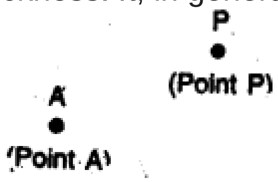
Lines and Angles (Including Construction of angles)

POINTS TO REMEMBER

1. POINT : A point: is a mark of position; which has no length, no breadth and no thickness. It, in general, is represented by a capital letter as shown alongside.



2. LINE : A line has length, but no breadth or thickness.

"The given figure shows a line AB in which two arrow-heads in opposite directions show that can be extended infinitely in both the directions.
A line may be straight or curved but when we say a line' it means a straight line only.

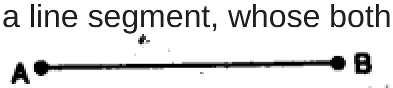
(A line or a straight line) (Curved lines)

(ii) Each line, whatever be its length, has an infinite number of points in it.

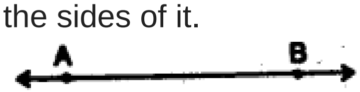
3. RAY : It is a straight line which stats from a fixed point and moves in the same direction.

The given figure shows a ray $\overrightarrow{AB}$ with fixed initial point A 'and moving in the direction AB.

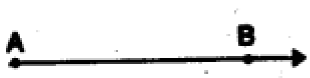
4. LINE SEGMENT : It is a straight line with its both ends fixed. The given figure shows a line segment, whose both the ends A and B are fixed.



(i) The adjoining figure shows a line AB which can be extended upto infinitey on both the sides of it.

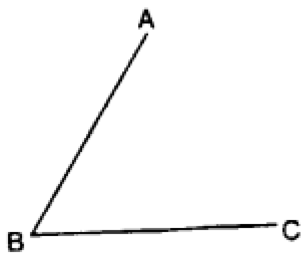


(ii) The adjoining figure shows a ray AB with fixed end as point A and which can be extended upto infinity through point B. It is clear from the figure, that a ray is a part of a line.



(iii) The adjoining figure shows a line-segment AB with fixed ends A and B. It is clear from the figure, that a line-segment is a part of a ray as well as of a line. Also, a line segment is the shortest distance between two fixed points.

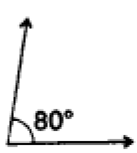
5. ANGLE : An angle is formed when two line segments or two rays have a common end-point.
The two line segments, forming an angle, are called the arms of the angle whereas their common end-point is called the vertex of the angle.

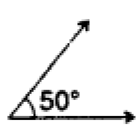


The adjacent figure represents an angle ABC or ∠ABC or simply ∠B. AB and BC are the arms of the angle and their common point B is the vertex.

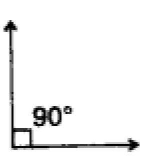
6. MEASUREMENT OF AN ANGLE : The unit of measuring an angle is degree. The symbol for degree is °.
Thus : 60 degree = 60°, 87 degree = 87’ and so on.
If one degree is divided into 60 equal parts, each part is called a minute (‘) and if one minute is further divided into 60 equal parts, each part is called a second (”).
Thus, **(i)** r = 60′ and l’ = 60″
(ii) 9 minutes 45 seconds = 9′ 45″
(iii) 85 degrees 30 minutes 15 seconds = 85° 30′ 15″ and so on.

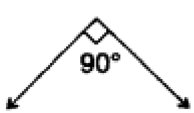
7. TYPES OF ANGLES :
1. Acute angle :
measures less than 90°

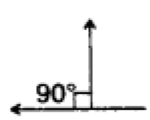




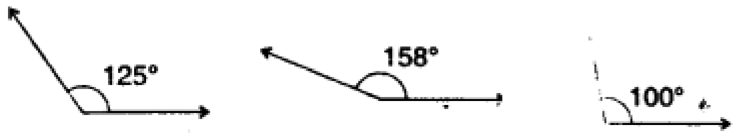
2. Right angle:
measures 90°



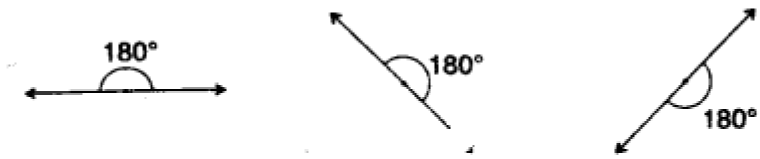




3. Obtuse angle :
measures between 90° and 180°



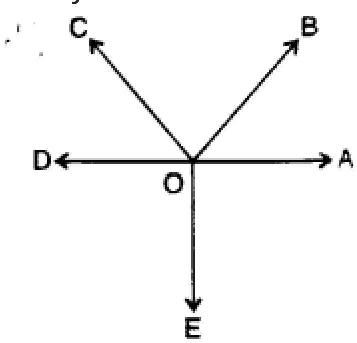
4. Straight angle :
measures 180°



5. Reflex angle :
measures between 180° and 360°

8. MORE ABOUT ANGLES :

(A) Angles about a point: If a number of angles are formed about a point, their sum is always 360°.



In the adjoining figure :

$\angle AOB + \angle BOC + \angle COD + \angle DOE + \angle EOA = 360°$

(B) Adjacent angles : Two angles are said to be adjacent angles, if:

(i) they have a common vertex,

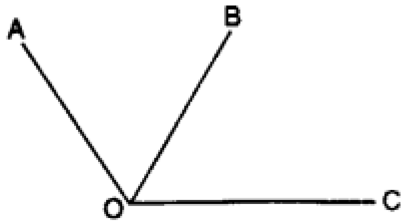
(ii) they have a common arm and

(iii) the other arms of the two angles lie on opposite sides of the common arm.

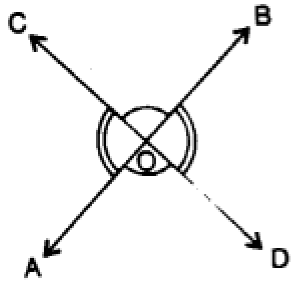
The adjoining figure shows a pair of adjacent angles :

(i) they have a common vertex (O),

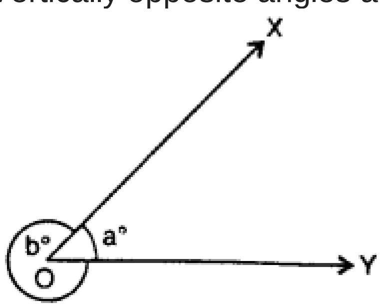
(ii) they have a common ann (OB) and



(iii) the other arms OA and OC of the two angles are on opposite sides of the common arm OB.
(C) Vertically opposite angles : When two straight lines intersect each other four angles are formed.
The pair of angles which lie on the opposite sides of the point of intersection are called vertically opposite angles.



In the adjoining figure, two straight lines AB and CD intersect each other at point 0. Angles AOD and BOC form one pair of vertically opposite angles; whereas angles AOC and BOD form another pair of vertically opposite angles.
Vertically opposite angles are always equal.

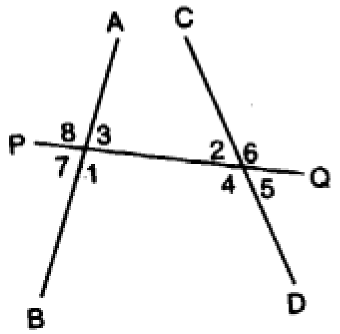


i. e. ∠AOD = ∠BOC and ∠AOC = ∠BOD.
Important: In the adjoining figure, rays OX and OY meet a O to form ∠XOY (i.e. ∠a) and reflex ∠XOY (i. e. ∠b). It must be noted that ∠XOY means the smaller angle only unless it is mentioned to take otherwise.

9. COMPLEMENTARY AND SUPPLEMENTARY ANGLES
1. Two angles are called **complementary angles,** if their sum is one’right angle i.e. 90° Each angle is called the **complement** of the other.
e.g., 20″ and 70″ are complementary angles, because 20° + 70° = 90°.
Clearly, 20″ is the complement of 70° and 70° is the complement of 20°.
Thus, the complement of angle 53° = 90° – 53° = 37°.
2. Two angles are called **supplementary angles**, if their sum is two right angles i.e. 180″. Each angle is called the **supplement of the other.**

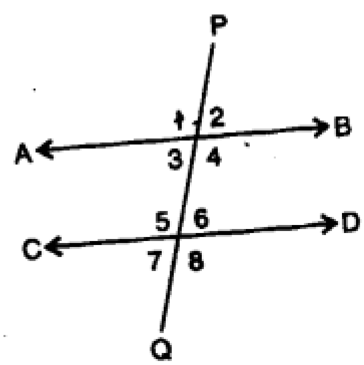
e.g., 30″ and 150° are supplementary angles because 30° + 150° = 180°.
Clearly, 30″ is the supplement of 150° and vice-versa.
Thus, the supplement of 105° = 180° – 105° = 75°.

10. Transversal : It is a straight line which cuts two or more given straight lines.



In the adjoining figure, PQ cuts straight lines AB and CD, and so it is a transversal.
When a transversal cuts two given straight lines (refer the adjoining figure), the following pairs of angles are formed.
1. Two pairs of interior alternate angles : Angles marked 1 and 2 form one pair of interior alternate angles, while angles marked 3 and 4 form another pair of interior alternate angles.
2. Two pairs of exterior alternate angles : Angles marked 5 and 8 form one pair, while angles marked 6 and 7 form the other pair of exterior alternate angles.
3. Four pairs of corresponding angles : Angles marked 3 and 6; 1 and 5; 8 and 2; 7 and 4 form the four pairs of corresponding angles.
4. Two pairs of allied or co-interior or conjoined angles : Angles marked 3 and 2 form one pair and angles marked 1 and 4 form another pair of allied angles.

11. PARALLEL LINES : Two straight lines are said to be parallel, if , they do not meet anywhere; no matter how long are they produced in any direction.



