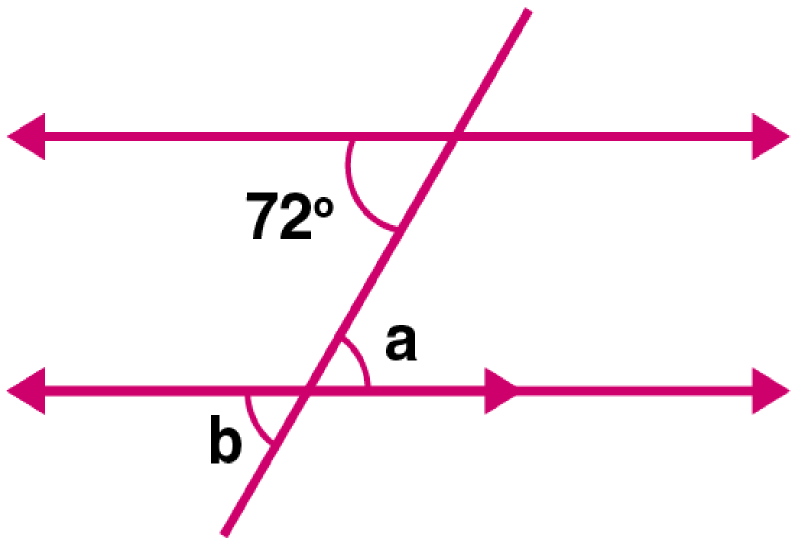
(iii)



(iv)



(v)



Solution:

(i) $a + 140^0 = 180^0$ [Linear pair]

$a = 180^0 - 140^0$

We get,

$a = 40^0$

Here, b = a {alternate angles}

Hence, $a = b = 40^0$

(ii) Given

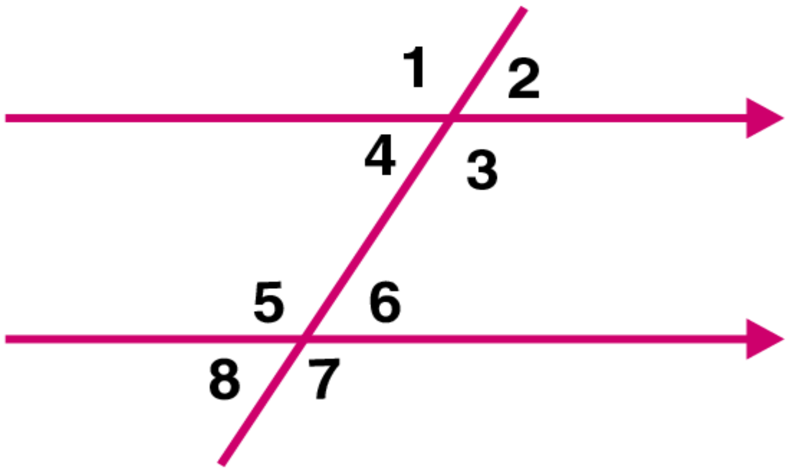
l || m and p intersects them

$b + 60^0 = 180^0$ [Linear pair]

$b = 180^0 - 60^0$

We get,
b = 120^0
and a = 60^0 {corresponding angles}
Hence, a = 60^0
b = 120^0
(iii) a = 110^0 [Vertically opposite angles]
b = $180^0 - a$ [Co-interior angles]
= $180^0 - a$
= $180^0 - 110^0$
We get,
= 70^0
(iv) a = 60^0 [Alternate interior angles]
b = $180^0 - a$ [Co-interior angles]
= $180^0 - 60^0$
We get,
= 120^0
(v) a = 72^0 [Alternate interior angles]
b = a [Vertically opposite angles]
Hence, b = 72^0

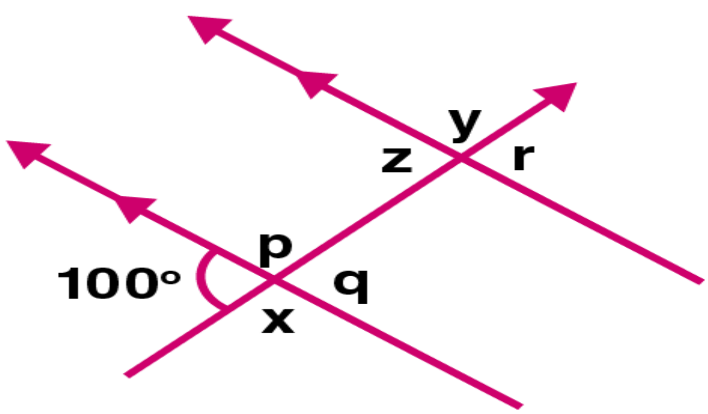
3. If ∠1 = 120^0, find the measures of: ∠2, ∠3, ∠4, ∠5, ∠6, ∠7 and ∠8. Give reasons.



Solution:
Given
l || m and p is their transversal and
∠1 = 120^0
∠1 + ∠2 = 180^0 [Straight line angle]
120^0 + ∠2 = 180^0
∠2 = 180^0 - 120^0

We get,
$\angle 2 = 60^0$
Therefore, $\angle 2 = 60^0$
But $\angle 1$ and $\angle 3$ [Vertically opposite angles]
Hence, $\angle 3 = \angle 1 = 120^0$
Similarly,
$\angle 4 = \angle 2$ [Vertically opposite angles]
$\angle 4 = 60^0$
$\angle 5 = \angle 1$ [Corresponding angles]
Hence, $\angle 5 = 120^0$
Similarly,
$\angle 6 = \angle 2$ [Corresponding angles]
$\angle 6 = 60^0$
$\angle 7 = \angle 5$ [Vertically opposite angles]
Hence, $\angle 7 = 120^0$
and $\angle 8 = \angle 6$ [Vertically opposite angles]
Hence, $\angle 8 = 60^0$
Therefore, the measures of angles are,
$\angle 2 = 60^0$
$\angle 3 = 120^0$
$\angle 4 = 60^0$
$\angle 5 = 120^0$
$\angle 6 = 60^0$
$\angle 7 = 120^0$ and
$\angle 8 = 60^0$

4. In the figure given below, find the measure of the angles denoted by x, y, z, p, q and r.



Solution:

$x = 180^0 - 100^0$ (Linear pair of angles)

