

## EXERCISE 5.1

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**1. Find the complement of each of the following angles:**

(i)

**Solution:-**Two angles are said to be complementary if the sum of their measures is  $90^\circ$ .The given angle is  $20^\circ$ Let the measure of its complement be  $x^\circ$ .

Then,

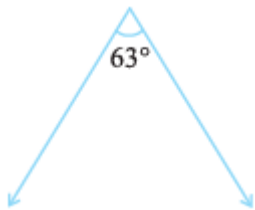
$$= x + 20^\circ = 90^\circ$$

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

$$= x = 70^\circ$$

Hence, the complement of the given angle measures  $70^\circ$ .

(ii)

**Solution:-**Two angles are said to be complementary if the sum of their measures is  $90^\circ$ .The given angle is  $63^\circ$ Let the measure of its complement be  $x^\circ$ .

Then,

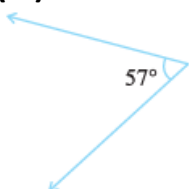
$$= x + 63^\circ = 90^\circ$$

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

$$= x = 27^\circ$$

Hence, the complement of the given angle measures  $27^\circ$ .

(iii)



**Solution:-**

Two angles are said to be complementary if the sum of their measures is  $90^\circ$ .

The given angle is  $57^\circ$

Let the measure of its complement be  $x^\circ$ .

Then,

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

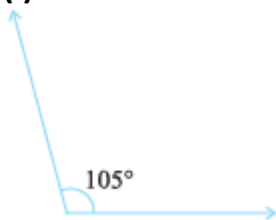
$$= x = 90^\circ - 57^\circ$$

$$= x = 33^\circ$$

Hence, the complement of the given angle measures  $33^\circ$ .

**2. Find the supplement of each of the following angles:**

(i)

**Solution:-**

Two angles are said to be supplementary if the sum of their measures is  $180^\circ$ .

The given angle is  $105^\circ$

Let the measure of its supplement be  $x^\circ$ .

Then,

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

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

$$= x = 75^\circ$$

Hence, the supplement of the given angle measures  $75^\circ$ .

(ii)

**Solution:-**

Two angles are said to be supplementary if the sum of their measures is  $180^\circ$ .

The given angle is  $87^\circ$

Let the measure of its supplement be  $x^\circ$ .

Then,

$$\begin{aligned} &= x + 87^\circ = 180^\circ \\ &= x = 180^\circ - 87^\circ \\ &= x = 93^\circ \end{aligned}$$

Hence, the supplement of the given angle measures  $93^\circ$ .

(iii)



**Solution:-**

Two angles are said to be supplementary if the sum of their measures is  $180^\circ$ .

The given angle is  $154^\circ$

Let the measure of its supplement be  $x^\circ$ .

Then,

$$\begin{aligned} &= x + 154^\circ = 180^\circ \\ &= x = 180^\circ - 154^\circ \\ &= x = 26^\circ \end{aligned}$$

Hence, the supplement of the given angle measures  $26^\circ$ .

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

(i)  $65^\circ$ ,  $115^\circ$

**Solution:-**

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

Then,

$$\begin{aligned} &= 65^\circ + 115^\circ \\ &= 180^\circ \end{aligned}$$

If the sum of two angle measures is  $180^\circ$ , then the two angles are said to be supplementary.

$\therefore$  These angles are supplementary angles.

(ii)  $63^\circ$ ,  $27^\circ$

**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  $90^\circ$ , then the two angles are said to be complementary.

∴ These angles are complementary angles.

**(iii)  $112^\circ, 68^\circ$**

**Solution:-**

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

Then,

$$\begin{aligned} &= 112^\circ + 68^\circ \\ &= 180^\circ \end{aligned}$$

If the sum of two angle measures is  $180^\circ$ , then the two angles are said to be supplementary.

∴ These angles are supplementary angles.

**(iv)  $130^\circ, 50^\circ$**

**Solution:-**

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

Then,

$$\begin{aligned} &= 130^\circ + 50^\circ \\ &= 180^\circ \end{aligned}$$

If the sum of two angle measures is  $180^\circ$ , then the two angles are said to be supplementary.

∴ These angles are supplementary angles.

**(v)  $45^\circ, 45^\circ$**

**Solution:-**

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

Then,

$$\begin{aligned} &= 45^\circ + 45^\circ \\ &= 90^\circ \end{aligned}$$

If the sum of two angle measures is  $90^\circ$ , then the two angles are said to be complementary.

