EXERCISE 5.1   PAGE: 101

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°.

The given angle is 20°
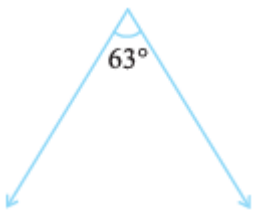
Let the measure of its complement be x°.

Then,

= x + 20° = 90°

= x = 90° – 20°

= x = 70°

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° = 90°

= x = 90° – 63°

= x = 27°

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°
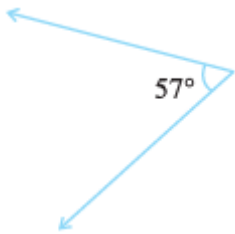
Let the measure of its complement be x°.

Then,

= x + 57° = 90°

= x = 90° – 57°
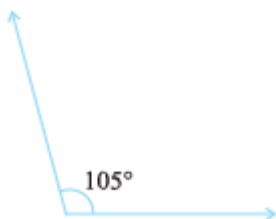
= x = 33°

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

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°.

The given angle is 105°

Let the measure of its supplement be x°.

Then,

= x + 105° = 180°

= x = 180° – 105°

= x = 75°

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° = 180°

= x = 180° – 87°

= x = 93°

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° = 180°

= x = 180° – 154°

= x = 26°

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

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

(i) 65°, 115°

Solution:-

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

Then,

= 65° + 115°

= 180°

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

∴ 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° + 27°

= 90°

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

∴ 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° + 68°

= 180°

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

∴ 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° + 50°

= 180°

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

∴ 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° + 45°

= 90°

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

∴ 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° + 10°

= 90°

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

∴ These angles are complementary angles.

4. Find the angles which are equal to their complement.

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°

= 2x = 90°

= x = 90/2

= x = 45°

Hence, the required angle measure is 45°.

5. Find the angles which are equal to their supplement.

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°

= 2x = 180°

= x = 180/2

= x = 90°

Hence, the required angle measure is 90°.

6. In the given figure, ∠1 and ∠2 are supplementary angles. If ∠1 is decreased, what changes should take place in ∠2 so that both angles still remain supplementary?
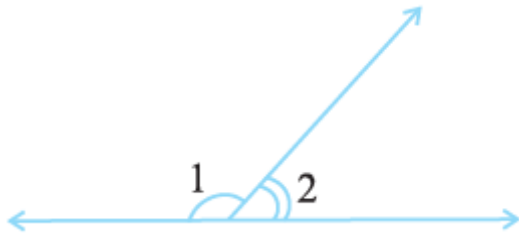
Solution:-

From the question, it is given that

∠1 and ∠2 are supplementary angles.

If ∠1 is decreased, then ∠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, 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.

∴ 90° + 90° = 180

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

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°

It is given in the question that p > 45°
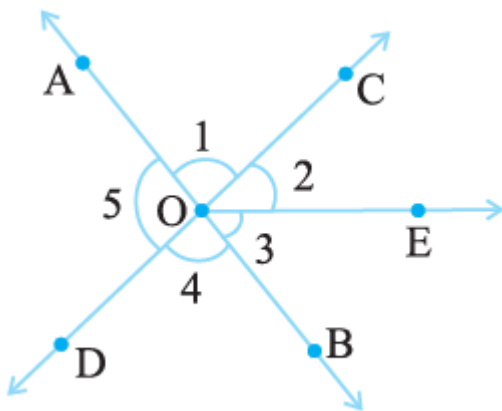
Adding q on both sides,

= p + q > 45°+ q

= 90° > 45°+ q

= 90° – 45° > q

= q < 45°

Hence, its complementary angle is less than 45°.

9. In the adjoining figure:

(i) Is ∠1 adjacent to ∠2?

Solution:-

By observing the figure, we came to conclude that,

Yes, as ∠1 and ∠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 ∠AOC adjacent to ∠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 ∠COE and ∠EOD form a linear pair?

Solution:-

By observing the figure, we came to conclude that,

Yes, as ∠COE and ∠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 ∠BOD and ∠DOA supplementary?

Solution:-

By observing the figure, we came to conclude that,

Yes, as ∠BOD and ∠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 ∠1 vertically opposite to ∠4?

