

Chapter 5: Lines and Angles

NCERT · Class 7 · Maths

Exercise 5.1 · Textbook page 101

Question 1

Find the complement of each of the following angles:

(i)



Solution

Solution:-

Two angles are said to be complementary if the sum of their measures is 90° .

The given angle is 20°

Let the measure of its complement be x° .

Then,

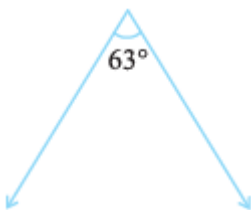
$$= x + 20^\circ = 90^\circ$$

$$= x = 90^\circ - 20^\circ$$

$$= x = 70^\circ$$

Hence, the complement of the given angle measures 70° .

(ii)



Solution:-

Two angles are said to be complementary if the sum of their measures is 90° .

The given angle is 63°

Let the measure of its complement be x° .

Then,

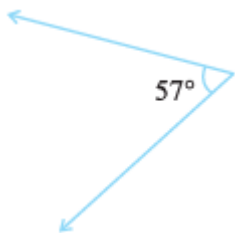
$$= x + 63^\circ = 90^\circ$$

$$= x = 90^\circ - 63^\circ$$

$$= x = 27^\circ$$

Hence, the complement of the given angle measures 27° .

(iii)

**Solution:-**

Two angles are said to be complementary if the sum of their measures is 90° .

The given angle is 57°

Let the measure of its complement be x° .

Then,

$$= x + 57^\circ = 90^\circ$$

$$= x = 90^\circ - 57^\circ$$

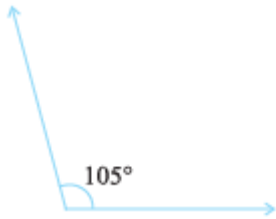
$$= x = 33^\circ$$

Hence, the complement of the given angle measures 33° .

Question 2

Find the supplement of each of the following angles:

(i)

**Solution****Solution:-**

Two angles are said to be supplementary if the sum of their measures is 180° .

The given angle is 105°

Let the measure of its supplement be x° .

Then,

$$= x + 105^\circ = 180^\circ$$

$$= x = 180^\circ - 105^\circ$$

$$= x = 75^\circ$$

Hence, the supplement of the given angle measures 75° .

(ii)

**Solution:-**

Two angles are said to be supplementary if the sum of their measures is 180° .

The given angle is 87°

Let the measure of its supplement be x° .

Then,

$$= x + 87^\circ = 180^\circ$$

$$= x = 180^\circ - 87^\circ$$

$$= x = 93^\circ$$

Hence, the supplement of the given angle measures 93° .

(iii)



Solution:-

Two angles are said to be supplementary if the sum of their measures is 180° .

The given angle is 154°

Let the measure of its supplement be x° .

Then,

$$= x + 154^\circ = 180^\circ$$

$$= x = 180^\circ - 154^\circ$$

$$= x = 26^\circ$$

Hence, the supplement of the given angle measures 26° .

Question 3

Identify which of the following pairs of angles are complementary and which are supplementary.

(i) 65° , 115°

Solution

Solution:-

We have to find the sum of given angles to identify whether the angles are complementary or supplementary.

Then,

$$= 65^{\circ} + 115^{\circ}$$

$$= 180^{\circ}$$

If the sum of two angle measures is 180° , then the two angles are said to be supplementary.

$\therefore$ These angles are supplementary angles.

(ii) 63° , 27°

Solution:-

We have to find the sum of given angles to identify whether the angles are complementary or supplementary.

Then,

$$= 63^{\circ} + 27^{\circ}$$

$$= 90^{\circ}$$

If the sum of two angle measures is 90° , then the two angles are said to be complementary.

$\therefore$ These angles are complementary angles.

(iii) 112° , 68°

Solution:-

We have to find the sum of given angles to identify whether the angles are complementary or supplementary.

Then,

$$= 112^{\circ} + 68^{\circ}$$

$$= 180^{\circ}$$

If the sum of two angle measures is 180° , then the two angles are said to be supplementary.

$\therefore$ These angles are supplementary angles.