∴ These angles are complementary angles.

(vi)  $80^\circ$ ,  $10^\circ$

**Solution:-**

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

Then,

$$\begin{aligned} &= 80^\circ + 10^\circ \\ &= 90^\circ \end{aligned}$$

If the sum of two angle measures is  $90^\circ$ , then the two angles are said to be complementary.

$\therefore$  These angles are complementary angles.

**4. Find the angles which is equal to its complement.**

**Solution:-**

Let the measure of the required angle be  $x^\circ$ .

We know that, sum of measures of complementary angle pair is  $90^\circ$ .

Then,

$$\begin{aligned} &= x + x = 90^\circ \\ &= 2x = 90^\circ \\ &= x = 90/2 \\ &= x = 45^\circ \end{aligned}$$

Hence, the required angle measures is  $45^\circ$ .

**5. Find the angles which is equal to its supplement.**

**Solution:-**

Let the measure of the required angle be  $x^\circ$ .

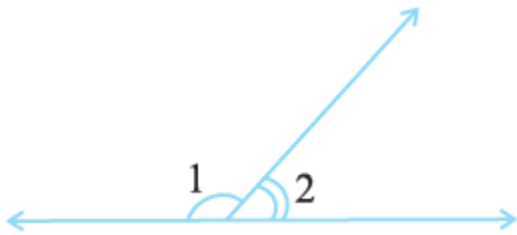
We know that, sum of measures of supplementary angle pair is  $180^\circ$ .

Then,

$$\begin{aligned} &= x + x = 180^\circ \\ &= 2x = 180^\circ \\ &= x = 180/2 \\ &= x = 90^\circ \end{aligned}$$

Hence, the required angle measures is  $90^\circ$ .

**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:-**

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.

**7. Can two angles be supplementary if both of them are:**

**(i). Acute?**

**Solution:-**

No. If two angles are acute, means less than  $90^\circ$ , the two angles cannot be supplementary. Because, their sum will be always less than  $90^\circ$ .

**(ii). Obtuse?**

**Solution:-**

No. If two angles are obtuse, means more than  $90^\circ$ , the two angles cannot be supplementary. Because, their sum will be always more than  $180^\circ$ .

**(iii). Right?**

**Solution:-**

Yes. If two angles are right, means both measures  $90^\circ$ , then two angles can form a supplementary pair.

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

**8. An angle is greater than  $45^\circ$ . Is its complementary angle greater than  $45^\circ$  or equal to  $45^\circ$  or less than  $45^\circ$ ?**

**Solution:-**

Let us assume the complementary angles be  $p$  and  $q$ ,

We know that, sum of measures of complementary angle pair is  $90^\circ$ .

Then,

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

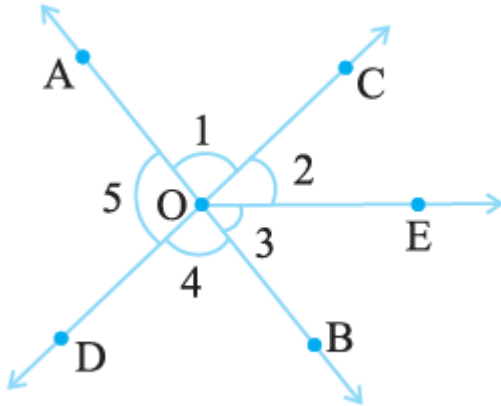
It is given in the question that  $p > 45^\circ$

Adding  $q$  on both the sides,

$$\begin{aligned}
 &= p + q > 45^\circ + q \\
 &= 90^\circ > 45^\circ + q \\
 &= 90^\circ - 45^\circ > q \\
 &= q < 45^\circ
 \end{aligned}$$

Hence, its complementary angle is less than  $45^\circ$ .

**9. In the adjoining figure:**



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

**Solution:-**

By observing the figure we came to conclude that,  
Yes, as  $\angle 1$  and  $\angle 2$  having a common vertex i.e. O and a common arm OC.  
Their non-common arms OA and OE are on both the side of common arm.