The adjacent figure shows two parallel straight lines AB and CD.
When two parallel lines AB and CD are cut by a transversal PQ :
(i) Interior and exterior alternate angles are equal:
i.e. $\angle 3 = \angle 6$ and $\angle 4 = \angle 5$ [Interior alternate angles]
$\angle 1 = \angle 8$ and $\angle 2 = \angle 7$ [Exterior alternate angles]
(ii) Corresponding angles are equal:

i.e. ∠1 = ∠5;∠2 = ∠6;∠3 = ∠7 and ∠4 = ∠8
(iii) Co-interior or allied angles are supplementary :
i. e. ∠3 + ∠5 = 180° and ∠4 +∠6 = 180°

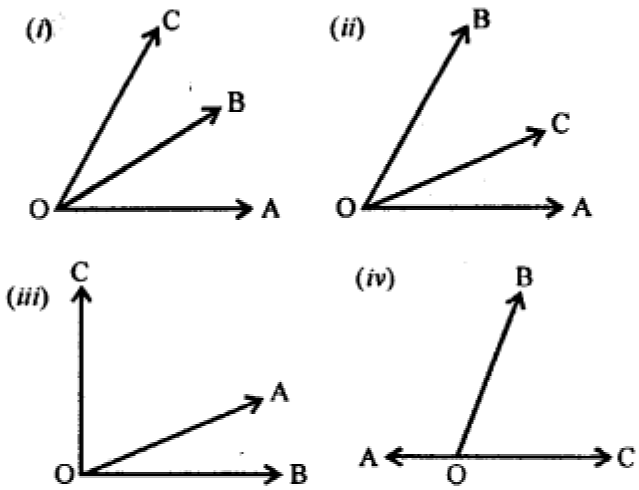
12. CONDITIONS OF PARALLELISM : If two straight lines are cut by a transversal such that:
(i) a pair of alternate angles are equal, or
(ii) a pair of corresponding angles are equal, or
(iii) the sum of the interior angles on the same side of the transversal is 180°, then the two straight lines are parallel to each other.
Therefore, in order to prove that the given lines are parallel, show either alternate angles are equal or, corresponding angles are equal or, the co-interior angles are supplementary.

EXERCISE 14 (A)

Question 1.
State, true or false :
(i) A line segment 4 cm long can have only 2000 points in it.
(ii) A ray has one end point and a line segment has two end-points.
(iii) A line segment is the shortest distance between any two given points.
(iv) An infinite number of straight lines can be drawn through a given point.
(v) Write the number of end points in
(a) a line segment AB (b) arayAB
(c) alineAB
(vi) Out of $\overleftrightarrow{AB}$ **,** $\overrightarrow{AB}$ **,** $\overleftarrow{AB}$ **and** $\overline{AB}$ **, which one has a fixed length?**
(vii) How many rays can be drawn through a fixed point O?
(viii) How many lines can be drawn through three
(a) collinear points?
(b) non-collinear points?
(ix) Is 40° the complement of 60°?
(x) Is 45° the supplement of 45°?
Solution:
(i) False : It has infinite number of points.
(ii) True
(iii) True
(iv) True
(v) (a) 2 (b) 1 (c) 0
(vi) AB
(vii) Infinite
(viii) (a) 1 (b) 3
(ix) False : 40° is the complement of 50° as 40° + 50° = 90°
(x) False : 45° is the supplement of 135° not 45°.

Question 2.

In which of the following figures, are ∠AOB and ∠AOC adjacent angles? Give, in each case, reason for your answer.

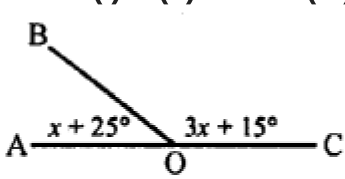


Solution:

If ∠AOB and ∠AOC are adjacent angle if they have OA their common arm.
(i) In the figure, OB is their common arm
∴∠AOB and ∠AOC are not adjacent angles.
(ii) In the figure, OC is their common arm
∴∠AOB and ∠AOC also not adjacent angles.
(iii) In this figure, OA is their common arm
∴ ∠AOB and ∠AOC are adjacent angles.
(iv) In this figure, OB is their common arm
∴ ∠AOB and ∠AOC are not adjacent angles.

Question 3.

In the given figure, B AC is a straight line.
Find : (i) x (ii) ∠AOB (iii) ∠BOC



Solution:

$\because \angle AOB$ and $\angle COB$ are linear pairs

$\therefore \angle AOB + \angle COB = 180°$

$\Rightarrow x + 25° + 3x + 15° = 180°$

$\Rightarrow 4x + 40° = 180°$

$\Rightarrow \quad 4x = 180° - 40° = 140°$

(i) $\Rightarrow x = \dfrac{140°}{4} = 35°$

Hence, $x = 35°$

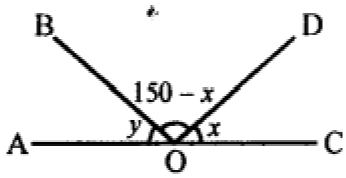
(ii) $\angle AOB = x + 25° = 35° + 25° = 60°$

(iii) $\angle BOC = 3x + 15° = 3 \times 35° + 15°$

$= 105° + 15° = 120°$

Question 4.

Find yin the given figure.



Solution:

$\because$ AOC is a straight line

$\therefore \angle AOB + \angle BOD + \angle DOC = 180°$

$\Rightarrow y + 150° - x + x = 180°$

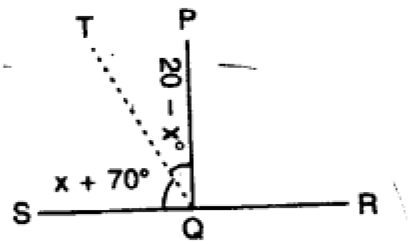
$\Rightarrow y + 150° = 180°$

$\Rightarrow \quad y = 180° - 150° = 30°$

Hence, $y = 30°$

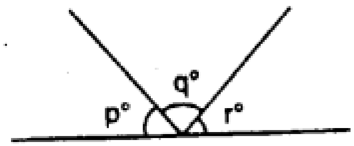
Question 5.

In the given figure, find $\angle PQR$.



Solution:
SQR is a straight line
∴∠SQT + ∠TQP + ∠PQR = 180°
⇒ x + 70° + 20° – x + ∠PQR = 180°
⇒ 90″ + ∠PQR = 180°
⇒ ∠PQR = 180°-90° = 90°
Hence ∠PQR = 90°

Question 6.
In the given figure. p° = q° = r°, find each.



Solution:

$p^\circ + q^\circ + r^\circ = 180^\circ$ (straight angle)

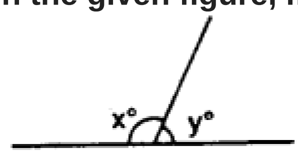
But $p^\circ = q^\circ = r^\circ$ (given)

$\therefore p^\circ + p^\circ + p^\circ = 180^\circ$

$\Rightarrow 3p^\circ = 180^\circ \quad \Rightarrow p^\circ = \frac{180^\circ}{3} = 60^\circ$

Hence $p^\circ = q^\circ = r^2 = 60^\circ$

Question 7.
In the given figure, if x = 2y, find x and y



Solution:

$x^\circ + y^\circ = 180^\circ$ (straight angle)

But $x = 2y$ (given)

$\therefore 2y + y = 180^\circ$

$\Rightarrow 3y = 180^\circ$

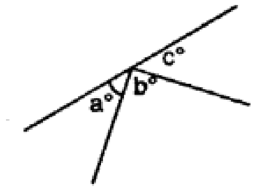
$\Rightarrow y = \frac{180^\circ}{3} = 60^\circ$

Hence $y = 60^\circ$

and $x = 2y = 2 \times 60^\circ = 120^\circ$

Question 8.

In the adjoining figure, if b° = a° + c°, find b.



Solution:

$a^\circ + b^\circ + c^\circ = 180^\circ$ (straight angle)

But $b^\circ = a^\circ + c^\circ$ (given)

$\therefore a^\circ + c^\circ + b^\circ = 180^\circ$

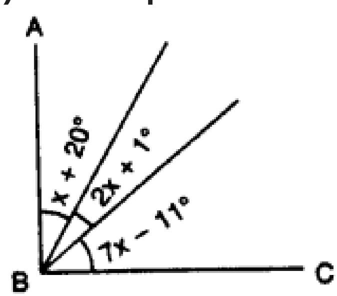
$\Rightarrow b^\circ + b^\circ = 180^\circ \quad \Rightarrow 2b^\circ = 180^\circ$

$$\Rightarrow \quad b^\circ = \frac{180^\circ}{2} = 90^\circ$$

Hence $b^\circ = 90^\circ$

Question 9.

In the given figure, AB is perpendicular to BC at B.
Find : (i) the value of x.
(ii) the complement of angle x.



Solution:

(*i*) In the given figure,

AB + BC at B.

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

$\Rightarrow x + 20^\circ + 2x + 1^\circ + 7x - 11^\circ = 90^\circ$

$\Rightarrow 10x + 10^\circ = 90^\circ$

$\Rightarrow \quad 10x = 90^\circ - 10^\circ = 80^\circ$

$$\Rightarrow \quad x = \frac{80^\circ}{10} = 8^\circ$$

Hence $x = 8^\circ$

(*ii*) Complement of angle $x = 90^\circ - x$

$= 90^\circ - 8^\circ = 82^\circ$

Question 10.
Write the complement of:

(i) 25° (ii) 90° (iii) a°

(iv) $(x + 5)^\circ$ (v) $(30 - a)^\circ$

(vi) $\frac{1}{2}$ of a right angle

(vii) $\frac{1}{3}$ of 180° ($viii$) $21^\circ\ 17'$

Solution:

(i) Complement of $25^\circ = 90^\circ - 25^\circ = 65^\circ$

(ii) Complement of $90^\circ = 90^\circ - 90^\circ = 0^\circ$

(iii) Complement of $a^\circ = 90^\circ - a^\circ$

(iv) Complement of $(x + 5)^\circ = 90^\circ - (x + 5^\circ)$

$= 90^\circ - x - 5^\circ = 85^\circ - x$

(v) Complement of $(30 - a)^\circ$

$= 90^\circ - (30 - a)^\circ$

$= 90^\circ - 30^\circ + a^\circ = 60^\circ + a^\circ$

(vi) Complement of $\frac{1}{2}$ of a right angle

$= 90^\circ - \frac{1}{2}$ right angle

$= 90^\circ - \frac{1}{2} \times 90^\circ = 90^\circ - 45^\circ = 45^\circ$

(vii) Complement of $\frac{1}{3}$ of 180°

$= 90^\circ - \frac{1}{3}$ of $180^\circ = 90^\circ - 60^\circ = 30^\circ$

($viii$) Complement of $21^\circ\ 17' = 90^\circ - 21^\circ\ 17'$

$= 68^\circ\ 43' = 68^\circ\ 43'$ ($\because$ P $= 60'$)

Question 11.
Write the supplement of:
(i) 100°
(ii) 0°
(iii) x°
(iv) (x + 35)°
(v) (90 +a + b)° f
(vi) (110 – x – 2y)°
(vii) $\frac{1}{5}$ of a right angle
(viii) 80° 49′ 25″
Solution:

(i) Supplement of $100° = 180° - 100° = 80°$

(ii) Supplement of $0° = 180° - 0° = 180°$

(iii) Supplement of $x° = 180° - x°$

(iv) Supplement of $(x + 35)°$
$= 180° - (x + 35)°$
$= 180° - x° - 35° = 145° - x°$

(v) Supplement of $(90 + a + b)°$
$= 180° - (90 + a + b)°$
$= 180° - 90° - a° - b°$
$= 90° - a° - b°$
$= (90 - a - b)°$

(vi) Supplement of $(110 - x - 2y)°$
$= 180° - (110 - x - 2y)°$
$= 180° - 110° + x° + 2y° = 70° + x° + 2y°$

(vii) Supplement of $\frac{1}{5}$ of a right angle

$= 180° - \frac{1}{5}$ of a right angle

$= 180° - \frac{1}{5} \times 90°$

$= 180° - 18° = 162°$

(viii) Supplement of $80° \, 49' \, 25''$
$= 180° - 80° \, 49' \, 25''$
$= 99° \, 10' \, 35''$ **Ans.** $\left\{\begin{matrix} \because 1° = 60' \\ 1' = 60'' \end{matrix}\right\}$

Question 12.
Are the following pairs of angles complementary ?
(i) 10° and 80°
(ii) 37° 28′ and 52° 33′
(iii) (x+ 16)°and(74-x)°
(iv) 54° and $\frac{2}{5}$ of a right angle.
Solution:

(i) 10° and 80° : Yes, these are complementary angles as their sum

$$= 10^\circ + 80^\circ = 90^\circ$$

(ii) $37^\circ\ 28'$ and $52^\circ\ 33'$: No, these are not complementary angles as their sum is not 90° $(37^\circ\ 28' + 52^\circ\ 33' = 90^\circ\ 1')$

(iii) $(x + 16)^\circ$ and $(74 - x)^\circ$: Yes these are complementary angles as their sum is 90° $(x^\circ + 16^\circ + 74^\circ - x^\circ = 90^\circ)$

(iv) 54° and $\frac{2}{5}$ of a right angle

$\Rightarrow 54^\circ$ and $\frac{2}{5} \times 90^\circ$ $\Rightarrow 54^\circ$ and 36° :

Yes, there are complementary angles as their sum is 90° $(54^\circ + 36^\circ = 90^\circ)$

Question 13.
Are the following pairs of angles supplementary?

(i) 139° and 39°.

(ii) $26^\circ\ 59'$ and $153^\circ\ 1'$.

(iii) $\frac{3}{10}$ of a right angle and $\frac{4}{15}$ of two right angles.

(iv) $2x^\circ + 65^\circ$ and $115^\circ - 2x^\circ$.

Solution:

(i) 139° and 39° : No, these are not supplementary angles as their sum is not 180° $(139^\circ + 39^\circ = 178^\circ)$

(ii) $26^\circ\ 59'$ and $153^\circ\ 1'$: Yes, there are supplementary angles as their sum is 180° $(26^\circ\ 59' + 153^\circ\ 1' = 180^\circ)$

(iii) $\frac{3}{10}$ of a right angle and $\frac{4}{15}$ of two right angles

$\Rightarrow \frac{3}{10}$ of 90° and $\frac{4}{15}$ of 180°

$\Rightarrow 27^\circ$ and 48° : No, there are not supplementary angles as their sum is not 180° $(27^\circ + 48^\circ = 75^\circ)$

(iv) $2x^\circ + 65^\circ$ and $115^\circ - 2x^\circ$: Yes there are supplementary angles as their sum is 180° $(2x^\circ + 65^\circ + 115^\circ - 2x^\circ = 65^\circ + 115^\circ = 180^\circ)$

Question 14.

If 3x + 18° and 2x + 25° are supplementary, find the value of x.

Solution:

$\because 3x + 18^\circ$ and $2x + 25^\circ$ are supplementary angles

$\therefore 3x + 18^\circ + 2x + 25^\circ = 180^\circ$

$\Rightarrow 5x + 43^\circ = 180^\circ$

$\Rightarrow \quad 5x = 180^\circ - 43^\circ = 137^\circ$

$\Rightarrow \quad x = \frac{137}{5} = 27{\cdot}4^\circ$ or $27^\circ\ 24'$

Question 15.
If two complementary angles are in the ratio 1:5, find them.
Solution:

Two complementary angles are in the ratio $= 1 : 5$

Let these angles be x and $5x$

$\therefore x + 5x = 90^\circ \quad \Rightarrow 6x = 90^\circ$

$$\Rightarrow x = \frac{90^\circ}{6} = 15^\circ$$

$\therefore$ Angles will be 15° and $15^\circ \times 5 = 75^\circ$

Question 16.
If two supplementary' angles are in the ratio 2 : 7, find them.
Solution:

Ratio between two supplementary angle $= 2 : 7$

Let the angles be $2x$ and $7x$

$\therefore 2x + 7x = 180^\circ$

$\Rightarrow 9x = 180^\circ \quad \Rightarrow x = \frac{180^\circ}{9} = 20^\circ$

$\therefore$ Angles are $2x = 2 \times 20^\circ = 40^\circ$

and $7x = 7 \times 20^\circ = 140^\circ$

Question 17.
Three angles which add upto 180° are in the ratio 2:3:7. Find them.
Solution:

Ratio of three angles $= 2 : 3 : 7$

Let first angle be $= 2x$

second angle $= 3x$

and third angle $= 7x$

$\therefore 2x + 3x + 7x = 180^\circ$

$\Rightarrow 12x = 180^\circ \quad \Rightarrow x = \frac{180^\circ}{12} = 15^\circ$

$\therefore$ First angle $= 2x = 2 \times 15^\circ = 30^\circ$

second angle $= 3x = 3 \times 15^\circ = 45^\circ$

and third angle $= 7x = 7 \times 15^\circ = 105^\circ$

Hence, angles are 30°, 45° and 105°

Question 18.
20% of an angle is the supplement of 60°. Find the angle.
Solution:

Let the given angle be x

then 20% of $x + 60^\circ = 180^\circ$

$\Rightarrow$ 20% of $x = 180^\circ - 60^\circ = 120^\circ$

$$\Rightarrow \frac{20}{100} \times x = 120^\circ \quad \Rightarrow x \frac{120 \times 100}{20}$$

$$\Rightarrow \quad x = 600^\circ$$

Hence $x = 600^\circ$

Question 19.
10% of x° is the complement of 40% of 2x°. Find x
Solution:

$\because$ 10% of x° is the complement of 40% of $2x^\circ$

$\therefore$ 10% of x° + 40% of $2x = 90^\circ$

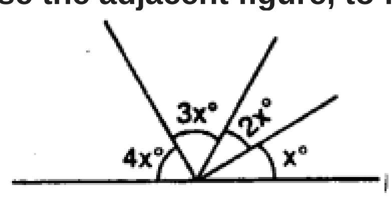
$$\Rightarrow \frac{10}{100} x + \frac{40}{100} \times 2x = 90^\circ$$

$$\Rightarrow \frac{10x}{100} + \frac{80x}{100} = 90^\circ \quad \Rightarrow \frac{90x}{100} = 90^\circ$$

$$\therefore \quad x = \frac{90 \times 100}{90} = 100^\circ$$

Hence $x = 100^\circ$

Question 20.
Use the adjacent figure, to find angle x and its supplement.



Solution:

In the given fig.

$x + 2x + 3x + 4x = 180^\circ$ (Straight angle)

$\Rightarrow 10x = 180^\circ$

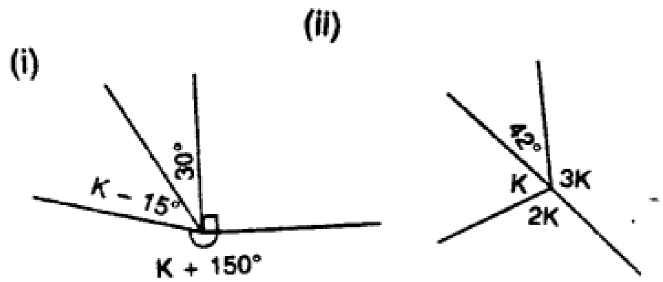
$\Rightarrow x = \frac{180^\circ}{10} = 18^\circ$

$\therefore x = 18^\circ$

Its supplementary angle $= 180^\circ - 18^\circ$

$= 162^\circ$

Question 21.
Find k in each of the given figures.



Solution:

(*i*) In the fig. (*i*) :

$k + 150^\circ + k - 15^\circ + 30^\circ + 90^\circ = 360^\circ$

(Angles at a point)

$\Rightarrow 2k + 150^\circ + 90^\circ + 30^\circ - 15^\circ = 360^\circ$

$\Rightarrow 2k + 270^\circ - 15^\circ = 360^\circ$

$\Rightarrow 2k = 360^\circ - 270^\circ + 15^\circ = 105^\circ$

$\Rightarrow k = \frac{105^\circ}{2} = 52{\cdot}5^\circ$ or $52^\circ 30'$

$\therefore k = 52{\cdot}5^\circ$ or $52^\circ 30'$

(*ii*) In the fig. (*ii*),

$k + 2k + 3k + 42^\circ = 360^\circ$

(Angles at a point)

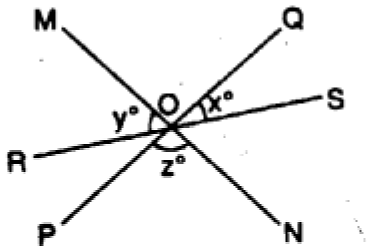
$\Rightarrow 6k + 42^\circ = 360^\circ$

$\Rightarrow 6k = 360^\circ - 42^\circ = 318^\circ$

$\Rightarrow k = \frac{318^\circ}{6} = 53^\circ$

$\therefore k = 53^\circ$

Question 22.
In the given figure, lines PQ, MN and RS intersect at O. If x : y = 1 : 2 and z = 90°, find ∠ROM and ∠POR.