(iv) 130° , 50°

Solution:-

We have to find the sum of given angles to identify whether the angles are complementary or supplementary.

Then,

$$= 130^{\circ} + 50^{\circ}$$

$$= 180^{\circ}$$

If the sum of two angle measures is 180° , then the two angles are said to be supplementary.

$\therefore$ These angles are supplementary angles.

(v) 45° , 45°

Solution:-

We have to find the sum of given angles to identify whether the angles are complementary or supplementary.

Then,

$$= 45^{\circ} + 45^{\circ}$$

$$= 90^{\circ}$$

If the sum of two angle measures is 90° , then the two angles are said to be complementary.

$\therefore$ These angles are complementary angles.

(vi) 80° , 10°

Solution:-

We have to find the sum of given angles to identify whether the angles are complementary or supplementary.

Then,

$$= 80^{\circ} + 10^{\circ}$$

$$= 90^{\circ}$$

If the sum of two angle measures is 90° , then the two angles are said to be complementary.

$\therefore$ These angles are complementary angles.

Question 4

Find the angles which are equal to their complement.

Solution**Solution:-**

Let the measure of the required angle be x° .

We know that the sum of measures of complementary angle pair is 90° .

Then,

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

$$= 2x = 90^\circ$$

$$= x = 90/2$$

$$= x = 45^\circ$$

Hence, the required angle measure is 45° .

Question 5

Find the angles which are equal to their supplement.

Solution**Solution:-**

Let the measure of the required angle be x° .

We know that the sum of measures of supplementary angle pair is 180° .

Then,

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

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

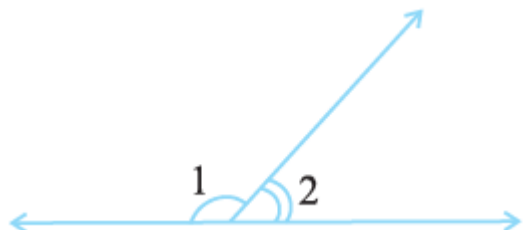
$$= x = 180/2$$

$$= x = 90^\circ$$

Hence, the required angle measure is 90° .

Question 6

In the given figure, $\angle 1$ and $\angle 2$ are supplementary angles. If $\angle 1$ is decreased, what changes should take place in $\angle 2$ so that both angles still remain supplementary?



Solution

Solution:-

From the question, it is given that

$\angle 1$ and $\angle 2$ are supplementary angles.

If $\angle 1$ is decreased, then $\angle 2$ must be increased by the same value. Hence, this angle pair remains supplementary.

Question 7

Can two angles be supplementary if both of them are:

(i). Acute?

Solution

Solution:-

No. If two angles are acute, which means less than 90° , then they cannot be supplementary because their sum will always be less than 90° .

(ii). Obtuse?

Solution:-

No. If two angles are obtuse, which means more than 90° , then they cannot be supplementary because their sum will always be more than 180° .

(iii). Right?**Solution:-**

Yes. If two angles are right, which means both measure 90° , then they can form a supplementary pair.

$$\therefore 90^\circ + 90^\circ = 180$$

Question 8

An angle is greater than 45° . Is its complementary angle greater than 45° or equal to 45° or less than 45° ?

Solution**Solution:-**

Let us assume the complementary angles be p and q ,

We know that the sum of measures of complementary angle pair is 90° .

Then,

$$= p + q = 90^\circ$$

It is given in the question that $p > 45^\circ$

Adding q on both sides,

$$= p + q > 45^\circ + q$$

$$= 90^\circ > 45^\circ + q$$

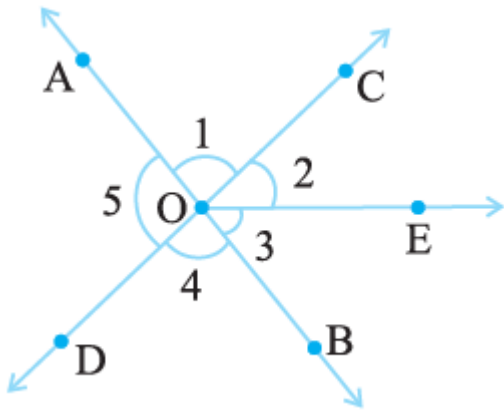
$$= 90^\circ - 45^\circ > q$$

$$= q < 45^\circ$$

Hence, its complementary angle is less than 45° .