$x = 80^0$

$y = x$ (Alternate exterior angles)

$y = 80^0$

$z = 100^0$ (Corresponding angles)

$p = x$ (Vertically opposite angles)

$p = 80^0$

$q = 100^0$ (Vertically opposite angles)

$r = q$ (Corresponding angles)

$r = 100^0$

Therefore, the measures of angles are,

$x = y = p = 80^0$

$q = r = z = 100^0$

5. Using the given figure, fill in the blanks.

∠x = ………..;

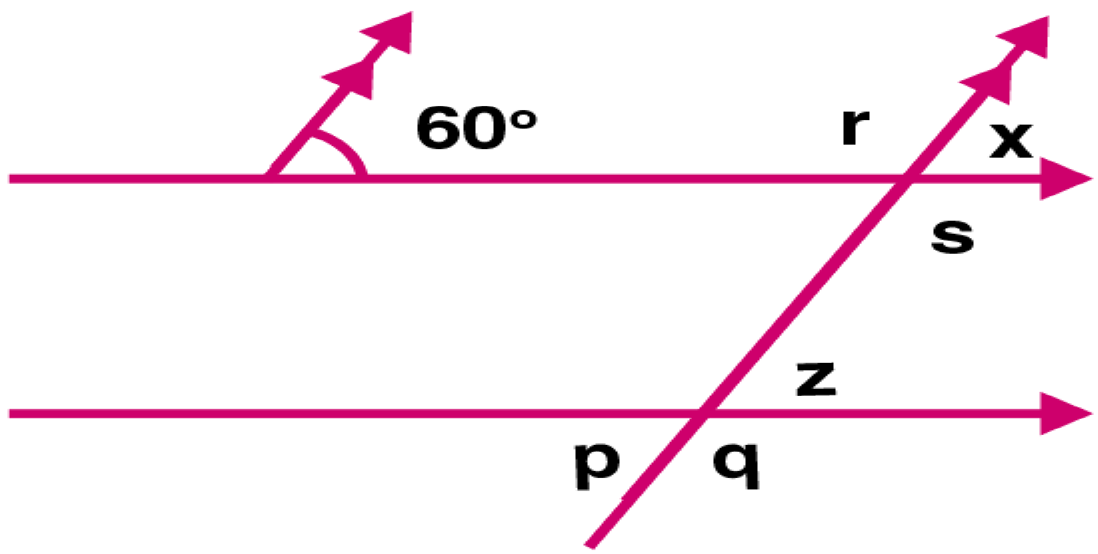
∠z = ………..;

∠p = ………..;

∠q = ………..;

∠r = …………;

∠s = …………;



Solutions:

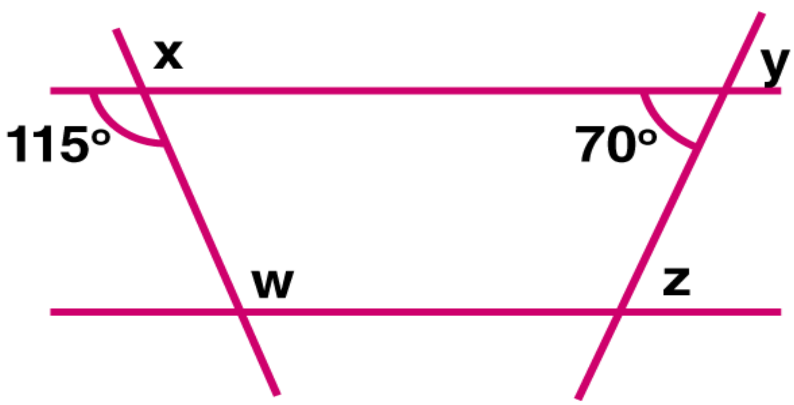
$\angle x = 60^0$ (Corresponding angles)

$z = x$ (Corresponding angles)

$= 60^0$

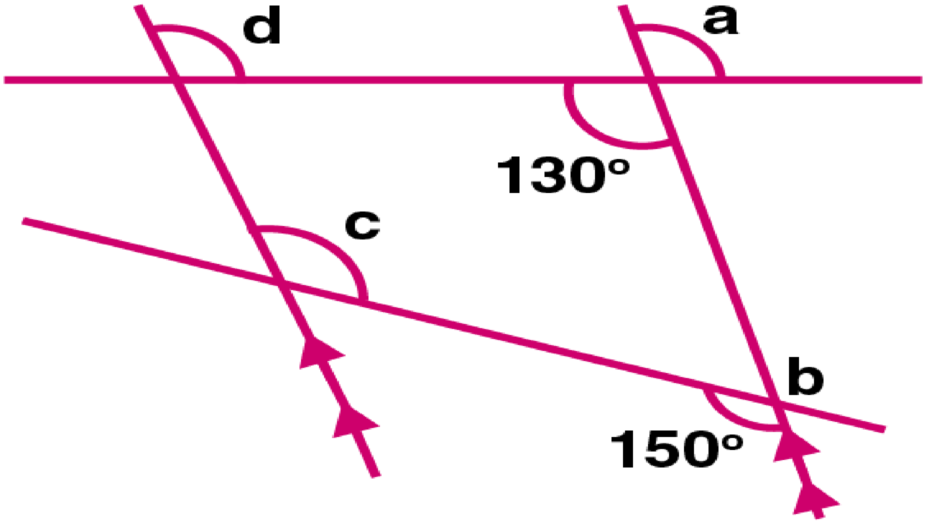
p = z (Vertically opposite angles)
$= 60^0$
$q = 180^0 - p$ (Linear pair of angles)
$= 180^0 - 60^0$
We get,
$= 120^0$
$r = 180^0 - x$ (Linear pair of angles)
$= 180^0 - 60^0$
We get,
$= 120^0$
s = r (Vertically opposite angles)
$s = r = 120^0$

6. In the given figure, find the angles shown by x, y, z and w. Give reasons.



Solution:
$x = 115^0$ (By vertically opposite angles)
$y = 70^0$ (By vertically opposite angles)
$z = 70^0$ (By alternate interior angles)
$w = 115^0$ (By alternate interior angles)