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

**Solution:-**

By observing the figure, we came to conclude that,  
No, since they are having a common vertex O and common arm OA.  
But, they have no non-common arms on both the side 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  $\angle EOD$  having a common vertex i.e. O and a common arm OE.  
Their non-common arms OC and OD are on both the side of 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  $\angle DOA$  having 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:-**

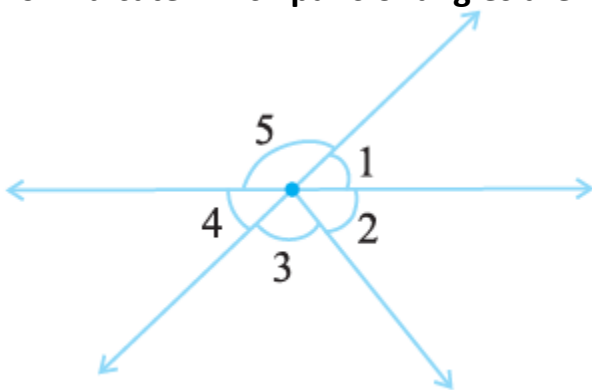
Yes,  $\angle 1$  and  $\angle 2$  are formed by the intersection of two straight lines AB and CD.

**(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.

**10. Indicate which pairs of angles are:**



**(i) Vertically opposite angles.**

**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.

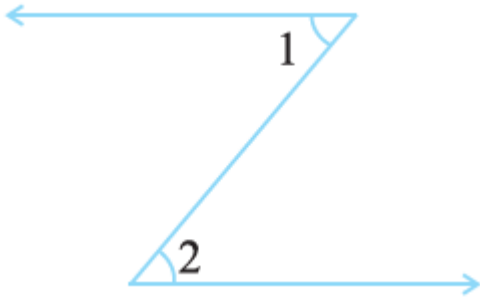
**(ii) Linear pairs.**

**Solution:-**

By observing the figure we can say that,  
 $\angle 1$  and  $\angle 5$ ,  $\angle 5$  and  $\angle 4$  as these are having a common vertex and also having non common arms opposite to each other.

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



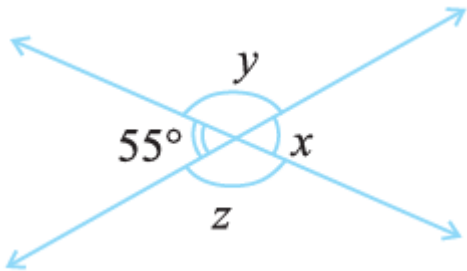


**Solution:-**

$\angle 1$  and  $\angle 2$  are not adjacent angles. Because, they are not lie on the same vertex.

**12. Find the values of the angles  $x$ ,  $y$ , and  $z$  in each of the following:**

(i)



**Solution:-**

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

$\angle x + \angle y = 180^\circ$  ... [ $\because$  linear pair]

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

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

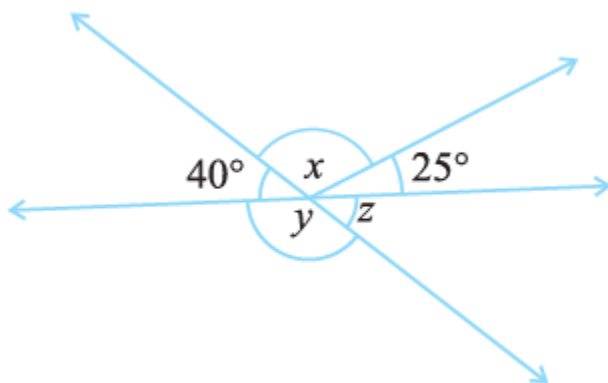
$= \angle y = 125^\circ$

Then,  $\angle y = \angle z$

... [ $\because$  vertically opposite angles]

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

(ii)



**Solution:-**

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

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

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

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

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

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

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

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

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

**13. Fill in the blanks:**

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

**Solution:-**

If two angles are complementary, then the sum of their measures is  $90^\circ$ .

(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  $180^\circ$ .

(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.

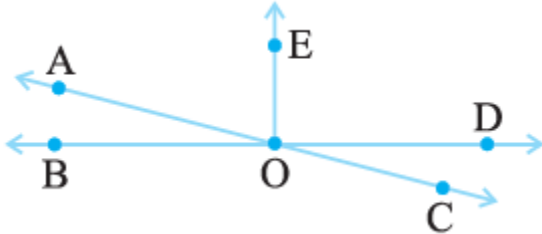
(vi) If two lines intersect at a point, and if one pair of vertically opposite angles are acute angles, then the other pair of vertically opposite angles are \_\_\_\_\_.