Question 9

In the adjoining figure:



(i) Is $\angle 1$ adjacent to $\angle 2$?

Solution

Solution:-

By observing the figure, we came to conclude that,

Yes, as $\angle 1$ and $\angle 2$ have a common vertex, i.e., O and a common arm, OC.

Their non-common arms, OA and OE, are on both sides of the common arm.

(ii) Is $\angle AOC$ adjacent to $\angle AOE$?

Solution:-

By observing the figure, we came to conclude that,

No, since they have a common vertex O and common arm OA.

But, they have no non-common arms on both sides of the common arm.

(iii) Do $\angle COE$ and $\angle EOD$ form a linear pair?

Solution:-

By observing the figure, we came to conclude that,

Yes, as $\angle COE$ and $\angle EOD$ have a common vertex, i.e. O and a common arm OE.

Their non-common arms, OC and OD, are on both sides of the common arm.

(iv) Are $\angle BOD$ and $\angle DOA$ supplementary?

Solution:-

By observing the figure, we came to conclude that,

Yes, as $\angle BOD$ and $\angle DOA$ have a common vertex, i.e. O and a common arm OE.

Their non-common arms, OA and OB, are opposite to each other.

(v) Is $\angle 1$ vertically opposite to $\angle 4$?

Solution:-

Yes, $\angle 1$ and $\angle 2$ are formed by the intersection of two straight lines AB and CD.

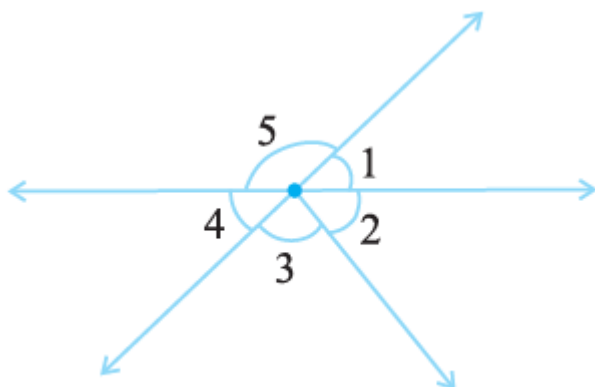
(vi) What is the vertically opposite angle of $\angle 5$?

Solution:-

$\angle COB$ is the vertically opposite angle of $\angle 5$. Because these two angles are formed by the intersection of two straight lines AB and CD.

Question 10

Indicate which pairs of angles are:



(i) Vertically opposite angles.

Solution

Solution:-

By observing the figure, we can say that

$\angle 1$ and $\angle 4$, $\angle 5$ and $\angle 2 + \angle 3$ are vertically opposite angles. Because these two angles are formed by the intersection of two straight lines.

(ii) Linear pairs.

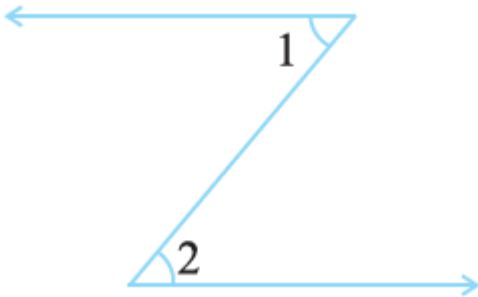
Solution:-

By observing the figure, we can say that,

$\angle 1$ and $\angle 5$, $\angle 5$ and $\angle 4$, as these have a common vertex and also have non-common arms opposite to each other.

Question 11

In the following figure, is $\angle 1$ adjacent to $\angle 2$? Give reasons.

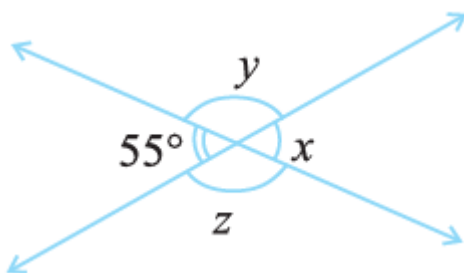
**Solution****Solution:-**

$\angle 1$ and $\angle 2$ are not adjacent angles because they are not lying on the same vertex.

