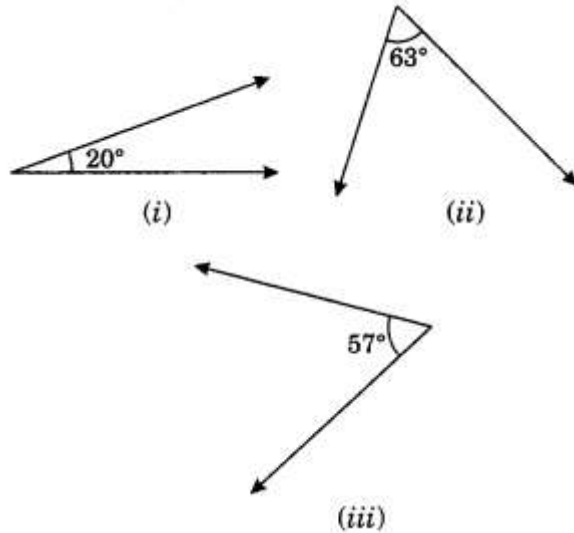# CHAPTER-5

Lines and Angles

EX 5.1:-

Question 1

Find the complement of each of the following angles:
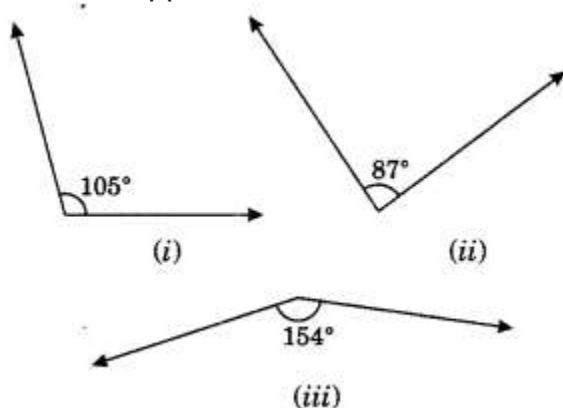

Solution:
(i) Complement of 20° = 90° − 20° = 70°
(ii) Complement of 63° = 90° − 63° = 27°
(iii) Complement of 57° = 90° − 57° = 33°

Question 2

Find the supplement of each of the following angles:

Solution:
(i) Supplement of 105° = 180° − 105° = 75°
(ii) Supplement of 87° = 180° − 87° = 93°
(iii) Supplement of 154° = 180° − 154° = 26°

Question 3
Identify which of the following pairs of angles are complementary and which are supplementary?
(i) 65°, 115°
(ii) 63°, 27°
(iii) 112°, 68°
(iv) 130°, 50°
(v) 45°, 45°
(vi) 80°, 10°
Solution:
(i) 65° (+) 115° = 180°
They are supplementary angles.
(ii) 63° (+) 27° = 90°
They are complementary angles.
(iii) 112° (+) 68° = 180°
They are supplementary angles.
(iv) 130° (+) 50° = 180°
They are supplementary angles.
(v) 45° (+) 45° = 90°
They are complementary angles.
(vi) 80° (+) 10° = 90°
They are complementary angles.

Question 4
Find the angle which equal to its complement.
Solution:
Let the required angle be x°.
its complement = (90 − x)°
Now, re = 90 − x ⇒ x + x = 90
⇒ 2x = 90 ∴ x = $\frac{90}{2}$ = 45°
Thus the required angles are 45°.
Ex 5.1 Class 7 Maths Question 5.
Find the angle which is equal to its supplement.
Solution:
Let the required angle be x°.
∴ it supplement = (180 − x)°
Now, x = 180 − x
⇒ x + x = 180
⇒ 2x = 180°
∴ x $= \frac{180°}{2} = 90°$
Thus, the required angle is 90°.