Solution:
In the fig., lines PQ, MN and RS are intersecting each other at O

$x : y = 1 : 2, z = 90^\circ$

$\angle MOQ = \angle PON = z$

(Vertically opposite angles)

Now, RS is a straight line

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

$\Rightarrow x + y + 90^\circ = 180^\circ \quad (\because z = 90^\circ)$

$\Rightarrow \quad x + y = 180^\circ - 90^\circ = 90^\circ$

But $x : y = 1 : 2$

Let $x = a$ then $y = 2a$

$\therefore a + 2a = 90^\circ$

$\Rightarrow 3a = 90^\circ$

$\Rightarrow a = \frac{90^\circ}{3} = 30^\circ$

$\therefore x = 30^\circ$ and $y = 2a = 2 \times 30^\circ = 60^\circ$

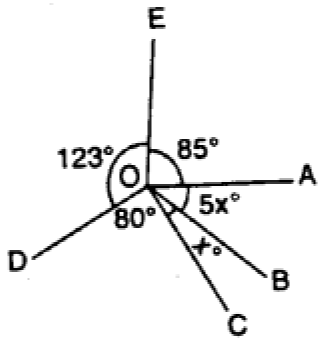
Now, $\angle ROM = y = 60^\circ$

and $\angle POR = \angle SOQ$

(Vertically opposite angles)

$= x = 30^\circ$

Question 23.
In the given figure, find ∠AOB and ∠BOC.



Solution:

In the figure,

$5x + x + 80° + 123° + 85° = 360°$

(Angles at a point)

$\Rightarrow 6x + 80° + 123° + 85° = 360°$

$\Rightarrow 6x + 288° = 360°$

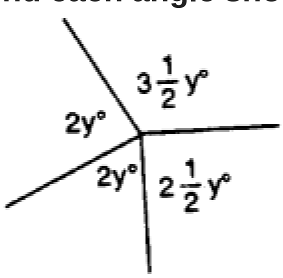
$\Rightarrow \quad 6x = 360° - 288° = 72°$

$\Rightarrow \quad x = \frac{72°}{6} = 12°$

Now, $\angle AOB = 5x = 5 \times 12° = 60°$

and $\angle BOC = x = 12°$

Question 24.
Find each angle shown in the diagram.



Solution:

In the figure,

$$3\frac{1}{2}y^\circ + 2y^\circ + 2y^\circ + 2\frac{1}{2}y^\circ = 360^\circ$$

(Angles at a point)

$$\Rightarrow \frac{7}{2}y^\circ + 2y^\circ + 2y^\circ + \frac{5}{2}y^\circ = 360^\circ$$

$$\Rightarrow \frac{7}{2}y^\circ + \frac{5}{2}y^\circ + 4y^\circ = 360^\circ$$

$$\Rightarrow \frac{12}{2}y^\circ + 4y^\circ = 360^\circ$$

$$\Rightarrow 6y^\circ + 4y^\circ = 360^\circ$$

$$\Rightarrow 10y^\circ = 360^\circ$$

$$\Rightarrow y = \frac{360^\circ}{10} = 36^\circ$$

$$\therefore \angle AOB = 3\frac{1}{2}y^\circ = \frac{7}{2}y^\circ = \frac{7}{2} \times 36^\circ$$

$$= 126^\circ$$

$$\angle BOC = 2y^\circ = 2 \times 36 = 72^\circ$$

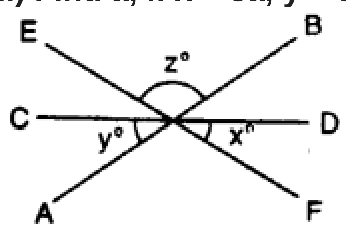
$$\angle COD = 2y^\circ = 72^\circ$$

$$\angle DOA = 2\frac{1}{2}y^\circ = \frac{5}{2}y^\circ$$

$$= \frac{5}{2} \times 36^\circ = 90^\circ$$

Question 25.

AB, CD and EF are three lines intersecting at the same point.
(i) Find x, if y = 45° and z = 90°.
(ii) Find a, if x = 3a, y = 5x and r = 6x.



Solution:

AB, CD and EF are intersecting each other at 0.

and $\angle DOF = x^o$, $\angle AOC = y^o$

and $\angle BOE = z^o$

But $\angle DOB = \angle AOC = y^o$

(Vertically opposite angles)

Similarly, $\angle COE = \angle DOF = x^o$

and $\angle AOF = \angle BOE = z^o$

$\because$ CD is a straight line

$\therefore \angle COE + \angle BOE + \angle DOB = 180^o$

$\Rightarrow x^o + z^o + y^o = 180^o$

$\Rightarrow x^o + y^o + z^o = 180^o$

(*i*) If $y = 45^o$ and $z = 90^o$, then

$\Rightarrow x^o + 45^o + 90^o = 180^o$

$\Rightarrow \quad x^o + 135^o = 180^o$

$\therefore x^o = 180^o - 135^o = 45^o$

(*ii*) If $x = 3a, y = 5x, z = 6x$,

then $x + y + z = 180^o$

$\Rightarrow x + 5x + 6x = 180^o \Rightarrow 12x = 180^o$

$$\Rightarrow \quad x = \frac{180^o}{12} = 15^o$$

But $x = 3a$

$\therefore 3a = 15^o \quad \Rightarrow a = \frac{15^o}{3} = 5^o$

Hence $a = 5^o$

EXERCISE 14 (B)

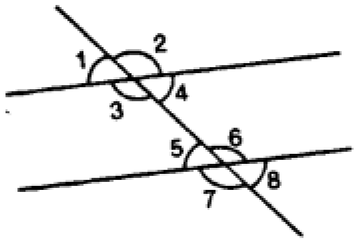
In questions 1 and 2, given below, identify the given pairs of angles as corresponding angles, interior alternate angles, exterior alternate angles, adjacent angles, vertically opposite angles or allied angles :

Question 1.

(i) $\angle 3$ and $\angle 6$

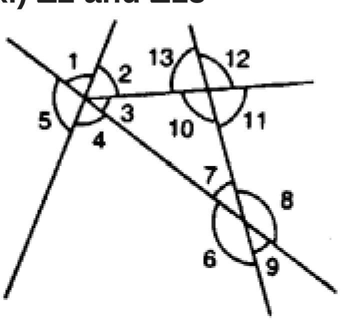
(ii) $\angle 2$ and $\angle 4$

(iii) ∠3 and ∠7
(iv) ∠2 and ∠7
(v) ∠4 and∠6
(vi) ∠1 and ∠8
(vii) ∠1 and ∠5
(viii) ∠1 and ∠4
(ix) ∠5 and ∠7



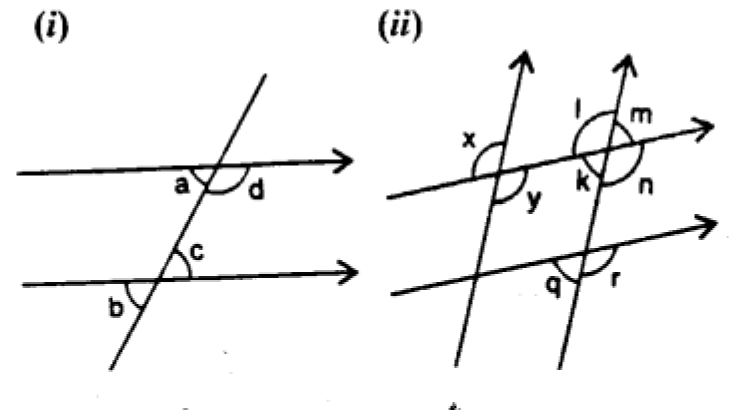
Solution:
(i) ∠3 and ∠6 are interior alternate angles.
(ii) ∠2 and ∠4 are adjacent angles.
(iii) ∠3 and ∠7 are corresponding angles.
(iv) ∠2 and ∠7 are exterior alternate angles,
(v) ∠4 and ∠6 are allied or co-interior angles,
(vi) ∠1 and ∠8 are exterior alternate angles.
(vii) ∠1 and ∠5 are corresponding angles.
(viii) ∠1 and ∠4 are vertically opposite angles.
(ix) ∠5 and ∠7 are adjacent angles.

Question 2.
(i) ∠1 and ∠4
(ii) ∠4 and ∠7
(iii) ∠10 and ∠12
(iv) ∠7 and ∠13
(v) ∠6 and ∠8
(vi) ∠11 and ∠8
(vii) ∠7 and ∠9
(viii) ∠4 and ∠5
(ix) ∠4 and ∠6
(x) ∠6 and ∠7
(xi) ∠2 and ∠13



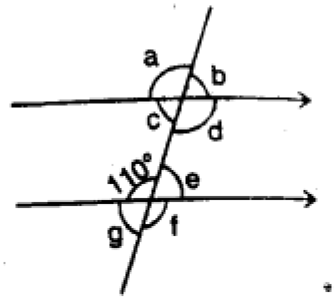
Solution:
(i) ∠1 and ∠4 are vertically opposite angles.
(ii) ∠4 and ∠7 are alternate angles.
(iii) ∠10 and ∠12 are vertically opposite angles.
(iv) ∠7 and ∠13 are corresponding angles.
(v) ∠6 and ∠8 are vertically opposite angles.
(vi) ∠11 and ∠8 are allied or co-interior angles.
(vii) ∠7 and ∠9 are vertically opposite angles.
(viii) ∠4 and ∠5 are adjacent angles.
(ix) ∠4 and ∠6 are allied or co-interior angles.
(x) ∠6 and ∠7 are adjacent angles.
(xi) ∠2 and ∠13 are allied or co-interior angles.

Question 3.
In the given figures, the arrows indicate parallel lines. State which angles are equal. Give reasons.