Question 12

Find the values of the angles x , y , and z in each of the following:

(i)

**Solution****Solution:-**

$\angle x = 55^\circ$, because vertically opposite angles.

$$\angle x + \angle y = 180^\circ \dots [\because \text{linear pair}]$$

$$= 55^\circ + \angle y = 180^\circ$$

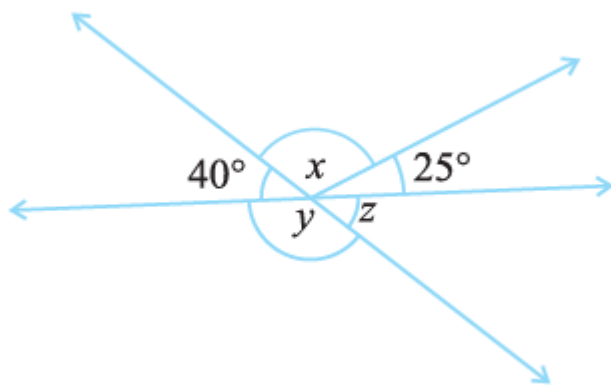
$$= \angle y = 180^\circ - 55^\circ$$

$$= \angle y = 125^\circ$$

Then, $\angle y = \angle z \dots [\because \text{vertically opposite angles}]$

$$\therefore \angle z = 125^\circ$$

(ii)



Solution:-

$\angle z = 40^\circ$, because vertically opposite angles.

$$\angle y + \angle z = 180^\circ \dots [\because \text{linear pair}]$$

$$= \angle y + 40^\circ = 180^\circ$$

$$= \angle y = 180^\circ - 40^\circ$$

$$= \angle y = 140^\circ$$

Then, $40 + \angle x + 25 = 180^\circ \dots [\because \text{angles on straight line}]$

$$65 + \angle x = 180^\circ$$

$$\angle x = 180^\circ - 65$$

$$\therefore \angle x = 115^\circ$$

Question 13

Fill in the blanks.

(i) If two angles are complementary, then the sum of their measures is _____.

Solution

Solution:-

If two angles are complementary, then the sum of their measures is 90° .

(ii) If two angles are supplementary, then the sum of their measures is _____.

Solution:-

If two angles are supplementary, then the sum of their measures is 180° .

(iii) Two angles forming a linear pair are _____.

Solution:-

Two angles forming a linear pair are supplementary.

(iv) If two adjacent angles are supplementary, they form a _____.

Solution:-

If two adjacent angles are supplementary, they form a linear pair.

(v) If two lines intersect at a point, then the vertically opposite angles are always

_____.

Solution:-

If two lines intersect at a point, then the vertically opposite angles are always equal.

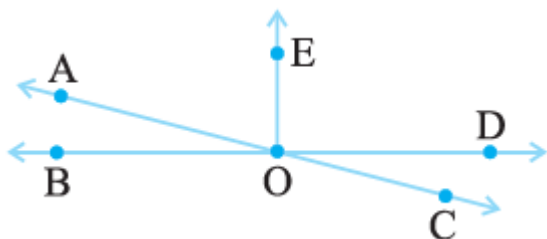
(vi) If two lines intersect at a point, and if one pair of vertically opposite angles are acute angles, then the other pair of vertically opposite angles are _____.

Solution:-

If two lines intersect at a point, and if one pair of vertically opposite angles are acute angles, then the other pair of vertically opposite angles are obtuse angles.

Question 14

In the adjoining figure, name the following pairs of angles.



(i) Obtuse vertically opposite angles

Solution

Solution:-

$\angle AOD$ and $\angle BOC$ are obtuse vertically opposite angles in the given figure.

(ii) Adjacent complementary angles

Solution:-

$\angle EOA$ and $\angle AOB$ are adjacent complementary angles in the given figure.

(iii) Equal supplementary angles

Solution:-

$\angle EOB$ and $\angle EOD$ are the equal supplementary angles in the given figure.