Question 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 the angles still remain supplementary.
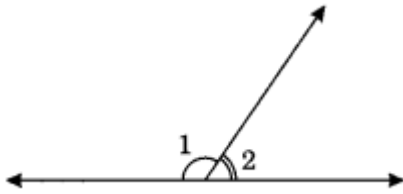
Solution:

∠1 + ∠2 = 180° (given)
If ∠1 is decreased by some degrees, then ∠2 will also be increased by the same degree so that the two angles still remain supplementary.

Question 7

Can two angles be supplementary if both of them are:
(i) acute?
(ii) obtuse?
(iii) right?

Solution:

(ii) Since, acute angle < 90°
∴ Acute angle + acute angle < 90° + 90° < 180° Thus, the two acute angles cannot be supplementary angles. (ii) Since, obtuse angle > 90°
∴ Obtuse angle + obtuse angle > 90° + 90° > 180°
Thus, the two obtuse angles cannot be supplementary angles.
(iii) Since, right angle = 90°
∴ right angle + right angle = 90° + 90° = 180°
Thus, two right angles are supplementary angles.

Question 8.

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

Given angle is greater than 45°
Let the given angle be x°.
∴ x > 45
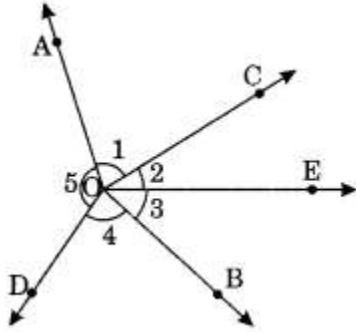Complement of x° = 90° − x° < 45° [∵ x > 45°]
Thus the required angle is less than 45°.

Question 9

In the following figure:
(i) Is ∠1 adjacent to ∠2?
(ii) Is ∠AOC adjacent to∠AOE?
(iii) Do ∠COE and ∠EOD form a linear pair?
(iv) Are ∠BOD and ∠DOA supplementary?
(v) Is ∠1 vertically opposite angle to ∠4?
(vi) What is the vertically opposite angle of ∠5?

Solution:
(i) Yes, ∠1 and ∠2 are adjacent angles.
(ii) No, ∠AOC is not adjacent to ∠AOE. [∵ OC and OE do not lie on either side of common arm OA] .
(iii) Yes, ∠COE and ∠EOD form a linear pair of angles.
(iv) Yes, ∠BOD and ∠DOA are supplementary. [∵ ∠BOD + ∠DOA = 180°]
(v) Yes, ∠1 is vertically opposite to ∠4.
(vi) Vertically opposite angle of ∠5 is ∠2 + ∠3 i.e. ∠BOC.

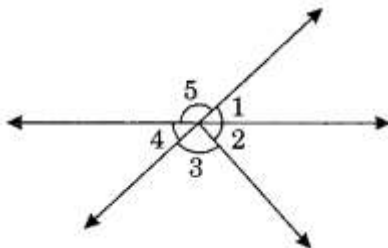## Question 10

Indicate which pairs of angles are:
(i) Vertically opposite angles
(ii) Linear pairs
Solution:
(i) Vertically opposite angles are ∠1 and ∠4, ∠5 and (∠2 + ∠3)

(ii) Linear pairs are
∠1 and ∠5, ∠5 and ∠4

Question 11

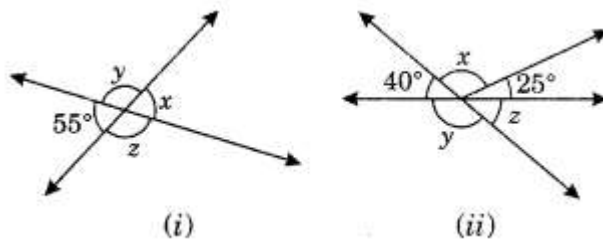In the following figure, is ∠1 adjacent to ∠2? Give reasons.
Solution:
No, ∠1 and∠2 are not adjacent angles.
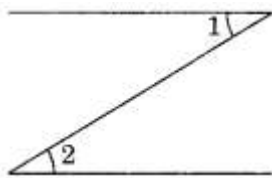
Reasons:
(i) ∠1 + ∠2 ≠ 180°
(ii) They have no common vertex.