**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.

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



**(i) Obtuse vertically opposite angles**

**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.

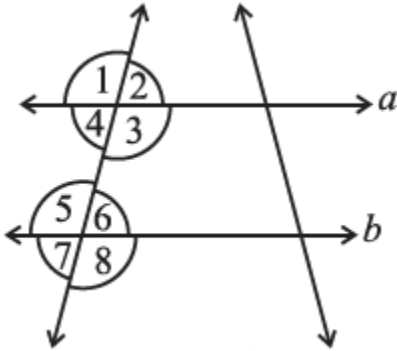
**(v) Adjacent angles that do not form a linear pair**

**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**

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



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

**Solution:-**

Corresponding angles property is used in the above statement.

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

**Solution:-**

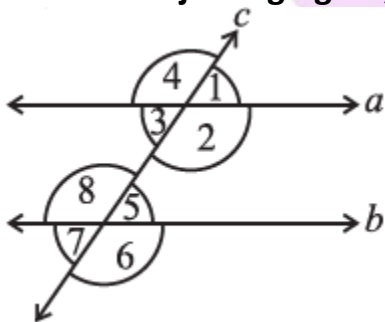
Alternate interior angles property is used in the above statement.

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

**Solution:-**

Interior angles on the same side of transversal are supplementary.

**2. In the adjoining figure, identify**



**(i) The pairs of corresponding angles.**

**Solution:-**

By observing the figure, the pairs of corresponding angle 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 angle 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:-**

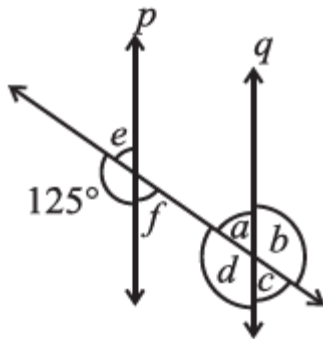
By observing the figure, the pairs of interior angles on the same side of the transversal are  $\angle 2$  and  $\angle 5$ ,  $\angle 3$  and  $\angle 8$

**(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  $\angle 8$

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



**Solution:-**

By observing the figure,

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

We know that, Linear pair is the sum of adjacent angles is  $180^\circ$

Then,

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

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

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

From the rule of vertically opposite angles,

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

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

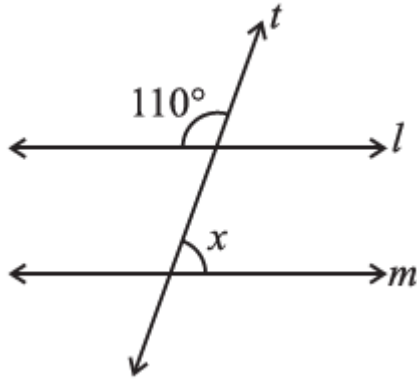
By the property of corresponding angles,

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

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

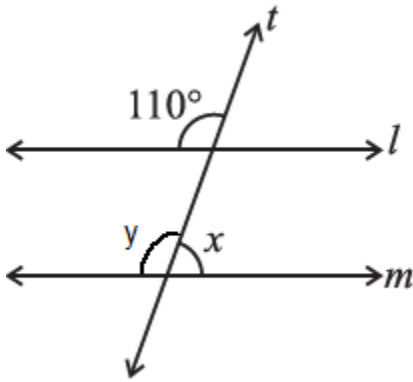
4. Find the value of  $x$  in each of the following figures if  $l \parallel m$ .

(i)



**Solution:-**

Let us assume 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  $180^\circ$

Then,

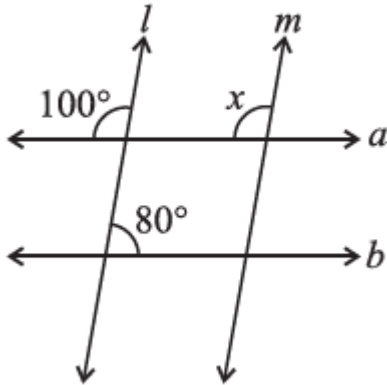
$$= \angle x + \angle y = 180^\circ$$

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

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

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

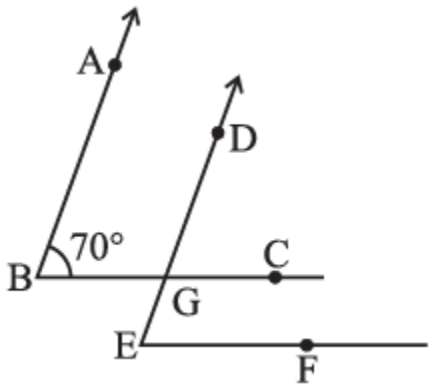
(ii)