(iv) Unequal supplementary angles

Solution:-

$\angle EOA$ and $\angle EOC$ are the unequal supplementary angles in the given figure.

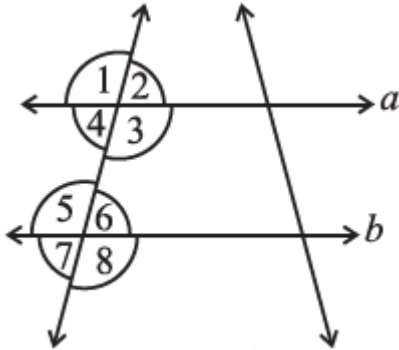
(v) Adjacent angles that do not form a linear pair

Solution:-

$\angle AOB$ and $\angle AOE$, $\angle AOE$ and $\angle EOD$, $\angle EOD$ and $\angle COD$ are the adjacent angles that do not form a linear pair in the given figure.

Exercise 5.2 · Textbook page 110**Question 1**

State the property that is used in each of the following statements?



(i) If $a \parallel b$, then $\angle 1 = \angle 5$.

Solution

Solution:-

Corresponding angles property is used in the above statement.

(ii) If $\angle 4 = \angle 6$, then $a \parallel b$.

Solution:-

Alternate interior angles property is used in the above statement.

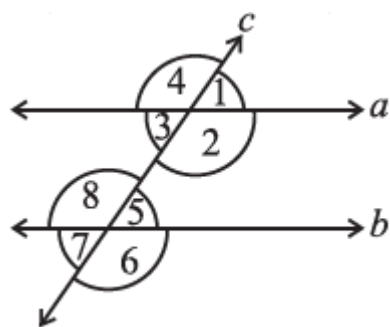
(iii) If $\angle 4 + \angle 5 = 180^\circ$, then $a \parallel b$.

Solution:-

Interior angles on the same side of the transversal are supplementary.

Question 2

In the adjoining figure, identify



(i) The pairs of corresponding angles.

Solution

Solution:-

By observing the figure, the pairs of the corresponding angles are,

$\angle 1$ and $\angle 5$, $\angle 4$ and $\angle 8$, $\angle 2$ and $\angle 6$, $\angle 3$ and $\angle 7$

(ii) The pairs of alternate interior angles.

Solution:-

By observing the figure, the pairs of alternate interior angles are,

$\angle 2$ and $\angle 8$, $\angle 3$ and $\angle 5$

(iii) The pairs of interior angles on the same side of the transversal.

Solution:-

By observing the figure, the pairs of interior angles on the same side of the transversal are $\angle 2$ and $\angle 5$, $\angle 3$ and $\angle 8$

(iv) The vertically opposite angles.

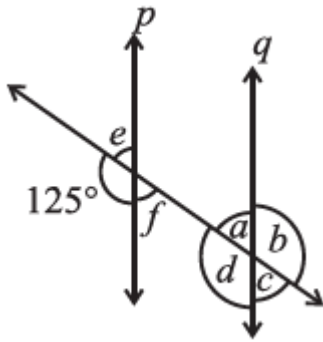
Solution:-

By observing the figure, the vertically opposite angles are,

$\angle 1$ and $\angle 3$, $\angle 5$ and $\angle 7$, $\angle 2$ and $\angle 4$, $\angle 6$ and $\angle 8$

Question 3

In the adjoining figure, $p \parallel q$. Find the unknown angles.



Solution

Solution:-

By observing the figure,

$$\angle d = 125^\circ \dots [\because \text{corresponding angles}]$$

We know that Linear pair is the sum of adjacent angles is 180°

Then,

$$= \angle e + 125^\circ = 180^\circ \dots [\text{Linear pair}]$$

$$= \angle e = 180^\circ - 125^\circ$$

$$= \angle e = 55^\circ$$

From the rule of vertically opposite angles,

$$\angle f = \angle e = 55^\circ$$

$$\angle b = \angle d = 125^\circ$$

By the property of corresponding angles,

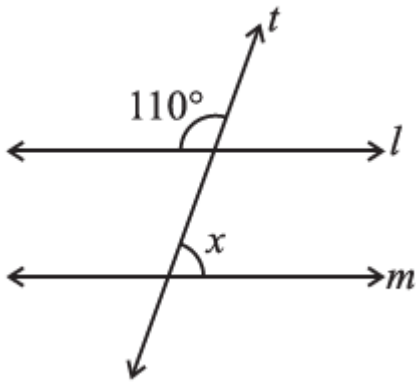
$$\angle c = \angle f = 55^\circ$$

$$\angle a = \angle e = 55^\circ$$

Question 4

Find the value of x in each of the following figures if $l \parallel m$.