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

(i)

(ii)

Solution:
From Fig. 1. we have
∠x = ∠55° (Vertically opposite angles)
∠x + ∠y = 180° (Adjacent angles)
55° + ∠y = 180° (Linear pair angles)
∴ ∠y = 180° − 55° = 125°
∠y = ∠z (Vertically opposite angles)
125° = ∠z
Hence, ∠x = 55°, ∠y = 125° and ∠z = 125°

(ii) 25° + x + 40° = 180° (Sum of adjacent angles on straight line)
65° + x = 180°
∴ x = 180° − 65° = 115°
40° + y = 180° (Linear pairs)
∴ y = 180° − 40° = 140°
y + z = 180° (Linear pairs)
140° + z = 180°
∴ z = 180° − 140° = 40°
Hence, x − 115°, y = 140° and z − 40°

Question 13

Fill in the blanks:

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

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

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

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

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

(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:

(i) 90°

(ii) 180°

(iii) Supplementary

(iv) Linear pair

(v) Equal

(vi) Obtuse angle

Question 14

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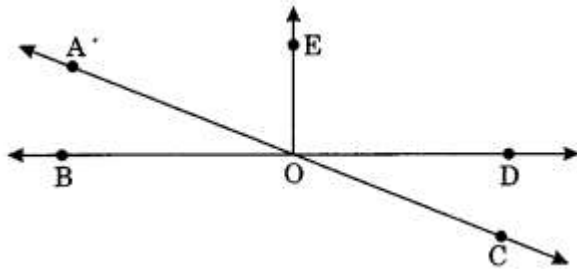
(i) Obtuse vertically opposite angles.

(ii) Adjacent complementary angles.

(iii) Equal supplementary angles.

(iv) Unequal supplementary angles.

(v) Adjacent angles but do not form a linear pair.

Solution:

(i) ∠BOC and ∠AOD are obtuse vertically opposite angles.

(ii) ∠AOB and ∠AOE are adjacent complementary angles.

(iii) ∠EOB and ∠EOD are equal supplementary angles.

(iv) ∠EOA and ∠EOC are unequal supplementary angles.

(v) ∠AOB and ∠AOE, ∠AOE and ∠EOD, ∠EOD and ∠COD are adjacent angles but do not form a linear pair.

Question 1:

Find the complement of each of the following angles:
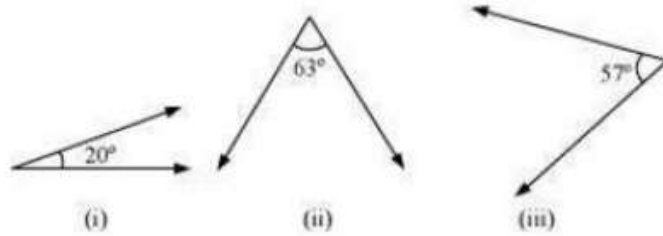
Answer:

The sum of the measures of complementary angles is 90º.

(i) 20°

Complement = 90° − 20°

= 70°

(ii) 63°

Complement = 90° − 63°

= 27°

(iii) 57°

Complement = 90° − 57°

= 33°

Question 2:

Find the supplement of each of the following angles:
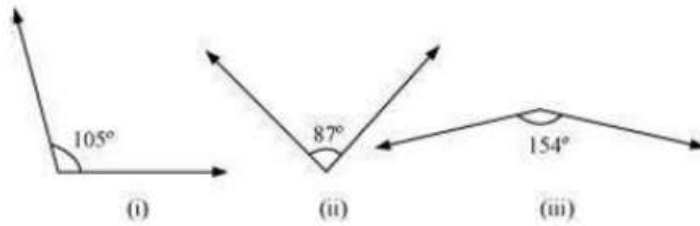
Answer:

The sum of the measures of supplementary anglesis 180°.