Solution:-

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

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

Solution:-

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

10. Indicate which pairs of angles are:
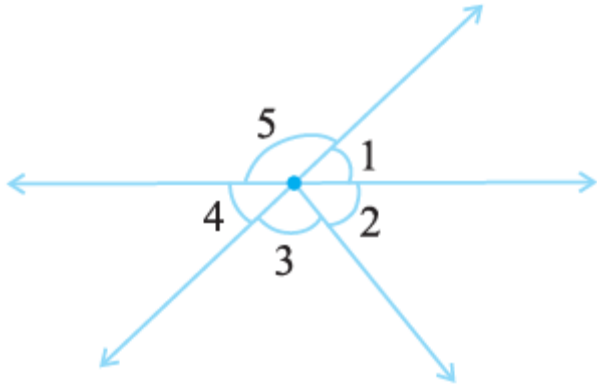
(i) Vertically opposite angles.

Solution:-

By observing the figure, we can say that

∠1 and ∠4, ∠5 and ∠2 + ∠3 are vertically opposite angles. Because these two angles are formed by the intersection of two straight lines.
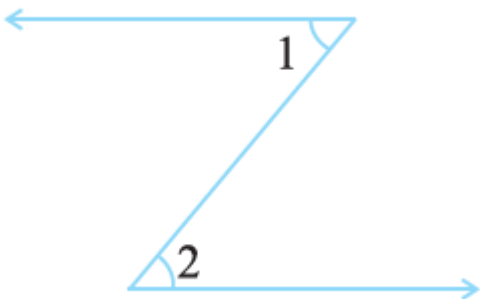
(ii) Linear pairs.

Solution:-

By observing the figure, we can say that,

∠1 and ∠5, ∠5 and ∠4, as these have a common vertex and also have non-common arms opposite to each other.
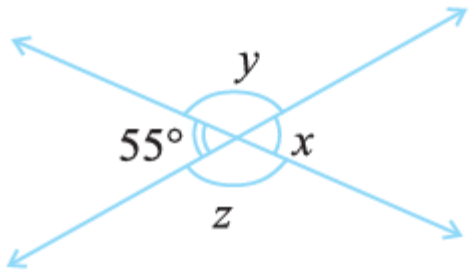
11. In the following figure, is ∠1 adjacent to ∠2? Give reasons.

Solution:-

∠1 and ∠2 are not adjacent angles because they are not lying on the same vertex.

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

(i)

Solution:-

∠x = 55°, because vertically opposite angles.

∠x + ∠y = 180° … [∵ linear pair]

= 55° + ∠y = 180°

= ∠y = 180° − 55°

= ∠y = 125°

Then, ∠y = ∠z … [∵ vertically opposite angles]

∴ ∠z = 125°

(ii)
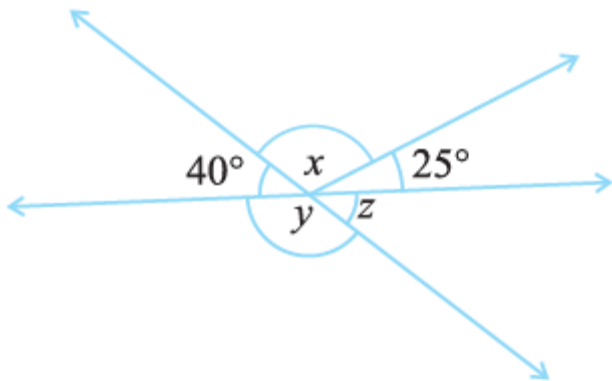
Solution:-

∠z = 40°, because vertically opposite angles.

∠y + ∠z = 180° … [∵ linear pair]

= ∠y + 40° = 180°

= ∠y = 180° − 40°

= ∠y = 140°

Then, 40 + ∠x + 25 = 180° … [∵angles on straight line]

65 + ∠x = 180°

∠x = 180° – 65

∴ ∠x = 115°

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°.

(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.

14. In the adjoining figure, name the following pairs of angles.
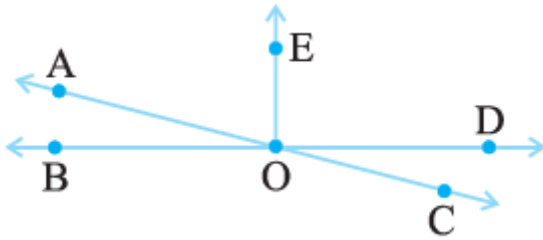
(i) Obtuse vertically opposite angles

Solution:-

∠AOD and ∠BOC are obtuse vertically opposite angles in the given figure.

(ii) Adjacent complementary angles

Solution:-

∠EOA and ∠AOB are adjacent complementary angles in the given figure.

(iii) Equal supplementary angles

Solution:-

∠EOB and EOD are the equal supplementary angles in the given figure.

(iv) Unequal supplementary angles

Solution:-

∠EOA and ∠EOC are the unequal supplementary angles in the given figure.