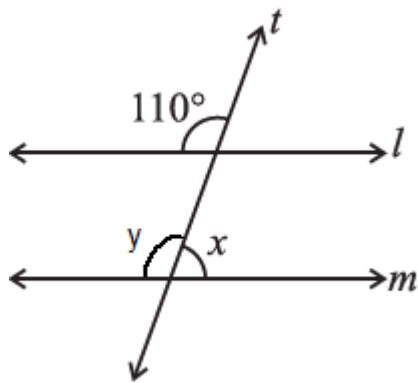
(i)



Solution

Solution:-

Let us assume the other angle on the line m be $\angle y$.



Then,

By the property of corresponding angles,

$$\angle y = 110^\circ$$

We know that Linear pair is the sum of adjacent angles is 180°

Then,

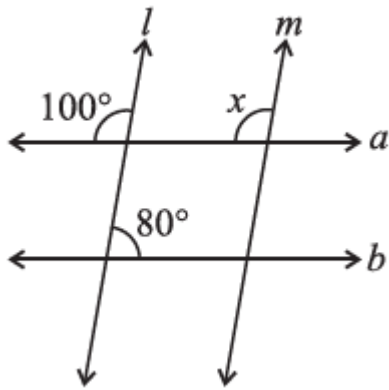
$$= \angle x + \angle y = 180^\circ$$

$$= \angle x + 110^\circ = 180^\circ$$

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

$$= \angle x = 70^\circ$$

(ii)



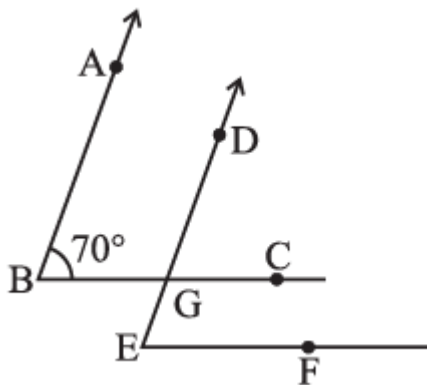
Solution:-

By the property of corresponding angles,

$$\angle x = 100^\circ$$

Question 5

In the given figure, the arms of the two angles are parallel.



If $\angle ABC = 70^\circ$, then find

(i) $\angle DGC$

(ii) $\angle DEF$

Solution

Solution:-

(i) Let us consider $AB \parallel DG$.

BC is the transversal line intersecting AB and DG .

By the property of corresponding angles

$$\angle DGC = \angle ABC$$

Then,

$$\angle DGC = 70^\circ$$

(ii) Let us consider that $BC \parallel EF$.

DE is the transversal line intersecting BC and EF.

By the property of corresponding angles

$$\angle DEF = \angle DGC$$

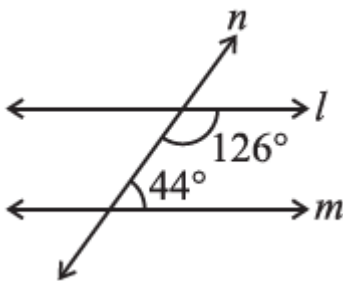
Then,

$$\angle DEF = 70^\circ$$

Question 6

In the given figures below, decide whether l is parallel to m.

(i)



Solution

Solution:-

Let us consider the two lines, l and m.

n is the transversal line intersecting l and m.

We know that the sum of interior angles on the same side of the transversal is 180° .