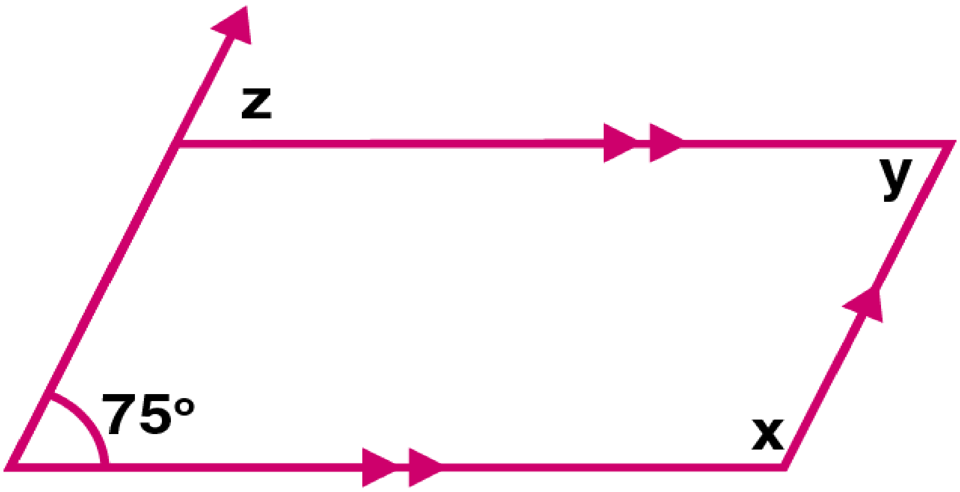
7. Find a, b, c and d in the figure given below:



Solution:

a = 130^0 (By vertically opposite angles)
b = 150^0 (By vertically opposite angles)
c = 150^0 (By alternate interior angles)
d = 130^0 (By alternate interior angles)

8. Find x, y and z in the figure given below:



Solution:

x = 180^0 - 75^0 (Co-interior angles)
We get,
x = 105^0
y = 180^0 – x (Co-interior angles)
y = 180^0 – 105^0
We get,
y = 75^0

$z = 75^0$ (Corresponding angles)

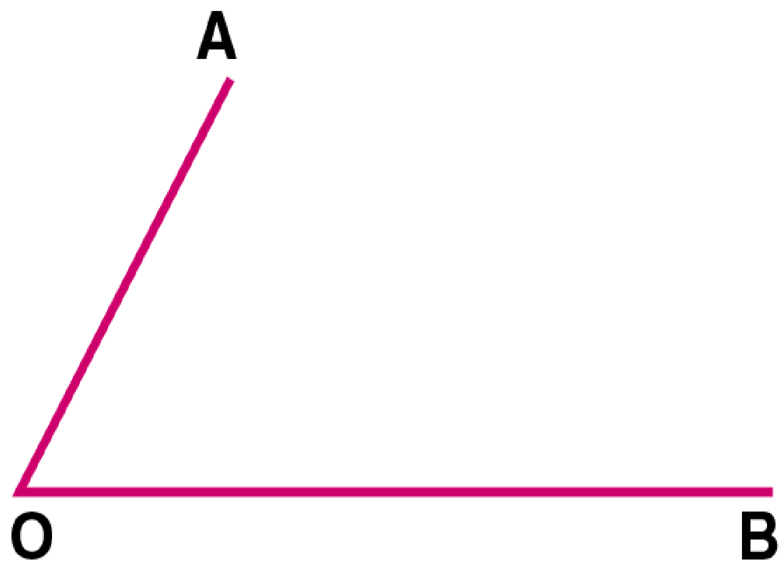
Therefore, the angles are,

$x = 105^0$, $y = 75^0$ and $z = 75^0$

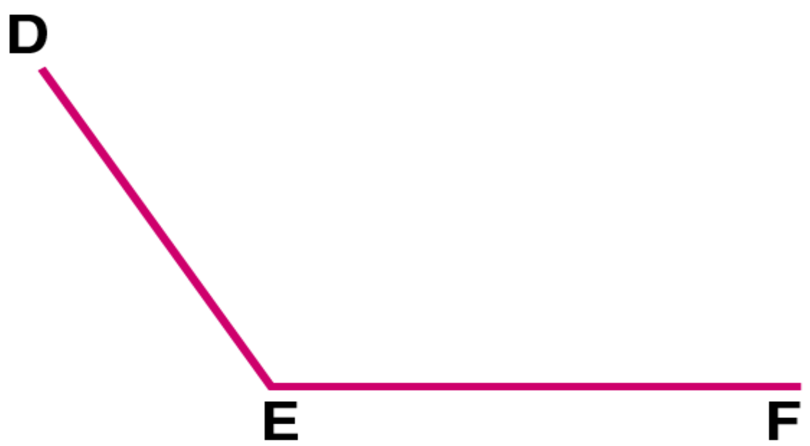
EXERCISE 25(C)

1. In your note-book copy the following angles using ruler and a pair compass only.

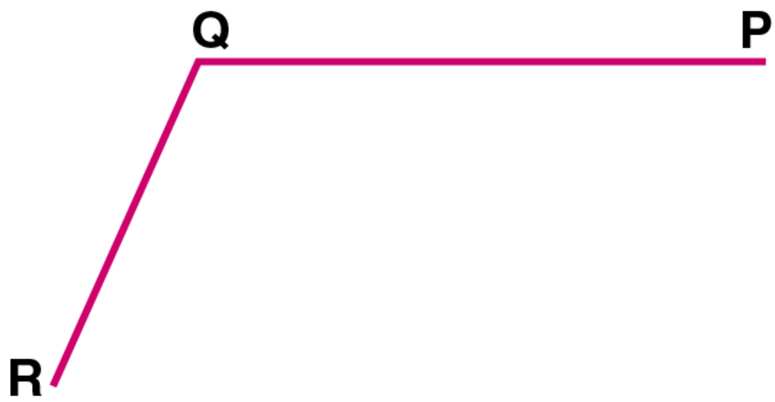
(i)



(ii)