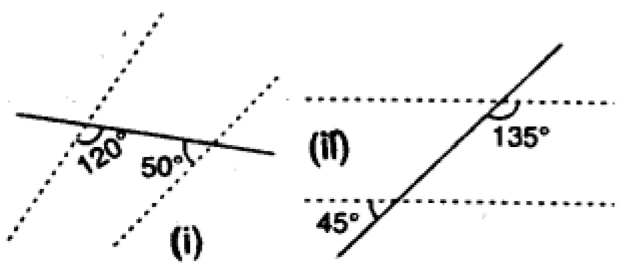
Solution:
In the figure (i),
a = b (corresponding angles)
b = c (vertically opposite angles)
a = c (alternate angles)
∴ a = b = c
(ii) In the figure (ii),
x =y (vertically opposite angles)
y=l (alternate angles)
x = l (corresponding angles)
1 = n (vertically opposite angles)
n = r (corresponding angles)
∴ x = y = l = n = r
Again m = k (vertically opposite angles)
k = q (corresponding angles)
∴ m = k = q

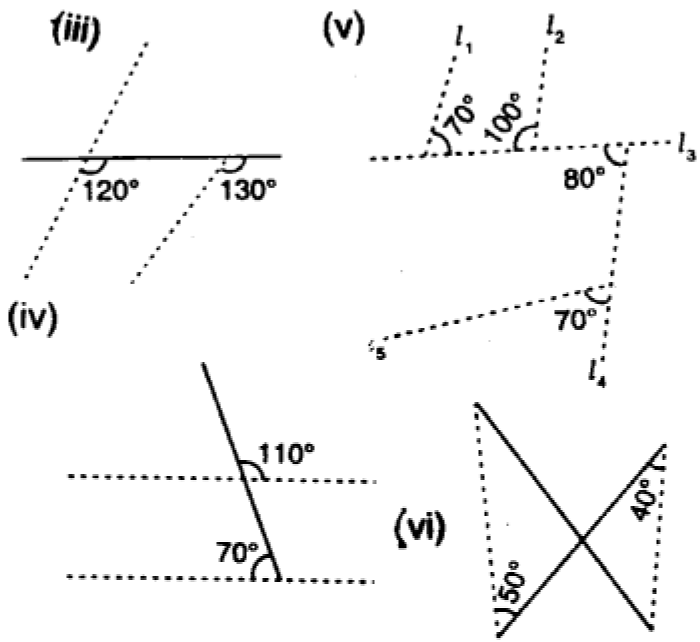
Question 4.
In the given figure, find the measure of the unknown angles :



Solution:
a = d (vertically opposite angles)
d=f (corresponding angles)
f= 110° (vertically opposite angles)
∴ a = d = f = 110°
e + 110° = 180° (co-interior angles)
∴ e = 180°- 110° = 70°
b = c (vertically opposite angles)
b = e (corresponding angles)
e = g (vertically opposite angles)
∴ b = c = e = g = 70° ”
Hence a = 110°, b = 70°, e = 70°, d = 110°, e = 70°,f= 110° and g = 70°

Question 5.
Which pair of the dotted line, segments, in the following figures, are parallel. Give reason:



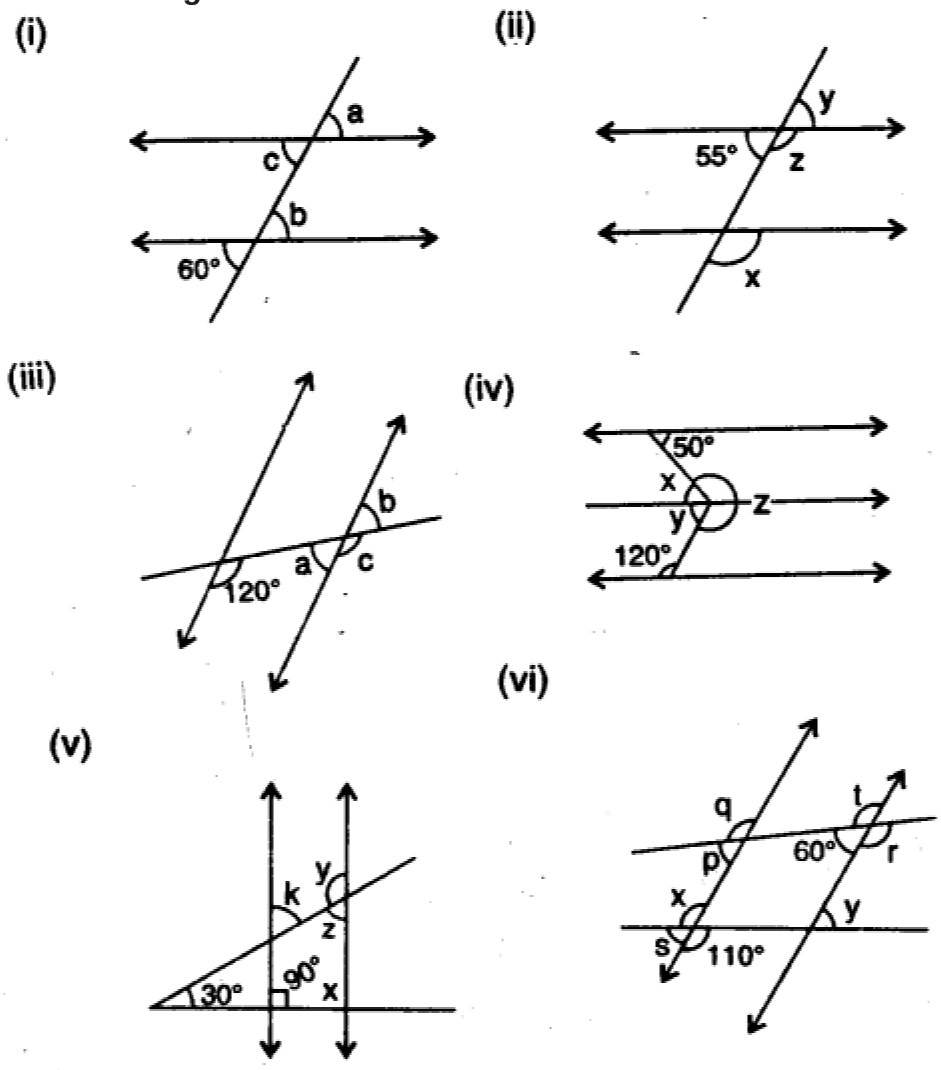


Solution:

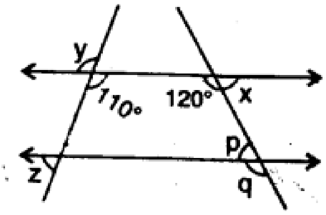
(i) In figure (i), If lines are parallel, then 120°+ 50° =180°
But there are co-interior angles
⇒170° = 180°. But it not true Hence, there are not parallel lines
(ii) In figure (ii),
∠1 = 45° (vertically opposite angles)
Lines are parallel if
∠1 + 135° = 180° (co-interior angles)
⇒45°+ 135°= 180°
⇒ 180° = 180° which is true.
Hence, the lines are parallel.
(iiii) In figure (iii),
Lines are parallel if corresponding angles are equal
If 120° =130° which is not correct
∴ Lines are not parallel.
(iv) ∠1 = 110° (vertically opposite angles)
If lines are parallel then
∠1 + 70° = 180° (co-interior angles)
⇒110° + 70°= 180°
⇒180° =180°
Which is correct.
∴ Lines are parallel.
(v) ∠1 + 100°= 180°
⇒∠1 = 180°- 100°= 80 (linear pair)
Lines l1 and l2 will be parallel If ∠1 = 70°
⇒ 80° = 70° which is not true
∴ l1 and 12 are not parallel Again, A, l3and l5 will be parallel
If 80° = 70° (corresponding angle)
Which is not true.

∴l3 and l5 are not parallel
But ∠1 = 80° (alternate angles)
⇒ 80° = 80°
Which is true
∴ l2 and l4 are parallel
(vi) Lines are parallel
If alternate angles are equal
⇒ 50° = 40°
Wliich is not ture lines are not parallel.

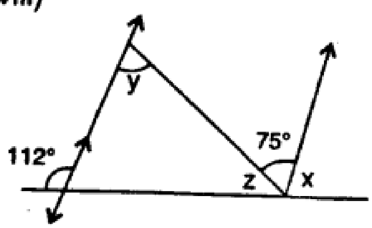
Question 6.
In the given figures, the directed lines are parallel to each other. Find the unknown angles.



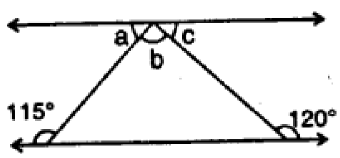
(vii)



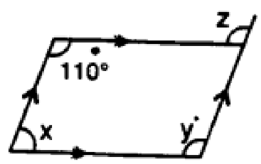
(viii)



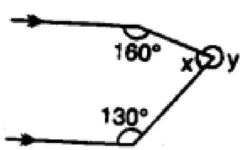
(ix)



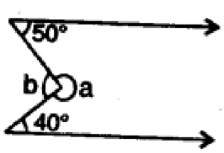
(x)



(xi)



(xii)



Solution:

(*i*) $\because$ Lines are parallel

$\therefore\ a = b$ (corresponding angles)

$a = c$ (vertically opposite angles)

$\therefore\ a = b = c$

But $b = 60°$ (vertically opposite angles)

$\therefore\ a = b = c = 60°$

(*ii*) $\because$ Lines are parallel

$\therefore\ x = z$ (corresponding angles)

But $z + y = 180°$ (linear pair)

But $y = 55°$ (vertically opposite angles)

$\therefore\ z + 55° = 180°$

$\Rightarrow\ z = 180° - 55° \quad \Rightarrow z = 125°$

But $x = z$

$\therefore\ x = 125°$

Hence $x = 125°, y = 55°, z = 125°$

(*iii*) $\because$ Lines are parallel

$\therefore\ c = 120°$

$a + 120° = 180°$ (co-interior angles)

$\therefore\ a = 180° - 120° = 60°$

But $a = b$ (vertically opposite angles)

$\therefore\ b = 60°$

Hence $a = 60°$, $b = 60°$ and $c = 120°$

(*iv*) $\because$ Lines are parallel

$\therefore\ x = 50°$ (alternate angles)

and $y + 120° = 180°$ (co-interior angles)

$\therefore\ y = 180° - 120° = 60°$

But $x + y + z = 360°$ (angles at a point)

$\Rightarrow 50° + 60° + z = 360°$

$\Rightarrow\ 110° + z = 360°$

$\Rightarrow\ z = 360° - 110° = 250°$

Hence $x = 50°, y = 60°, z = 250°$

(*v*) $\because$ Lines are parallel

$\therefore\ x + 90° = 180°$ (co-interior angles)

$\Rightarrow\ x = 180° - 90° = 90° \ \Rightarrow \angle 2 = x$

$\Rightarrow \angle 2 = 90°$

But $\angle 1 + \angle 2 + 30° = 180°$

(sum of angles of a triangle)

$\Rightarrow \angle 1 + 90° + 30° = 180°$

$\Rightarrow \quad \angle 1 + 120° = 180°$

$\Rightarrow \quad \angle 1 = 180° - 120° = 60°$

But $\angle 1 = k$ (vertically opposite angle)

$\therefore k = 60°$

But $\angle 1 = z$ (alternate angles)

$\therefore z = 60°$

But $k + y = 180°$ (co-interior angles)

$\Rightarrow 60° + y = 180° \Rightarrow y = 180° - 60° = 120°$

Hence $x = 90°, y = 120°,$

$z = 60°, k = 60°$

(*vi*) $\because$ Lines are parallel

$\therefore q = t$ and $p = 60°$ (corresponding angles)

But $t + 60° = 180°$ (linear pair)

$\Rightarrow t = 180° - 60° = 120°$

$t = r$ (vertically opposite angles)

$\therefore r = 120°$

$q = t = 120°$

$x = 110°$ (vertically opposite angles)

$x + s = 180°$ (linear pair)

$\Rightarrow 110° + s = 180°$

$\Rightarrow \quad s = 180° - 110° = 70°$

$s = \angle 1$ (corresponding angles)

$\therefore \angle 1 = 70°$

$y = \angle 1 = 70°$ (vertically opposite angles)

Hence $x = 110°, y = 70°, p = 60°, q = 120°,$
$r = 120°, s = 70°, t = 120°$

(*vii*) $\because$ Lines are parallel

$\therefore x = p$

and $p + 120° = 180°$ (alternate angles)

$\Rightarrow p = 180° - 120° = 60°$

$\therefore x = 60°$

$q = 120°$ (corresponding angles)

$y = 110°$ (vertically opposite angles)

and $\angle 1 + 110° = 180°$

(co-interior angles)

$\therefore \angle 1 = 180° - 110° = 70°$

But $z = \angle 1$ (vertically opposite angles)

$\therefore \angle z = 70^\circ$

Hence $x = 60^\circ, y = 110^\circ, z = 70^\circ,$

$p = 60^\circ, q = 120^\circ$.