**Solution:-**

By the property of corresponding angles,  
 $\angle x = 100^\circ$

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



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

(i)  $\angle DGC$

(ii)  $\angle DEF$

**Solution:-**

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

$BC$  is the transversal line intersecting  $AB$  and  $DG$

By the property of corresponding angles,

$\angle DGC = \angle ABC$

Then,

$\angle DGC = 70^\circ$

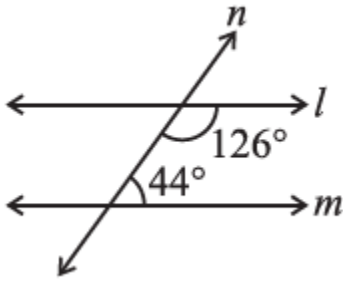
(ii) Let us consider that  $BC \parallel EF$

$DE$  is the transversal line intersecting  $BC$  and  $EF$

By the property of corresponding angles,  
 $\angle DEF = \angle DGC$   
 Then,  
 $\angle DEF = 70^\circ$

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

(i)



**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 transversal is  $180^\circ$ .

Then,

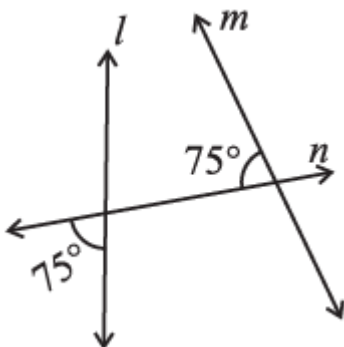
$$= 126^\circ + 44^\circ$$

$$= 170^\circ$$

But, the sum of interior angles on the same side of transversal is not equal to  $180^\circ$ .

So, line  $l$  is not parallel to line  $m$ .

(ii)

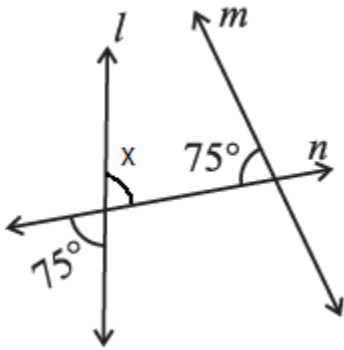


**Solution:-**

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 transversal is  $180^\circ$ .

Then,

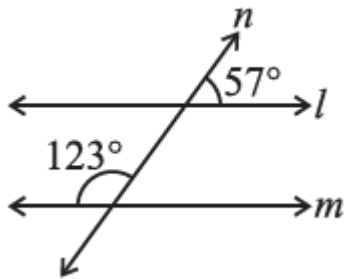
$$= 75^\circ + 75^\circ$$

$$= 150^\circ$$

But, the sum of interior angles on the same side of transversal is not equal to  $180^\circ$ .

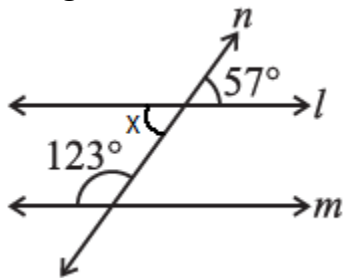
So, line  $l$  is not parallel to line  $m$ .

(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 transversal is  $180^\circ$ .

Then,

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

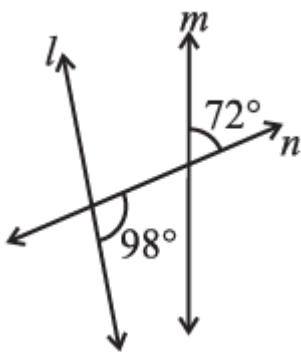
$$= 123^\circ + 57^\circ$$

$$= 180^\circ$$

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

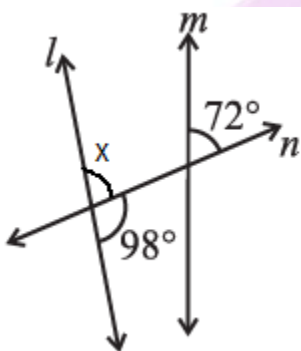
So, line  $l$  is parallel to line  $m$ .

(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 Linear pair is the sum of adjacent angles is equal to  $180^\circ$ .

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

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

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

Now, we consider  $\angle x$  and  $72^\circ$  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 measures  $82^\circ$  and  $72^\circ$  respectively.

∴ Line l is not parallel to line m.