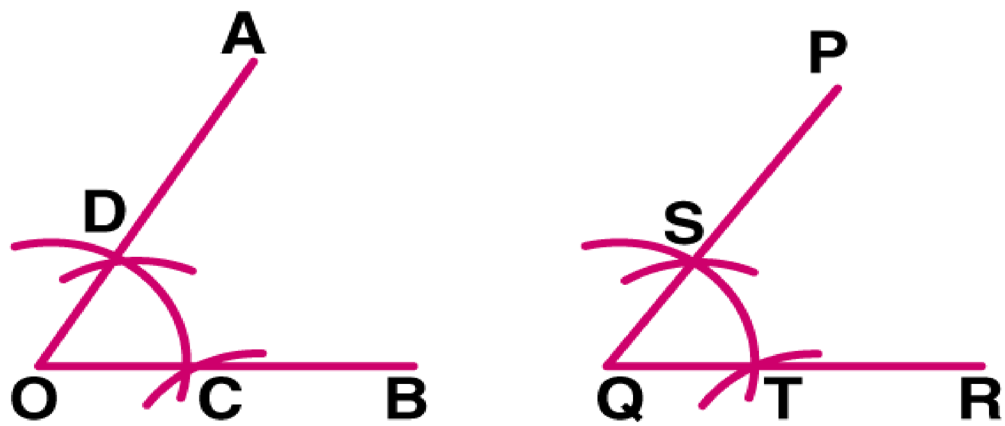
(iii)



Solution:

(i) Steps of Construction:

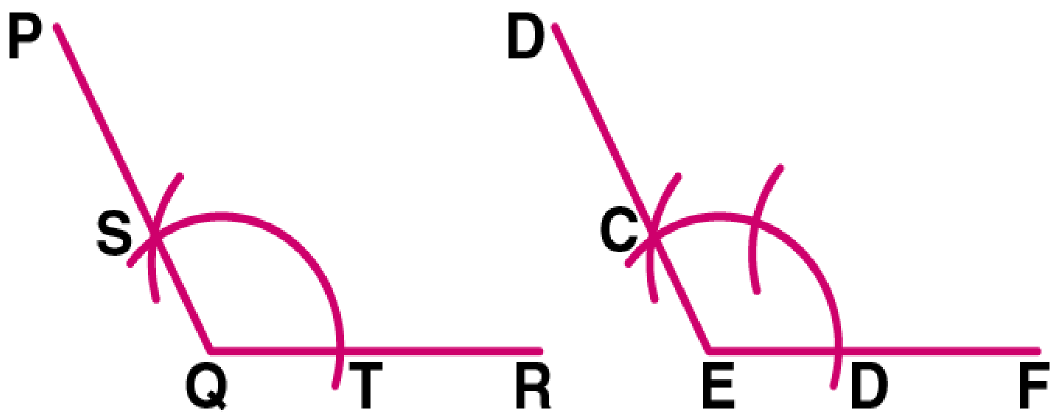
1. Draw line QR = OB at point Q



2. Keeping O as centre, draw an arc of any suitable radius, to cut the arms of the angle at points C and D
3. Keeping Q as centre, draw the arc of the same size as drawn for C and D. Let this arc line cuts line QR at point T
4. With the help of compasses, take the distance equal to distance between C and D; and then taking T as centre, draw an arc which cuts the earlier arc at point S.
5. Join QS and produce up to a suitable point P. Now, the obtained ∠PQR , is the angle equal to the given ∠AOB

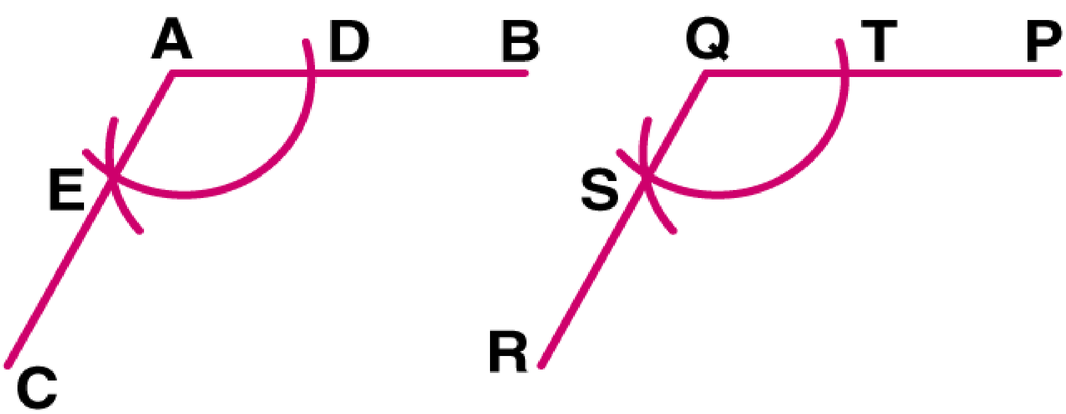
(ii) Steps of Construction:

1. Draw a line EF, at a point E



2. Taking E as centre, draw an arc of any suitable radius, to cut the arms of the angle at points C and D
3. Taking Q as centre, draw an arc of the same size as drawn for points C and D. Let this arc cuts line QR at point T
4. With the help of compasses, take the distance equal to the distance between C and D; and then taking T as centre, draw an arc which cuts the earlier arc at point S
5. Join QS and produce up to a suitable point S. Now, the obtained ∠PQR is the angle equal to the the given ∠DEF

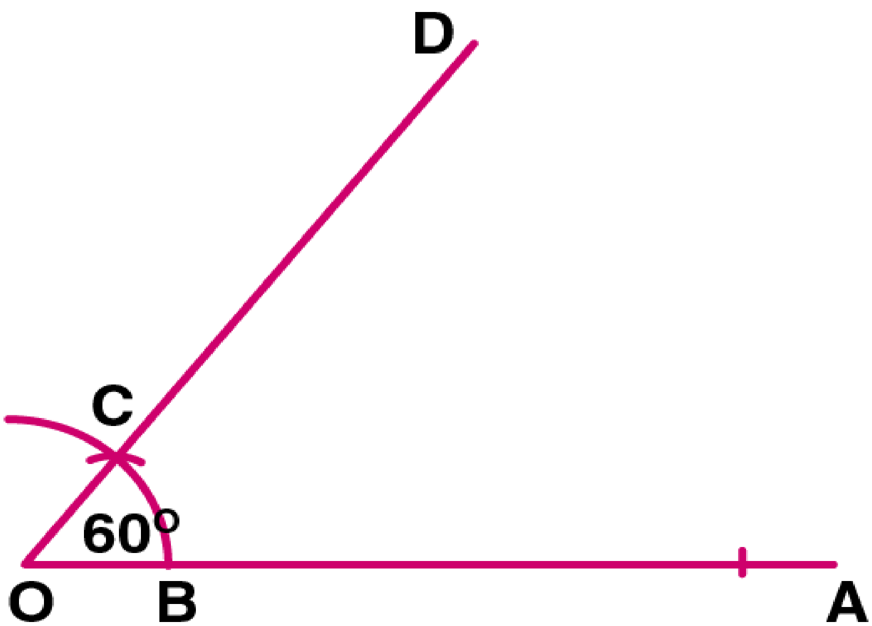
(iii) Steps of Construction:
1. Draw a line AB = QP at a point A