(i) 105°

Supplement = 180° − 105°

= 75°

(ii) 87°

Supplement = 180° − 87°

= 93°

(iii) 154°

Supplement = 180° − 154°

= 26°

Question 3:

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

(i) 65°, 115° (ii) 63°, 27°

(iii) 112°, 68° (iv) 130°, 50°

(v) 45°, 45° (vi) 80°, 10°

Answer:

The sum of the measures of complementary angles is 90° and that of supplementary anglesis 180°.

(i) 65°, 115°

Sum of the measures of these angles = 65° + 115° = 180°

∴ These angles are supplementary angles.

(ii) 63°, 27°

Sum of the measures of these angles = 63° + 27° = 90°

∴ These angles are complementary angles.

(iii) 112°, 68°

Sum of the measures of these angles = 112° + 68° = 180°

∴ These angles are supplementary angles.

(iv) 130°, 50°

Sum of the measures of these angles = 130° + 50° = 180°

∴ These angles are supplementary angles.

(v) 45°, 45°

Sum of the measures of these angles = 45° + 45° = 90°

∴ These angles are complementary angles.

(vi) 80°, 10°

Sum of the measures of these angles = 80° + 10° = 90°

∴ These angles are complementary angles.

Question 4:

Find the angle which is equal to its complement.

Answer:

Let the angle be x.

Complement of this angle is also x.

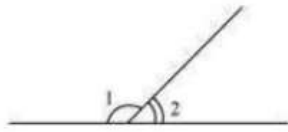The sum of the measures of a complementary angle pair is 90°.

∴ x + x = 90°

2x = 90°

$$x = \frac{90°}{2} = 45°$$

Question 5:

Find the angle which is equal to its supplement.

Answer:

Let the angle be x.

Supplement of this angle is also x.

The sum of the measures of a supplementary angle pair is 180°.

∴ x + x = 180°

2x = 180°

Question 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 the angles still remain supplementary.

Answer:

∠1 and ∠2 are supplementary angles.

If ∠1 is reduced, then ∠2 should be increased by the same measure so that this angle pair remains supplementary.

Question 7:

Can two angles be supplementary if both of them are:

(i) Acute? (ii) Obtuse? (iii) Right?

Answer:

(i) No. Acute angle is always lesser than 90°. It can be observed that two angles, even of 89°, cannot add up to 180°. Therefore, two acute angles cannot be in a supplementary angle pair.

(ii) No. Obtuse angle is always greater than 90°. It can be observed that two angles, even of 91°, will always add up to more than 180°. Therefore, two obtuse angles cannot be in a supplementary angle pair.

(iii) Yes. Right angles are of 90° and 90° + 90° = 180°

Therefore, two right angles form a supplementary angle pair together.

Question 8:

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

Answer:

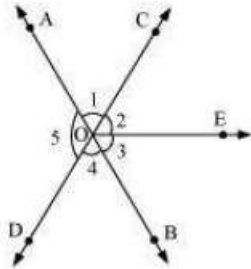Let A and B are two angles making a complementary angle pair and A is greater than 45º.

A + B = 90º

B = 90º − A

Therefore, B will be lesser than 45º.

Question 9:

In the adjoining figure:

(i) Is ∠1 adjacent to ∠2?

(ii) Is ∠AOC adjacent to ∠AOE?

(iii) Do ∠COE and ∠EOD form a linear pair?

(iv) Are ∠BOD and ∠DOA supplementary?

(v) Is ∠1 vertically opposite to ∠4?

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

Answer:

(i) Yes. Since they have a common vertex O and also a common arm OC. Also, their non-common arms, OA and OE, are on either side of the common arm.

(ii) No. They have a common vertex O and also a common arm OA. However, their noncommon arms, OC and OE, are on the same side of the common arm. Therefore, these are not adjacent to each other.