(*viii*) $\because$ Lines are parallel

$\therefore y = 75^\circ$ (alternate angles)

$\angle 1 + 112^\circ = 180^\circ$ (linear pair)

$\angle 1 = 180^\circ - 112^\circ = 68^\circ$

$\angle 1 = x$ (corresponding angles)

$\therefore x = 68^\circ$

But $x + 75 + z = 180^\circ$ (angles on a line)

$\Rightarrow 68^\circ + 75^\circ + z = 180^\circ$

$\Rightarrow \quad z + 143^\circ = 180^\circ$

$\Rightarrow \quad z = 180^\circ - 143^\circ = 37^\circ$

Hence $x = 68^\circ, y = 75^\circ, z = 37^\circ$

(*ix*) $\because$ Line are parallel

$\angle a = \angle 1$ and $\angle c = \angle 2$ (alternate angles)

But $\angle 1 + 115^\circ = 180^\circ$ (linear pair)

$\therefore \angle 1 = 180^\circ - 115^\circ = 65^\circ$

Similarly $\angle 2 + 120^\circ = 180^\circ$

$\therefore \angle 2 = 180^\circ - 120^\circ = 60^\circ$

$\therefore \angle a = \angle 1 = 65^\circ, \angle c = \angle 2 = 60^\circ$

But $a + b + c = 180^\circ$ (angles on a line)

$\Rightarrow 65^\circ + b + 60^\circ = 180^\circ$

$\Rightarrow \quad b + 125^\circ = 180^\circ$

$\Rightarrow \quad b = 180^\circ - 125^\circ = 55^\circ$

Hence $a = 65^\circ, b = 55^\circ, c = 60^\circ$.

(x) $\because$ Lines are parallel

$\therefore x + 110^\circ = 180^\circ$ (co-interior angles)

$x = 180^\circ - 110^\circ = 70^\circ$

and $x + y = 180^\circ$ (co-interior angles)

$\Rightarrow 70^\circ + y = 180^\circ$

$\Rightarrow \quad y = 180^\circ - 70^\circ = 110^\circ$

$z = y$ (corresponding angles)

$\therefore z = 110^\circ$

Hence $x = 70^\circ, y = 110^\circ, z = 110^\circ$

(xi) From 0, draw a line parallel to the given parallel lines

$\because$ Lines are parallel

$\therefore \angle 1 = 160^\circ$ and $\angle 2 = 130^\circ$
(alternate angles)

$\therefore y = \angle 1 + \angle 2 = 160^\circ + 130^\circ = 290^\circ$

But $x + y = 360^\circ$ (angles at a point)

$\Rightarrow 290^\circ + x = 360^\circ$

$\Rightarrow \quad x = 360^\circ - 290^\circ = 70^\circ$

Hence $x = 70^\circ, y = 290^\circ$

(xii) From 0, draw a line parallel to the given parallel lines

$\therefore \angle 1 = 50^\circ$ (alternate angles)

$\angle 2 = 40^\circ$

$\therefore b = \angle 1 + \angle 2 = 50^\circ + 40^\circ = 90^\circ$

But $a + b = 360^\circ$ (angles at a point)

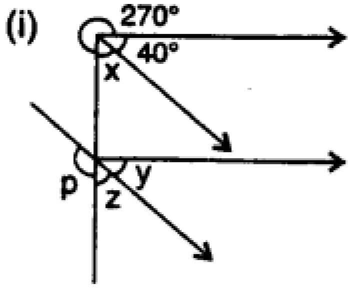
$\therefore a + 90^\circ = 360^\circ$

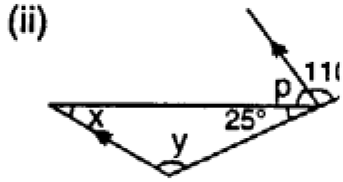
$\Rightarrow a = 360^\circ - 90^\circ = 270^\circ$

Hence $a = 270^\circ, b = 90^\circ$

Question 7.

Find x. y and p is the given figures





Solution:

In figure (i)

$\because$ Lines are parallel

$\therefore x = z$ (corresponding angles)

$y = 40°$ (corresponding angles)

But $x + 40° + 270° = 360°$

(angles at a point)

$\Rightarrow x + 310° = 360°$

$\Rightarrow x = 360° - 310° = 50°$

$\therefore z = x = 50°$

But $p + z = 180°$ (linear pair)

$\Rightarrow p + 50° = 180°$

$\Rightarrow p = 180° - 50° = 130°$

Hence $x = 50°, y = 40°, z = 50°$

and $p = 130°$

(ii) In figure (ii)

$\because$ Lines are parallel

$\therefore y = 110°$ (corresponding angles)

But $25° + p + 110° = 180°$

(angles on a line)

$\Rightarrow p + 135° = 180°$

$\Rightarrow p = 180° - 135° = 45°$

$\Rightarrow x + y + 25° = 180°$

(sum of angles of a triangle)

$\Rightarrow x + 110° + 25° = 180°$

$\Rightarrow x + 135° = 180°$

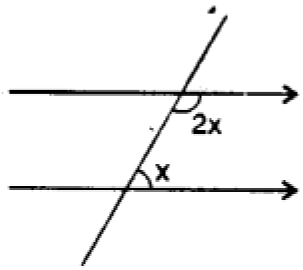
$\Rightarrow x = 180° - 135° = 45°$

Hence $x = 45°, y = 110°$ and $p = 45°$

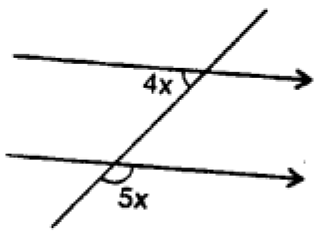
Question 8.

Find x in the following cases :

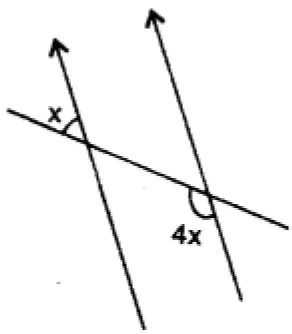
(i)



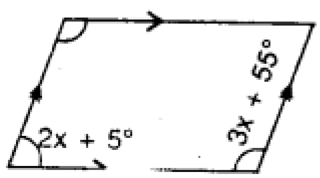
(ii)



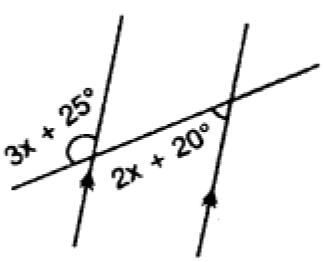
(iii)



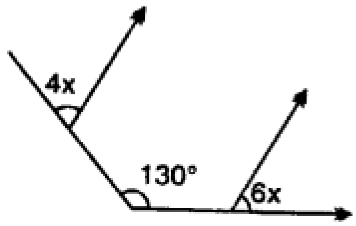
(iv)



(v)



(vi)



Solution:

(i) In figure (i),

$\because$ Lines are parallel

$\therefore 2x + x = 180°$ (co-interior angles)

$\Rightarrow 3x = 180° \quad \Rightarrow x = \frac{180°}{3} = 60°$

(ii) In figure (ii),

$\because$ Lines are parallel

$\therefore 4x + 1 = 180°$ (co-interior angles)

But $\angle 1 = 5x$ (vertically opposite angles)

$\therefore 4x + 5x = 180° \quad \Rightarrow 9x = 180°$

Hence $x = \frac{180°}{9} = 20°$

(iii) In figure (iii),

$\because$ Lines are parallel

$\therefore \angle 1 + 4x = 180°$ (co-interior angles)

But $\angle 1 = x$ (vertically opposite angles)

$\therefore x + 4x = 180°$

$\Rightarrow \quad 5x = 180° \quad \Rightarrow x = \frac{180°}{5} = 36°$

Hence $x = 36°$

(iv) In figure (iv),

$\because$ Lines are parallel

$\therefore 2x + 5° + 3x + 55° = 180°$

(co-inteior angles)

$\Rightarrow 5x + 60° = 180°$

$\Rightarrow \quad 5x = 180° - 60° = 120°$

$\therefore x = \frac{120°}{5} = 24°$

Hence $x = 24°$

(v) In figure (v),

$\because$ Lines are parallel

$\therefore \angle 1 = 2x + 20°$ (alternate angles)

But $\angle 1 + 3x + 25° = 180°$ (linear pair)

$\Rightarrow 2x + 20° + 3x + 25° = 180°$

$\Rightarrow 5x + 45° = 180°$

$\Rightarrow 5x = 180° - 45° = 135°$

$\therefore x = \frac{135°}{5} = 27°$

(vi) In figure (vi),

From 0, draw a line parallel to the given parallel lines

$\therefore \angle 1 = 4x$ and $\angle 2 = 6x$

(corresponding angles)

But $\angle 1 + \angle 2 = 130°$

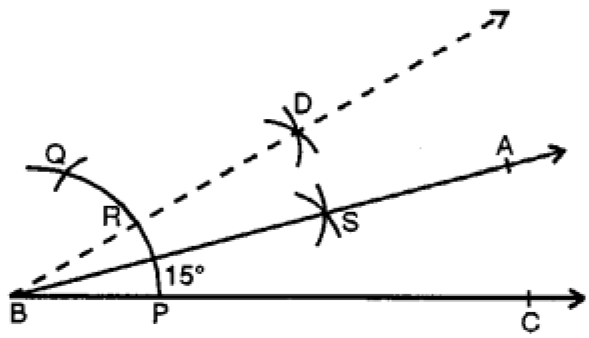
$\Rightarrow 4x + 6x = 130° \Rightarrow 10x = 130°$