2. Taking Q as centre, draw an arc of any suitable radius, to cut the arms of the angle T and S
3. Taking A as centre, draw an arc of the same size as drawn for points T and S. Let this arc cuts the line AB at point D
4. With the help of compasses, take the distance equal to the distance between T and S; and then taking D as centre, draw an arc which cuts the earlier arc at point E

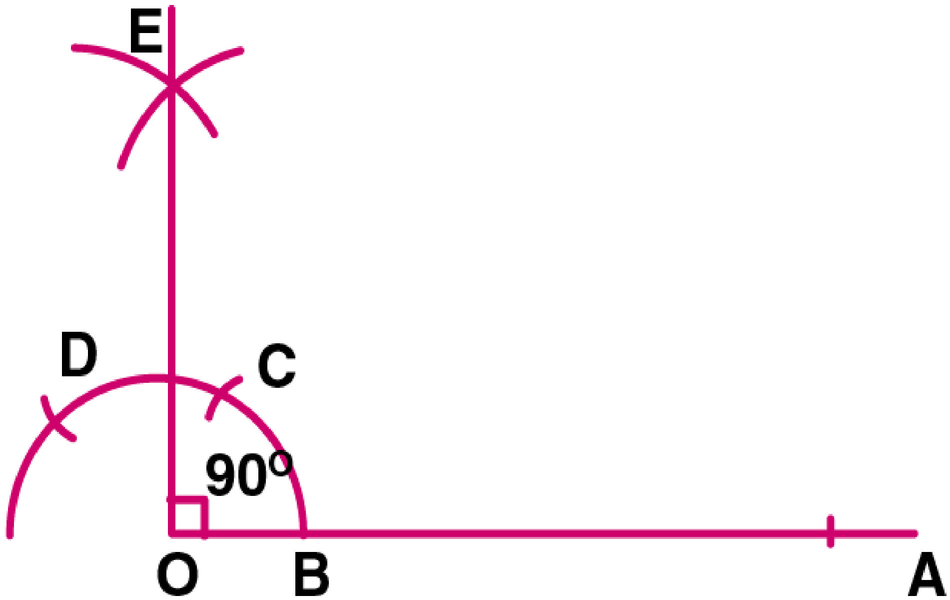
5. Join AE produced up to a suitable point C. The obtained ∠BAC is the angle equal to the given ∠PQR

2. Construct the following angles, using ruler and a pair of compass only
(i) 60^0
(ii) 90^0
(iii) 45^0
(iv) 30^0
(v) 120^0
Solution:
(i) Steps of Construction:
Constructing the angle of 60^0



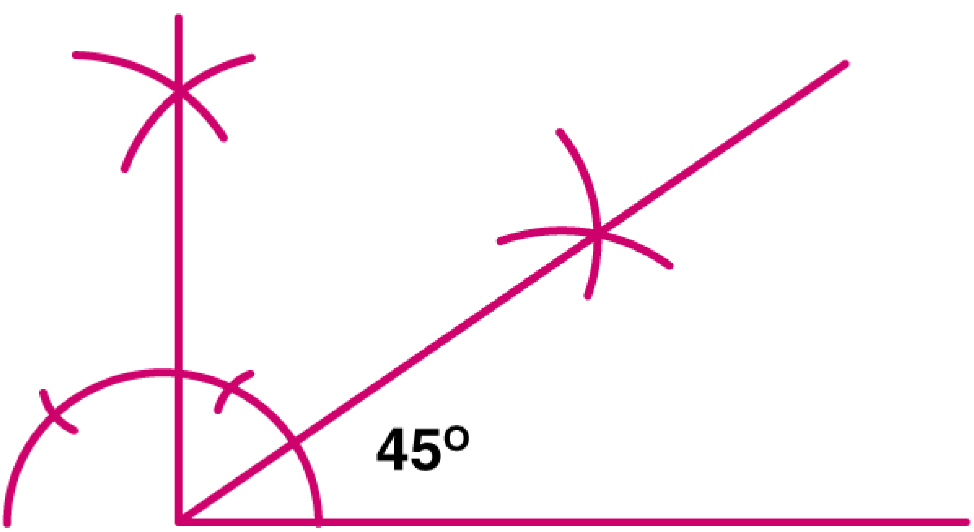
1. Draw a line OA of any suitable length
2. Taking O as centre, draw an arc of any size to cut OA at point B
3. Now, taking B as centre, draw the same size arc, to cut the previous arc at point C
4. Join OC and produce up to a suitable point D. Then, the obtained ∠DOA is the angle of 60^0

(ii) Steps of Construction:
Constructing angle of 90^0
Let OA be the line and at point O, the angle of 90^0 is to be drawn