(iii) Yes. Since they have a common vertex O and a common arm OE. Also, their noncommon arms, OC and OD, are opposite rays.

(iv) Yes. Since ∠BOD and ∠DOA have a common vertex O and their non-common arms are opposite to each other.

(v) Yes. Since these are formed due to the intersection of two straight lines (AB and CD).

(vi) ∠COB is the vertically opposite angle of ∠5 as these are formed due to the intersection of two straight lines, AB and CD.

Question 10:

Indicate which pairs of angles are:

(i) Vertically opposite angles. (ii) Linear pairs.
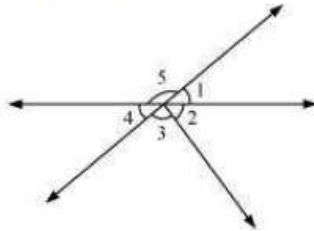
Answer:

(i) ∠1 and ∠4, ∠5 and ∠2 +∠3 are vertically opposite angles as these are formed due to the intersection of two straight lines.

(ii) ∠1 and ∠5, ∠5 and ∠4 as these have a common vertex and also have non-common arms opposite to each other.

Question 11:

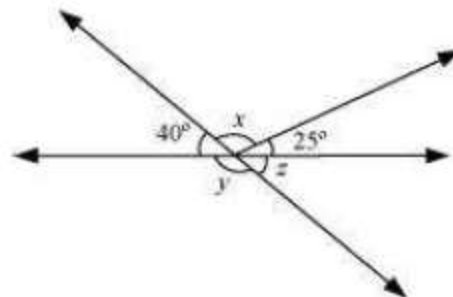In the following figure, is ∠1 adjacent to ∠2? Give reasons.
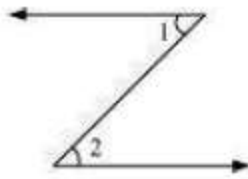
Answer:

∠1 and ∠2 are not adjacent angles because their vertex is not common.

Question 12:

Find the value of the angles x, y, and z in each of the following:
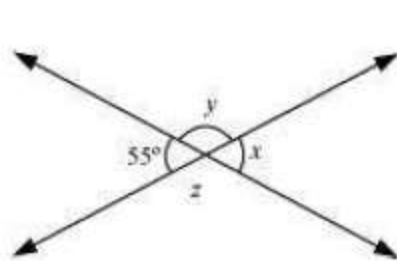
(i)   (ii)

Answer:

(i) Since ∠x and ∠55° are vertically opposite angles,

∠x = 55°

∠x + ∠y = 180° (Linear pair)

55° + ∠y = 180°

∠y = 180° − 55° = 125°

∠y = ∠z (Vertically opposite angles)

∠z = 125°

(ii) ∠z = 40° (Vertically opposite angles)

∠y + ∠z = 180° (Linear pair)

∠y = 180° − 40° = 140°

40° + ∠x + 25° = 180° (Angles on a straight line)

65° + ∠x = 180°

∠x = 180° − 65° = 115°

Question 13:

Fill in the blanks:

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

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

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

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

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

(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 _____.

Answer:

(i) 90°

(ii) 180°

(iii) Supplementary

(iv) Linear pair

(v) Equal

(vi) Obtuse angles

Question 14:

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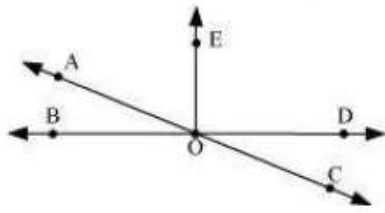
(i) Obtuse vertically opposite angles

(ii) Adjacent complementary angles

(iii) Equal supplementary angles

(iv) Unequal supplementary angles

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

Answer:

(i) ∠AOD, ∠BOC

(ii) ∠EOA, ∠AOB

(iii) ∠EOB, ∠EOD

(iv) ∠EOA, ∠EOC

(v) ∠AOB and ∠AOE, ∠AOE and ∠EOD, ∠EOD and ∠COD

Ex 5.2:-

Question 1
State the property that is used in each of the following statements?
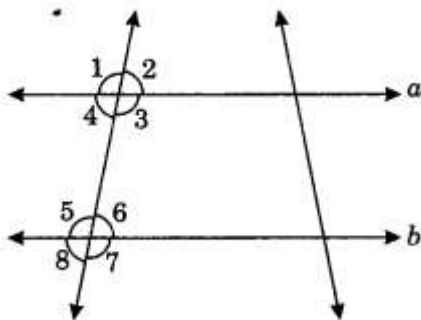
(i) If a || b, then ∠1 = ∠5
(ii) If ∠4 = ∠6, then a || b
(iii) If ∠4 + ∠5 = 180°, then a || b
Solution:
(i) Given a || b
∴ ∠1 = ∠5 (Pair of corresponding angles)
(ii) Given: ∠4 = ∠6
∴ a || b [If pair of alternate angles are equal, then the lines are parallel]
(iii) Given: ∠4 + ∠5 = 180°
∴ a || b [If sum of interior angles is 180°, then the lines are parallel]

Question 2
In the given figure, identify
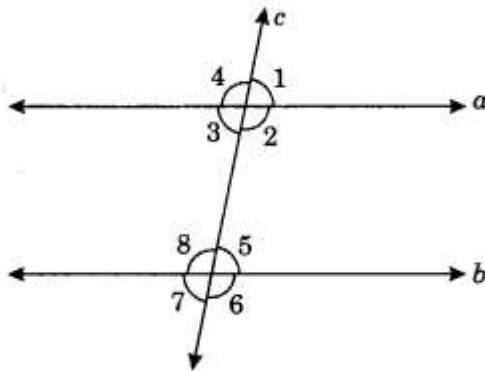
(i) the pairs of corresponding angles.
(ii) the pairs of alternate interior angles.
(iii) the pairs of interior angles on the same side of the transversal.
Solution:
(i) The pair of corresponding angles are ∠1 and ∠5, ∠2 and ∠6, ∠4 and ∠8, ∠3 and ∠7.
(ii) The pairs of alternate interior angles are ∠2 and ∠8, ∠3 and ∠5.
(iii) The pairs of interior angles on the same side of the transversal are ∠2 and ∠5, ∠3 and ∠8.

Question 3
In the given figure, p || q. Find the unknown angles.
Solution:
∠e + 125° = 180° (Linear pair)
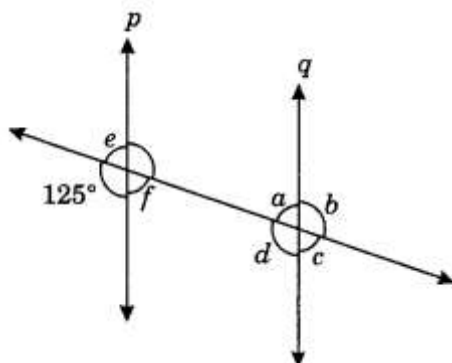
∴ ∠e = 180° − 125° = 55°
∠e = ∠f (Vertically opposite angles)
∴ ∠f = 55°
∠a = ∠f = 55° (Alternate interior angles)
∠c = ∠a = 55° (Vertically opposite angles)
∠d = 125° (Corresponding angles)
∠b = ∠d = 125° (Vertically opposite angles)
Thus, ∠a = 55°, ∠b = 125°, ∠c = 55°, ∠d = 125°, ∠e = 55°, ∠f = 55°.