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

Solution:-

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

EXERCISE 5.2   PAGE: 110

1. State the property that is used in each of the following statements?
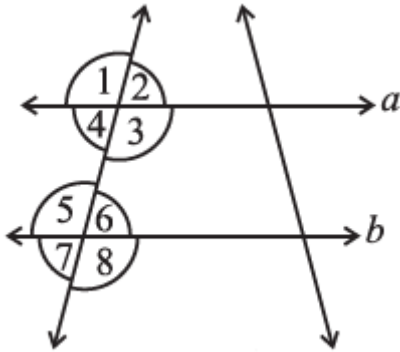
(i) If a ∥ b, then ∠1 = ∠5.

Solution:-

Corresponding angles property is used in the above statement.

(ii) If ∠4 = ∠6, then a ∥ b.

Solution:-

Alternate interior angles property is used in the above statement.

(iii) If ∠4 + ∠5 = 180°, then a ∥ b.

Solution:-

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

2. In the adjoining figure, identify
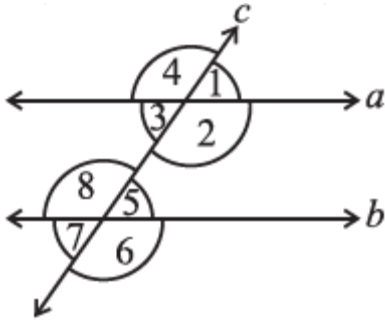
(i) The pairs of corresponding angles.

Solution:-

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

∠1 and ∠5, ∠4 and ∠8, ∠2 and ∠6, ∠3 and ∠7

(ii) The pairs of alternate interior angles.

Solution:-

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

∠2 and ∠8, ∠3 and ∠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 ∠2 and ∠5, ∠3 and ∠8

(iv) The vertically opposite angles.

Solution:-

By observing the figure, the vertically opposite angles are,

∠1 and ∠3, ∠5 and ∠7, ∠2 and ∠4, ∠6 and ∠8

3. In the adjoining figure, p ∥ q. Find the unknown angles.
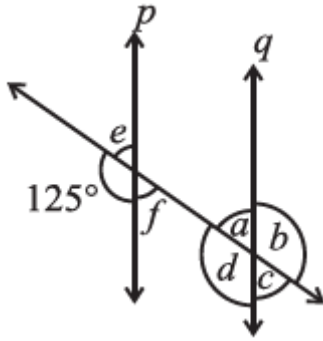
Solution:-

By observing the figure,

∠d = ∠125° … [∵ corresponding angles]

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

Then,

= ∠e + 125° = 180° … [Linear pair]

= ∠e = 180° – 125°

= ∠e = 55°

From the rule of vertically opposite angles,

∠f = ∠e = 55°

∠b = ∠d = 125°

By the property of corresponding angles,

∠c = ∠f = 55°

∠a = ∠e = 55°

4. Find the value of x in each of the following figures if l ∥ m.

(i)
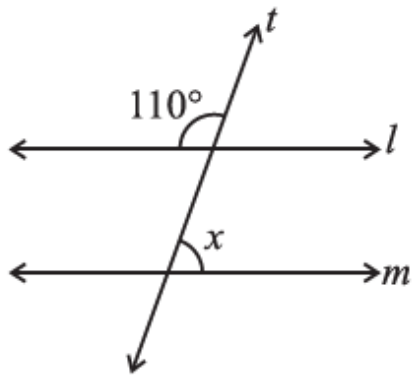
Solution:-

Let us assume the other angle on the line m be ∠y.
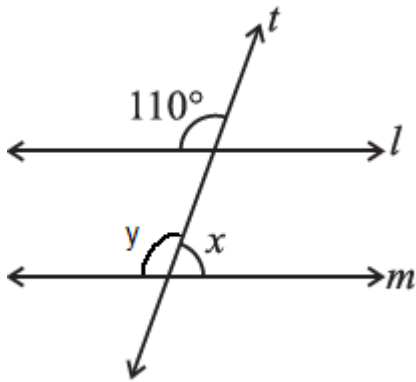
Then,