$\therefore x = \frac{130°}{10} = 13°$

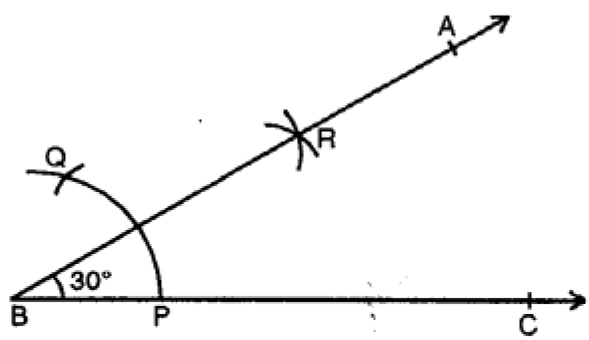
EXERCISE 14 (C)

Question 1.
Using ruler and compasses, construct the following angles :
(i)30°
(ii)15°
(iii) 75°
(iv) 180°
(v) 165°
(vi) 22.5°
(vii) 37.5°
(viii) 67.5°
Solution:
(i) 30°

Steps of Construction :
(i) Draw a line segment BC.
(ii) With centre B and a suitable radius draw an arc meeting BC at P.
(iii) With centre P and with same radius cut off the arc at Q.
(iv) Now with centre P and Q draw two arcs intersecting each other at R.
(v) Join BR and produce it to A, forming ZABC
= 30°

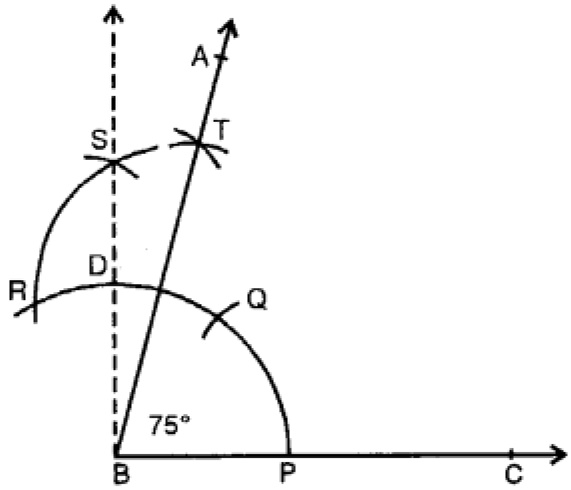


(ii) (15°)
Steps of Construction:
(i) Draw a line segment BC.
(ii) With centre B and a suitable radius draw an arc meeting BC at P.
(iii) With centre P and with same radius cut off the arc at Q.
(iv) Taking P and Q as curves, draw two arcs intersecting each other at D nnd join BD.
(v) With centre P and R, draw two more arcs intersecting each other at S.
(vi) Join BS and produce it to A.
Then ∠ABC = 15°.

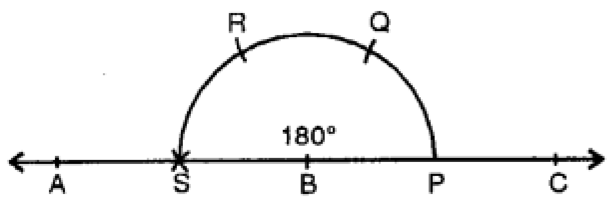


(iii) 75°
Steps of Construction :
(i) Draw a line segment BC.
(ii) With centre B and a suitable radius draw an arc and cut off PQ, then QR of the same radius.
(iii) With centre Q and R, draw two arcs intersecting each other at S.
(iv) Join SB.
(v) With centre Q and D draw two arcs intersecting each other at T.
(vi) Join BT and produce it to A.

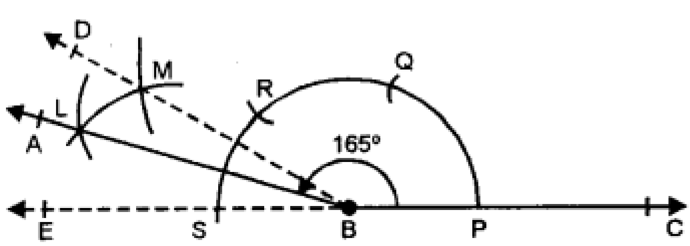
Then ∠ABC = 75°.



(iv) 180°
Steps of Construction :
(i) Draw a line segment BC.
(ii) With centre B and some suitable radius draw arc meeting BC at P.
(iii) With centre P and with same radius cut of arcs PQ, QR and then RS.
(iv) Join BS and produce it to A.
Then ∠ABC = 180°.



(v) 165°
Steps of Construction :
(i) Draw a line segment BC.
(ii) With centre B and some suitable radius draw an arc meeting BC at P.
(iii) With centre P and same radius cut off arcs PQ, QR and then RS.



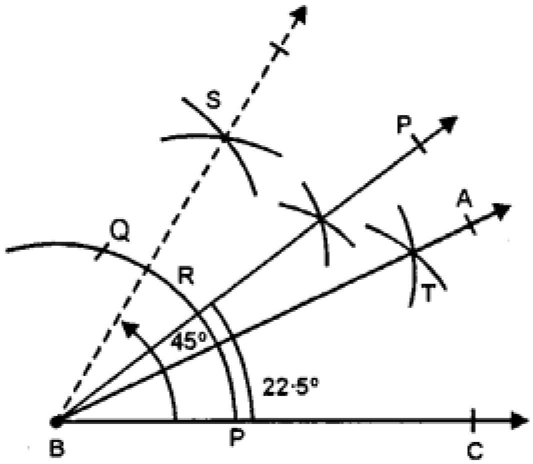
(iv) Join SB.
(v) With centres R and S, draw two arcs intersecting each other at M.
(vi) With centre T and S draw two arcs intersecting each other at L.
(vi) Join BL and produce it to A. Then ∠ABC = 165°

(vi) 22.5°

Steps of Construction :

(i) Draw a line segment BC.

(ii) With centre B and some suitable radius, draw an arc meeting BC at P.



(iii) With centre P and some radius, cut off arcs PQ.

(iv) Bisect arc PQ at R and join BR.

(v) Bisect arc QR at S and join BS.

(vii) Now bisect arc PR at T.

(viii) Join BT and produce it to A.

Then ∠ABC = 22 $\frac{1}{2}$ ° or 22.5°.

(vii) 37.5°

Steps of Construction :

(i) Draw a line segment BC.

(ii) With centre B and some suitable radius, draw an arc meeting BC at P.

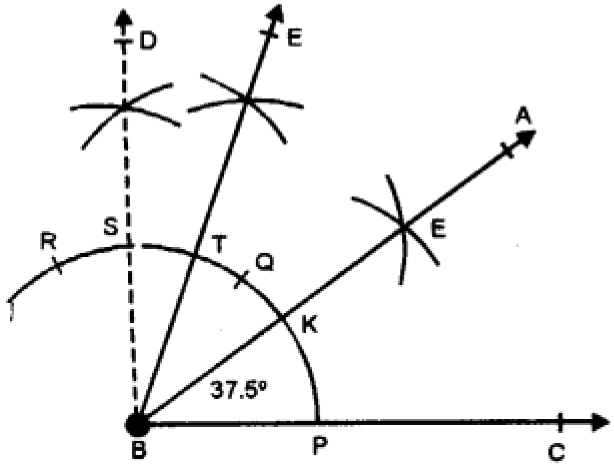
(iii) With centre P and same radius cut off arcs PQ and QR.

(iv) Now bisect arc QR at S and again bisect arc QS at T.

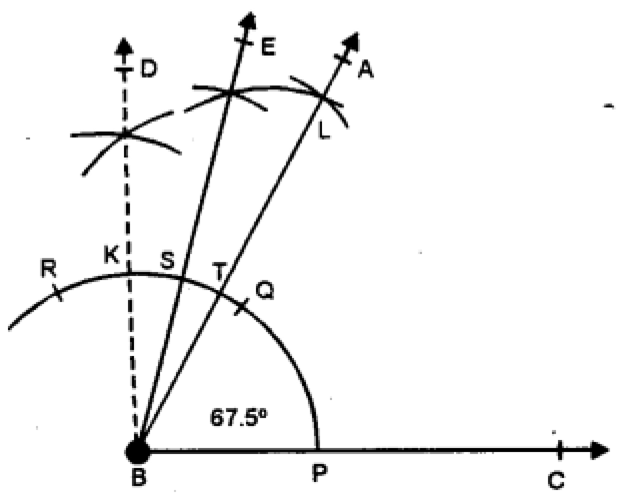
(v) Bisect arc PT at K.

(vi) Join BK and produce it to A.

Then, ∠ABC – 37 $\frac{1}{2}$ °or 37-5.

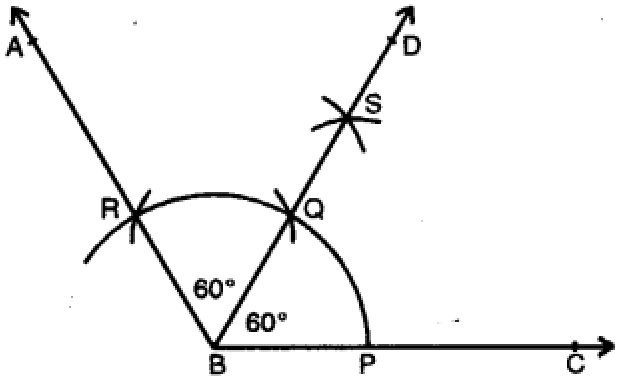


(viii) 67.5°
Steps of Construction :
(i) Draw a line segment BC.
(ii) With centre B and some suitable radius, draw an arc meeting BC at P.
(iii) With centre P and with same radius, cut arcs PQ and then QR.
(iv) Bisect arc QR at K and again bisect arc QK at S.
(v) Bisect again arc SQ at T.
(vi) Join BT and produce it to A.
Then ∠ABC = 67$\frac{1}{2}$ ° or 67.5°



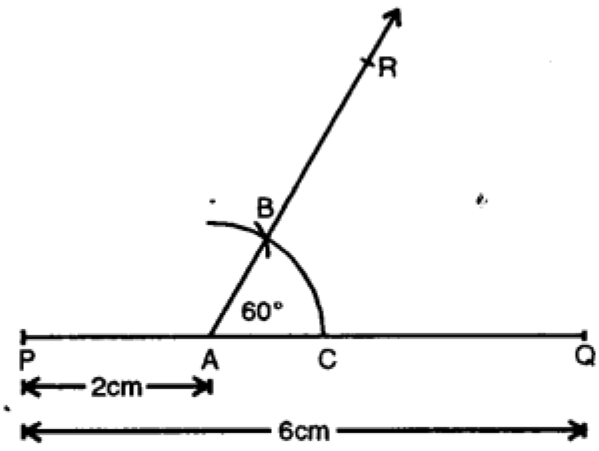
Question 2.
Draw ∠ABC = 120°. Bisect the angle using ruler and compasses only. Measure each 1 angle so obtained and check whether the angles obtained on bisecting ∠ABC are equal or not.
Solution:
Steps of Construction :

(i) Draw a line segment BC.
(ii) With centre B and some suitable radius, draw an arc meeting BC at P.