Question 4
Find the value of x in each of the following figures if l || m

(i)   (ii)
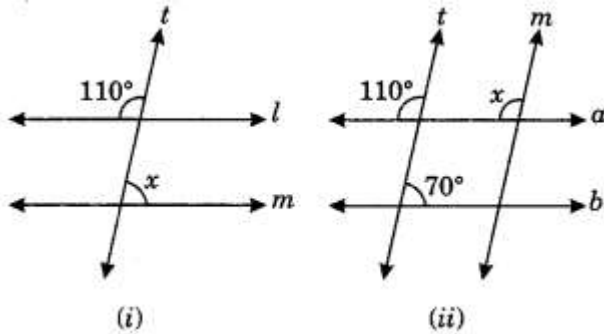
Solution:
(i) Let the angle opposite to 110° be y.
∴ y = 110° (Vertically opposite angles)
∠x + ∠y = 180° (Sum of interior angle on the same side of transversal)
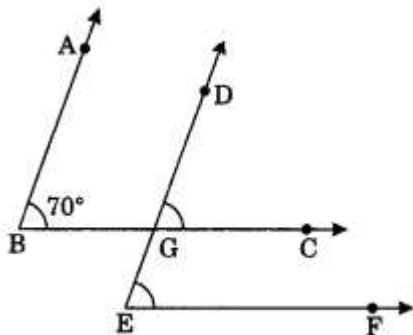∠x + 110° = 180° .
∴ ∠x = 180° − 110° = 70°
Thus x= 70°
(ii) ∠x = 110° (Pair of corresponding angles)

Question 5
In the given figure, the arms of two angles are parallel. If ∠ABC = 70°, then find
(i) ∠DGC
(ii) ∠DEF

Solution:
Given
AB || DE
BC || EF
∠ABC = 70°
∠DGC = ∠ABC
(i) ∠DGC = 70° (Pair of corresponding angles)
∠DEF = ∠DGC
(ii) ∠DEF = 70° (Pair of corresponding angles)

Question 6

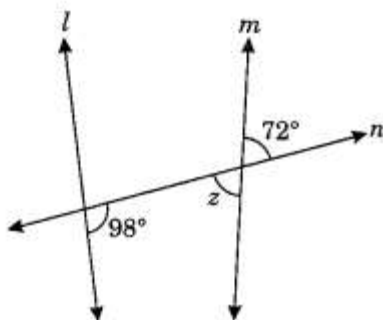In the given figure below, decide whether l is parallel to m.

(i)
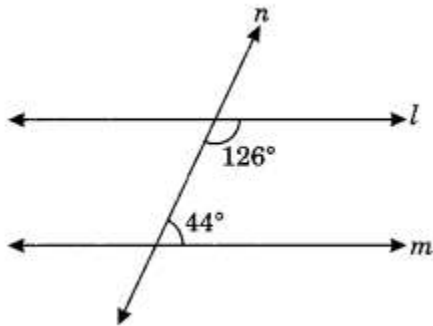
(ii)
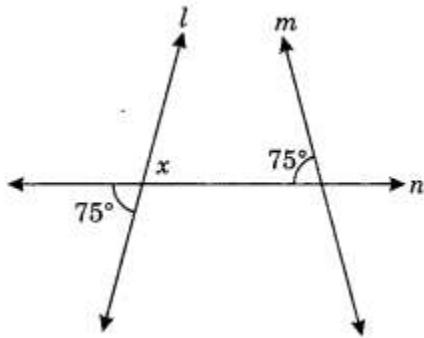
(iii)
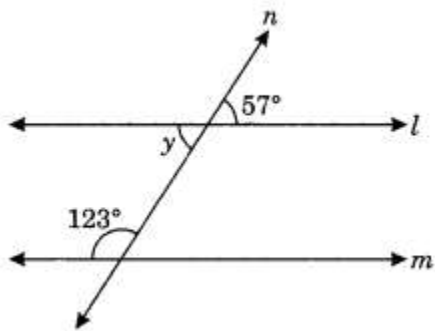
(iv)

Solution:

Sum of interior angles on the same side of transversal
= 126° + 44° = 170° ≠ 180°
∴ l is not parallel to m.