Then,

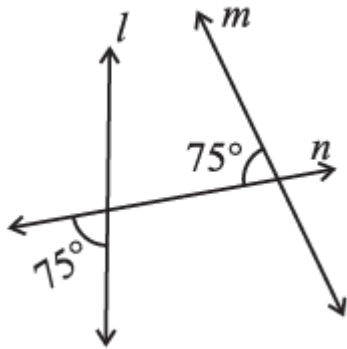
$$= 126^\circ + 44^\circ$$

$$= 170^{\circ}$$

But, the sum of interior angles on the same side of transversal is not equal to 180° .

So, line l is not parallel to line m .

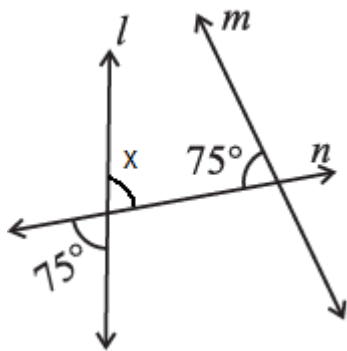
(ii)



Solution:-

Let us assume $\angle x$ be the vertically opposite angle formed due to the intersection of the straight line l and transversal n ,

Then, $\angle x = 75^{\circ}$



Let us consider the two lines, l and m .

n is the transversal line intersecting l and m .

We know that the sum of interior angles on the same side of the transversal is 180° .

Then,

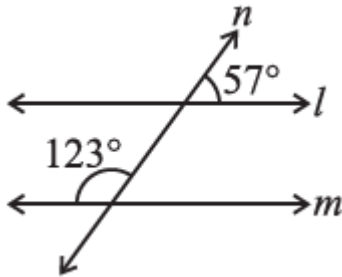
$$= 75^{\circ} + 75^{\circ}$$

$$= 150^{\circ}$$

But, the sum of interior angles on the same side of transversal is not equal to 180° .

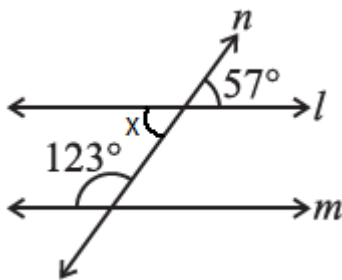
So, line l is not parallel to line m .

(iii)



Solution:-

Let us assume $\angle x$ be the vertically opposite angle formed due to the intersection of the straight line l and transversal line n .



Let us consider the two lines, l and m .

n is the transversal line intersecting l and m .

We know that the sum of interior angles on the same side of the transversal is 180° .

Then,

$$= 123^\circ + \angle x$$

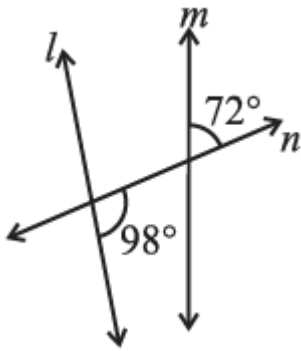
$$= 123^\circ + 57^\circ$$

$$= 180^\circ$$

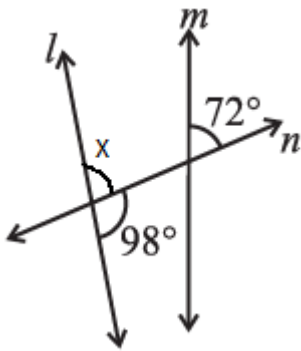
$\therefore$ The sum of interior angles on the same side of the transversal is equal to 180° .

So, line l is parallel to line m .

(iv)

**Solution:-**

Let us assume $\angle x$ be the angle formed due to the intersection of the Straight line l and transversal line n .



We know that the Linear pair is the sum of adjacent angles equal to 180° .

$$= \angle x + 98^\circ = 180^\circ$$

$$= \angle x = 180^\circ - 98^\circ$$

$$= \angle x = 82^\circ$$

Now, we consider $\angle x$ and 72° are the corresponding angles.

For l and m to be parallel to each other, corresponding angles should be equal.

But, in the given figure, corresponding angles measure 82° and 72° , respectively.

$\therefore$ Line l is not parallel to line m .

Disclaimer:

Dropped Topics – 5.2.3 Adjacent angles, 5.2.4 Linear pairs and 5.2.5 Vertically opposite angles