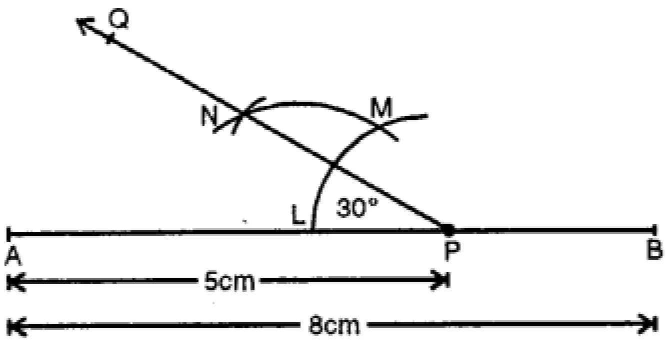
(iii) With centre P and with same radius, cut arcs PQ and QR.
(iv) Join BR and produce it to A.
Then ∠ABC = 120°
(v) With centres P and R, draw two arcs intersecting each other at S.
(vi) Join BS and produce it to D. BD is the bisector of ∠ABC.
On measuring each angle, it is of 60° each. Yes, both angles are equal in measure.

Question 3.
Draw a line segment PQ = 6 cm. Mark a point A in PQ so that AP = 2 cm. At point A, construct angle QAR = 60°.
Solution:
Steps of Construction :
(i) Draw a line segment PQ = 6 cm.

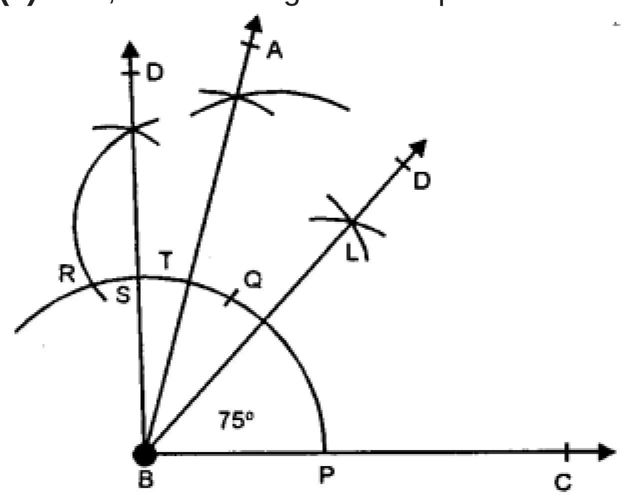


(ii) Mark a point A on PQ so that AP = 2 cm.
(iii) With centre A and some suitable radius draw an arc meeting AQ at C.
(iv) With centre C and with same radius, cut arc CB.
(v) Join AB and produce it to R.
Then ∠QAR = 60°

Question 4.
Draw a line segment AB = 8 cm. Mark a point P in AB so that AP = 5 cm. At P, construct angle APQ = 30°.
Solution:
Steps of Construction :
(i) Draw a line segment AB = 8 cm.
(ii) Mark a point P in AB such that AP = 5 cm.
(iii) With centre P and some suitable radius, draw an arc meeting AB in L.
(iv) With centre L and same radius cut arc LM.
(v) Bisect arc LM at N.
(vi) Join PN and produce it to Q.
Then ∠APQ = 30°

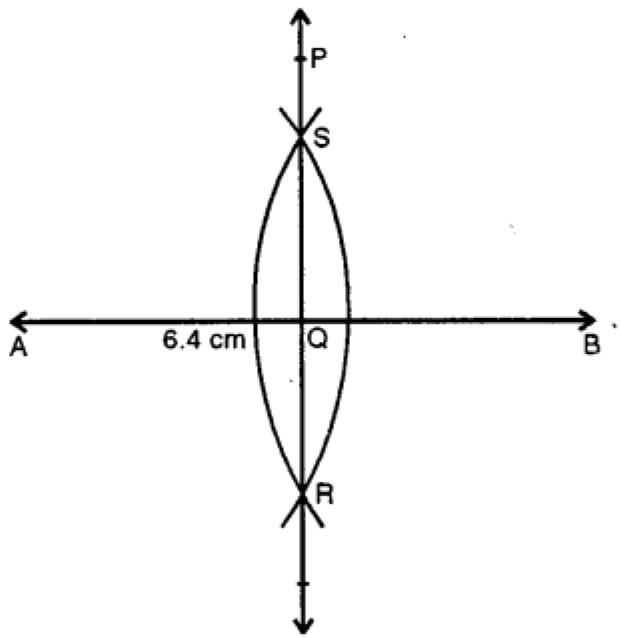


Question 5.
Construct an angle of 75° and then bisect it.
Solution:
Steps of Construction :
(i) Draw a line segment BC.
(ii) At B, draw an angle ABC equal to 75°.



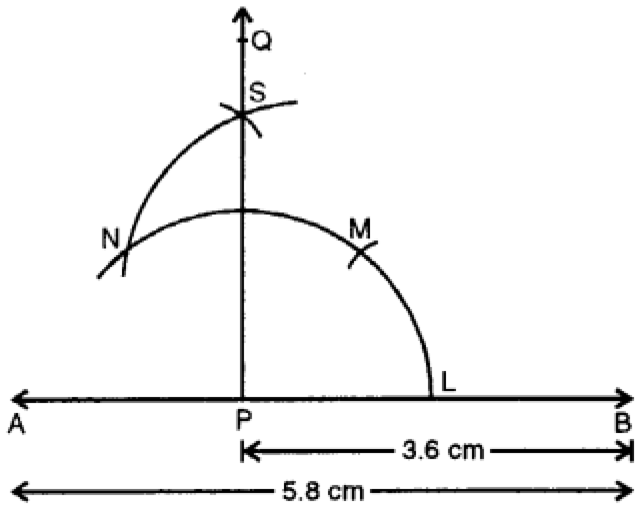
(iii) With centres P and T, draw arcs intersecting each other at L.
(iv) Join BL and produce it to D. Then BD bisects ∠ABC.

Question 6.
Draw a line segment of length 6 .4 cm. Draw its perpendicular bisector.
Solution:
Steps of Construction :
(i) Draw a line segment AB = 6.4 cm.
(ii) With centres A and B and with some suitable radius, draw arcs intersecting each other at S and R.
(iii) Join SR intersecting AB at Q. Then PQR is the perpendicular bisector of line segment AB



Question 7.
Draw a line segment AB = 5.8 cm. Mark a point P in AB such that PB = 3.6 cm. At P, draw perpendicular to AB.
Solution:
Steps of Construction :
(i) Draw a line segment AB = 5.8 cm.
(ii) Mark a point P in AB such that PB = 3.6 cm.
(iii) With centre P and some suitable radius draw an arc meeting AB in L.
(iv) With centre L and same radius cut arcs LM and then as N.
(v) Bisect arc MN at S.

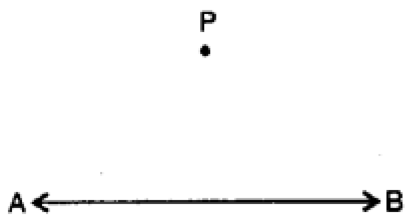
(vi) Join PS and produce it to Q. Then PQ is perpendicular to AB at P.



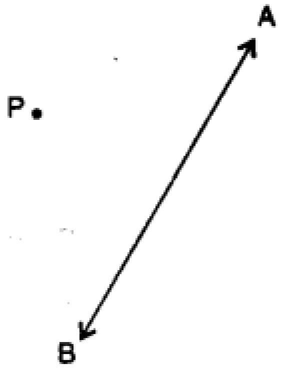
Question 8.

In each case, given below, draw a line through point P and parallel to AB :

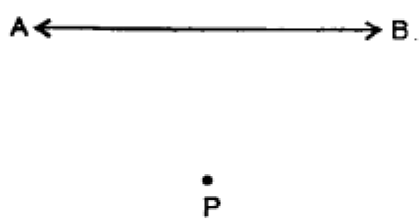
(i)



(ii)



(iii)



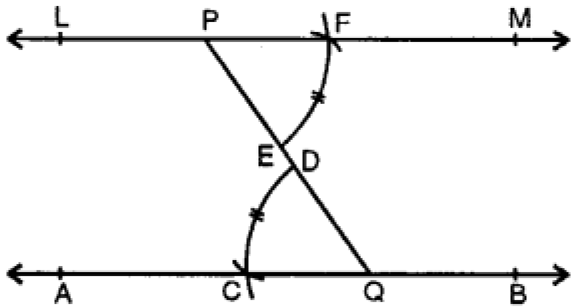
Solution:

Steps of construction :

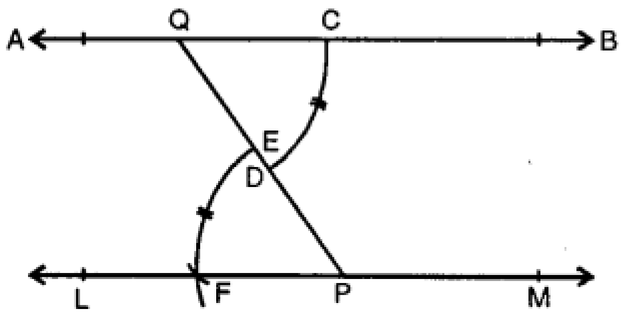
(i) From P. draw a line segment meeting AB at

(ii) With centre Q and some suitable radius draw an arc CD.

(iii) With centre P and same radius draw another arc meeting PQ at E.



(iv) With centre E and radius equal to CD, cut this arc at F



(v) Join PF and produce it to both sides to L and M. Then line LM is parallel to given line AB.