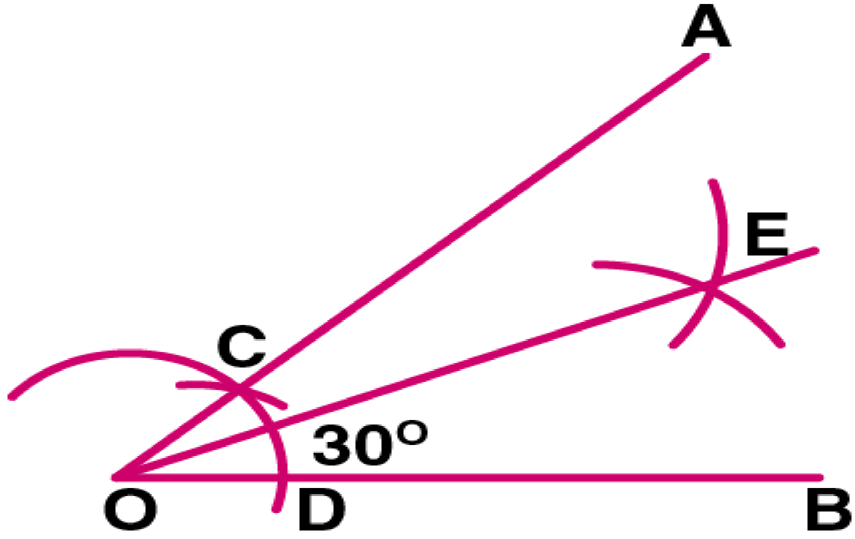


1. Taking O as centre, draw an arc to cut the arm OA at point B
2. Taking B as centre, draw the same size arc to cut the previous arc at point C
3. Again with C as centre and with the same radius, draw one more arc to cut the previous arc at point D
4. Now, taking C and D as centres, draw two arcs of equal radii to cut each other at point E.
5. Join O and E. Then $\angle AOE = 90^0$ is obtained

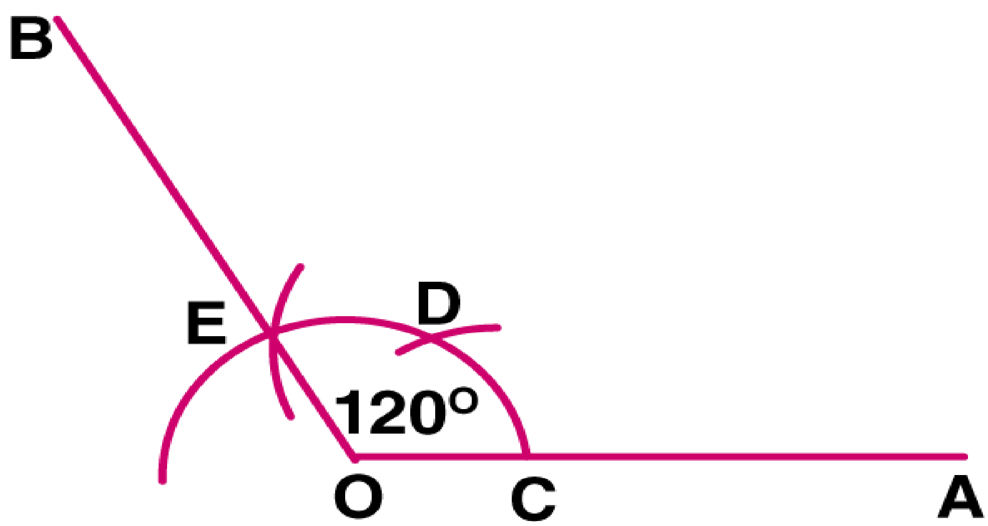
(iii) Draw an angle of 90^0, following the steps as in question (ii) and bisect it. Each angle so obtained will be 45^0



(iv) Steps of Construction:
Constructing an angle of 30^0
1. Draw an angle of 60^0 following the steps as drawn in question no.(i)
2. Now, bisecting this angle, we get two angles each of 30^0. Therefore ∠EOB = 30^0



(v) Steps of Construction:
Constructing an angle of 120^0



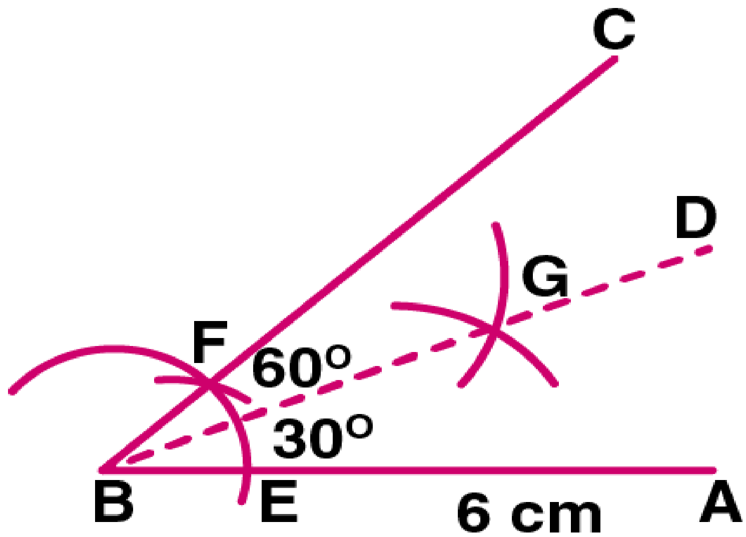
1. Taking centre as O on the line OA, draw an arc to cut this line at point C
2. Now, taking C as centre, draw a same size arc which cuts the first arc at point D
3. Taking D as centre, draw one more arc of same size which cuts the first arc at point E
4. Join OE and produce it up to point B. Now, the ∠AOB is the obtained angle whose measure is 120^0

3. Draw line AB = 6 cm. Construct angle ABC = 60^0. Then draw the bisector of angle ABC.

Solution:

Steps of Construction:

1. Draw a line segment AB of length 6 cm



2. Using compass construct ∠CBA = 60^0
3. Bisect ∠CBA, using compass, take any radius which meet line AB and BC at points E and F
4. Now, with the help of compass take radius more than ½ of EF and draw two arcs from point E and F, where both the arcs intersects at point G, proceed BG towards D.

Now the ∠DBA is bisector of ∠CBA

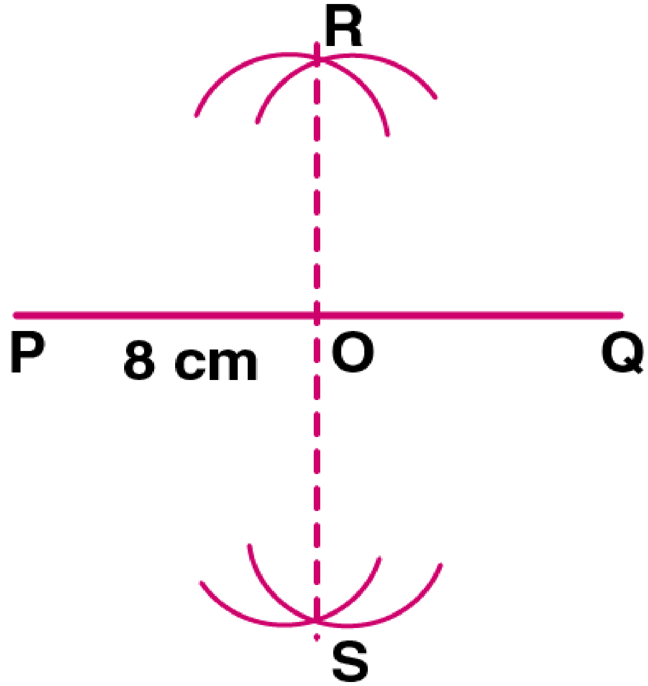
4. Draw a line segment PQ = 8 cm. Construct the perpendicular bisector of the line segment PQ. Let the perpendicular bisector drawn meet PQ at point R. Measure the lengths of PR and QR. Is PR = QR?