By the property of corresponding angles,

∠y = 110°

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

Then,

= ∠x + ∠y = 180°

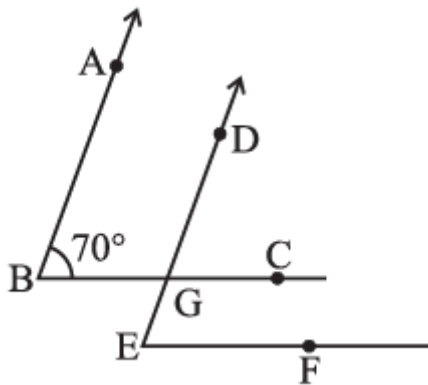= ∠x + 110° = 180°

= ∠x = 180° – 110°

= ∠x = 70°

(ii)
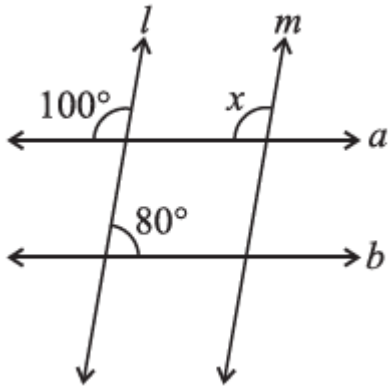
Solution:-

By the property of corresponding angles,

∠x = 100°

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

If ∠ABC = 70°, then find

(i) ∠DGC

(ii) ∠DEF

Solution:-

(i) Let us consider AB ∥ DG.

BC is the transversal line intersecting AB and DG.

By the property of corresponding angles

∠DGC = ∠ABC

Then,

∠DGC = 70°

(ii) Let us consider that BC ∥ EF.

DE is the transversal line intersecting BC and EF.

By the property of corresponding angles

∠DEF = ∠DGC

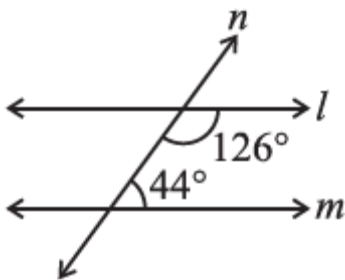Then,

∠DEF = 70°

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

(i)

Solution:-

Let us consider the two lines, l and m.

n is the transversal line intersecting l and m.

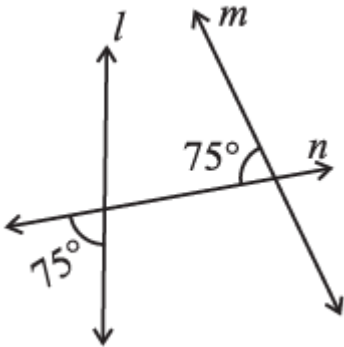We know that the sum of interior angles on the same side of the transversal is 180°.

Then,

= 126° + 44°

= 170°

But, the sum of interior angles on the same side of transversal is not equal to 180°.
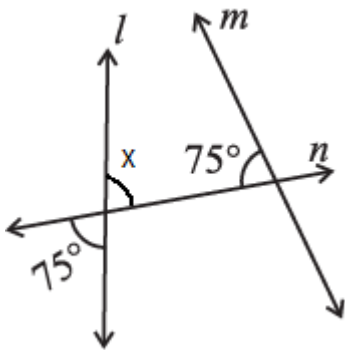
So, line l is not parallel to line m.

(ii)

Solution:-

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

Then, ∠x = 75°

Let us consider the two lines, l and m.

n is the transversal line intersecting l and m.

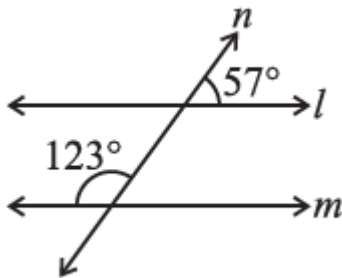We know that the sum of interior angles on the same side of the transversal is 180°.

Then,

= 75° + 75°

= 150°

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

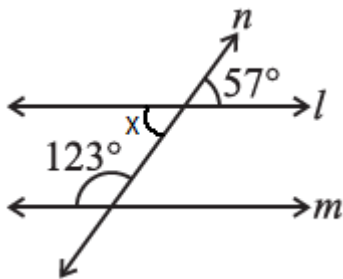So, line l is not parallel to line m.

(iii)

Solution:-

Let us assume ∠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° + ∠x

= 123° + 57°
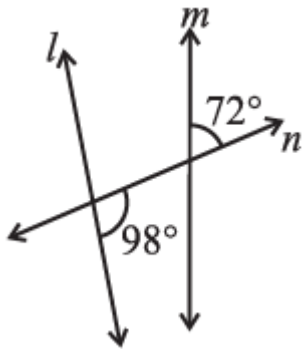
= 180°

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

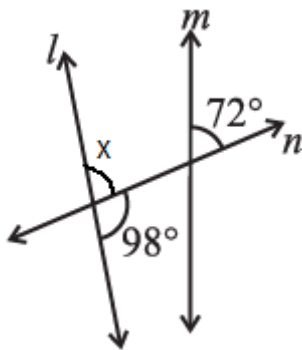So, line l is parallel to line m.

(iv)

Solution:-

Let us assume ∠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°.

= ∠x + 98° = 180°

= ∠x = 180° – 98°

= ∠x = 82°

Now, we consider ∠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.

∴ Line l is not parallel to line m.