Solution:

Steps of Construction:

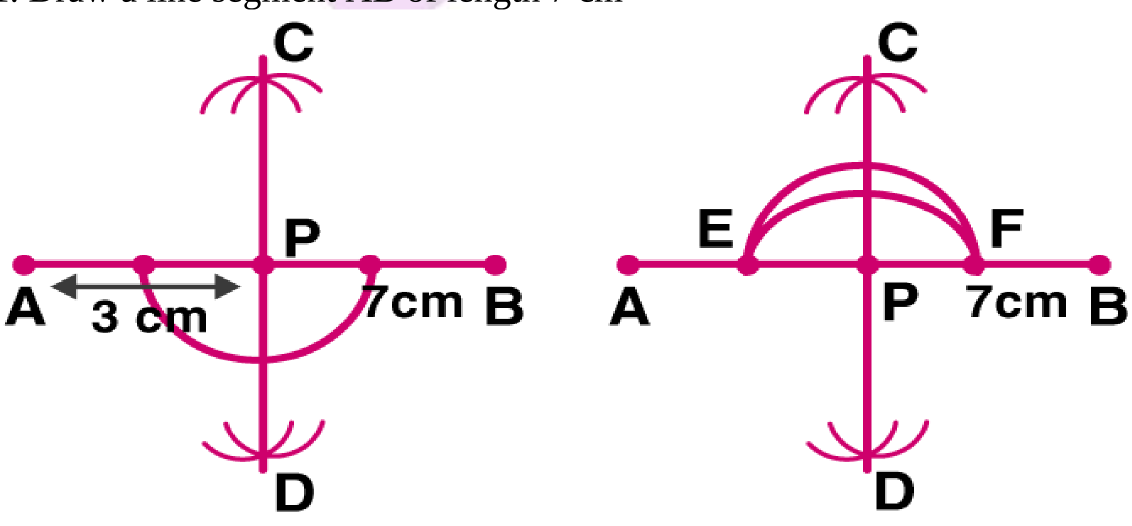
1. Taking P and Q as centres, draw arcs on both sides of PQ with equal radii. The radius should be more than half the length of PQ
2. Let these arcs cut each other at point R and RS
3. Now, join RS which cuts PQ at point D

Now, RS = PQ. Also ∠POR = 90^0



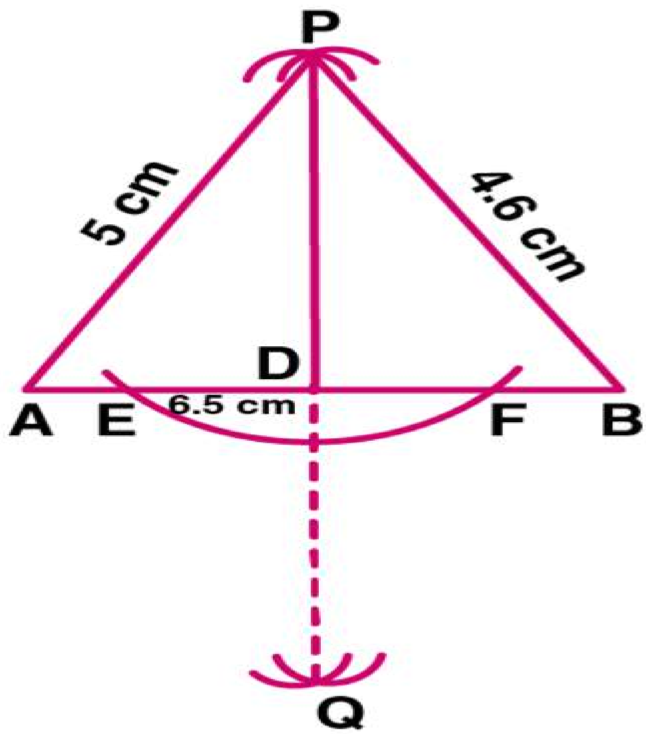
Therefore, the line segment RS is the perpendicular bisector of PQ as it bisects PQ at point P and it also perpendicular to PQ. Now, on measuring the length
PR = 4 cm
QR = 4 cm
Since, PR = QR = 4 cm
Therefore, PR = QR

5. Draw a line segment AB = 7 cm. Mark a point AB such that AP = 3 cm. Draw perpendicular on to AB at point P.
Solution:
1. Draw a line segment AB of length 7 cm



2. Mark a point on AB such that, AB – AP = 3 cm
3. From point P, cut arc on outside of AB, and mark them as point E and F
4.Now, from point E and F cut arcs on both side intersecting each other at point C and D
5. Join point P, C and D
6. Which is the required perpendicular

6. Draw a line segment AB = 6.5 cm. Locate a point P that is 5 cm from A and 4.6 cm from B. Through the point P, draw a perpendicular on to the line segment AB.
Solution:



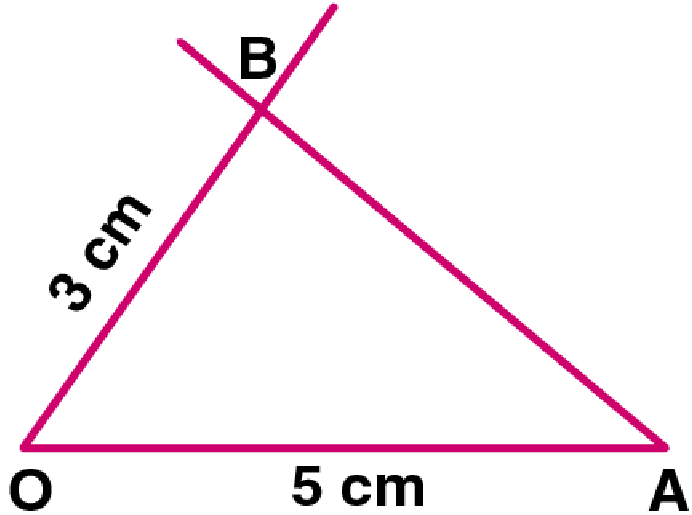
Steps of Construction:
(i) Draw a line segment AB of length 6.5 cm
(ii) Taking radius as 5 cm and with centre A, draw an arc and taking radius as 4.6 cm and with centre B, draw another arc which intersects the first arc at point P
Now, P is the required point
(iii) Taking centre A and a suitable radius, draw an arc which intersect AB at points E and F
(iv) Now, taking E and F as centres and radius greater than half of EF, draw the arcs which intersect each other at point Q
(v) Join PQ which intersect AB at point D
(vi) Now, PD is perpendicular to AB

EXERCISE 25(D)

1. Draw a line segment OA = 5 cm. Use set-square to construct angle AOB = 60^0, such that OB = 3 cm. Join A and B; then measure the length of AB.

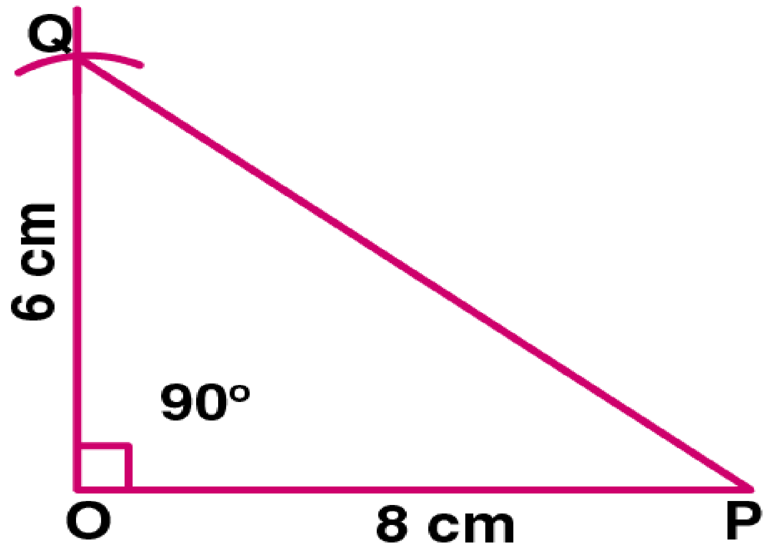
Solution:

The length of AB = 4.4 cm (approximately)



2. Draw a line segment OP = 8 cm. Use set-square to construct ∠POQ = 90^0; such that OQ = 6 cm. Join P and Q; then measure the length of PQ.

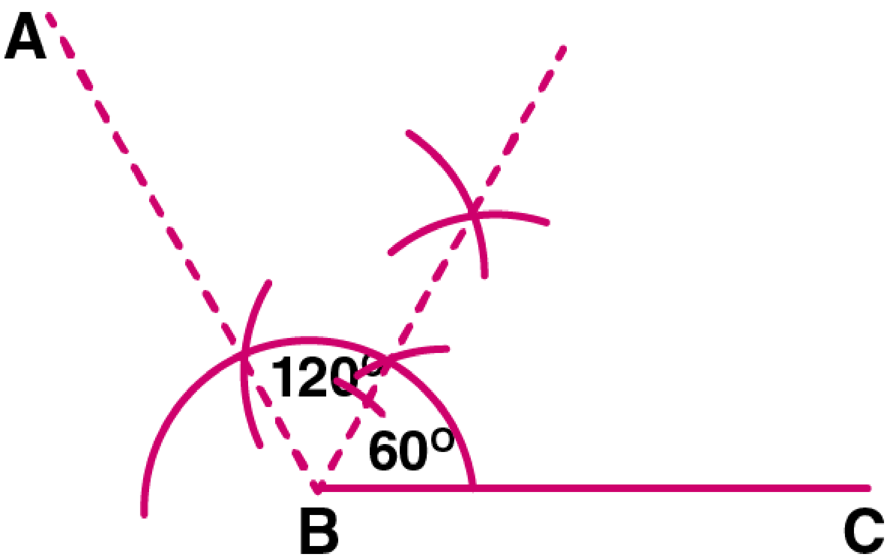
Solution:



Measuring the length of PQ = 10 cm

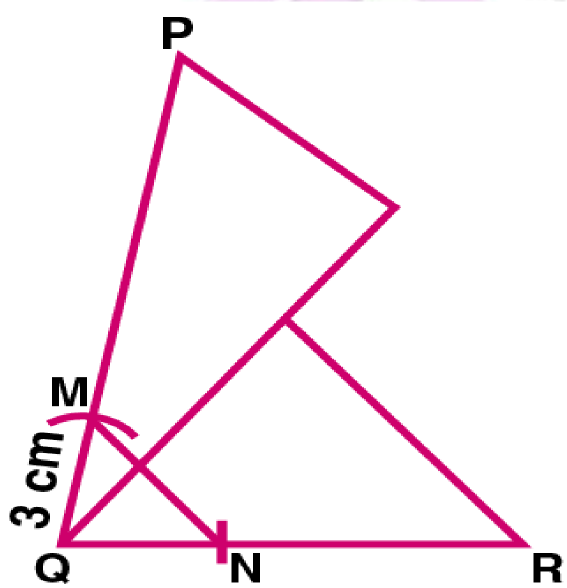
3. Draw ∠ABC = 120^0. Bisect the angle using ruler and compasses. Measure each angle so obtained and check whether or not the new angles obtained on bisecting

∠ABC are equal.
Solution:



Each angle measure = 60^0
Yes, the angles obtained on bisecting ∠ABC are equal

4. Draw ∠PQR = 75^0 by using set-squares. On PQ mark a point M such that MQ = 3 cm. On QR mark a point N such that QN = 4 cm. Join M and N. Measure the length of MN.
Solution:



The length of MN = 4.3 cm