(ii) Let angle opposite to 75° be x.
x = 75° [Vertically opposite angles]
∴ Sum of interior angles on the same side of transversal

= x + 75° = 75° + 75°
= 150° ≠ 180°
∴ l is not parallel to m.

(iii) Let the angle opposite to 57° be y.
∴ ∠y = 57° (Vertically opposite angles)
∴ Sum of interior angles on the same side of transversal
= 57° + 123° = 180°
∴ l is parallel to m.

(iv) Let angle opposite to 72° be z.
∴ z = 70° (Vertically opposite angle)
Sum of interior angles on the same side of transversal
= z + 98° = 72° + 98°
= 170° ≠ 180°
∴ l is not parallel to m.

Question 1:

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

(i) If a||b, then ∠1 = ∠5

(ii) If ∠4 = ∠6, then a||b

(iii) If ∠4 + ∠5 = 180°, then a||b
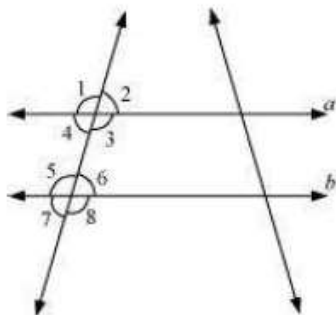
Answer:

(i) Corresponding angles property

(ii) Alternate interior angles property

(iii) Interior angles on the same side of transversal are supplementary.

Question 2:

In the adjoining figure, identify

(i) The pairs of corresponding angles

(ii) The pairs of alternate interior angles

(iii) The pairs of interior angles on the same side of the transversal
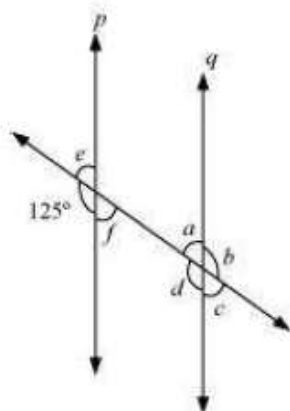
(iv) The vertically opposite angles
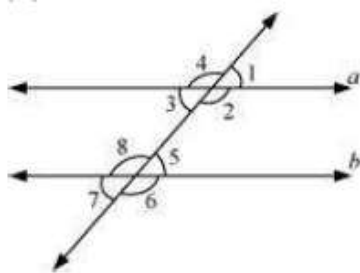
Answer:

(i) ∠1 and ∠5, ∠2 and ∠6, ∠3 and ∠7, ∠4 and ∠8

(ii) ∠2 and ∠8, ∠3 and ∠5

(iii) ∠2 and ∠5, ∠3 and ∠8

(iv) ∠1 and ∠3, ∠2 and ∠4, ∠5 and ∠7, ∠6 and ∠8

Question 3:

In the adjoining figure, p || q. Find the unknown angles.

Answer:

∠d = 125° (Corresponding angles)

∠e = 180° − 125° = 55° (Linear pair)

∠f = ∠e = 55° (Vertically opposite angles)

∠c = ∠f = 55° (Corresponding angles)

∠a = ∠e = 55° (Corresponding angles)

∠b = ∠d = 125° (Vertically opposite angles)

Question 4:

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

Answer:

(i)
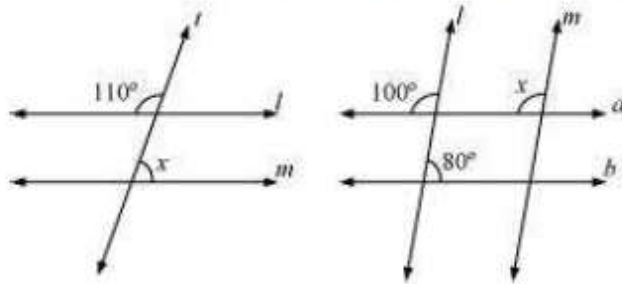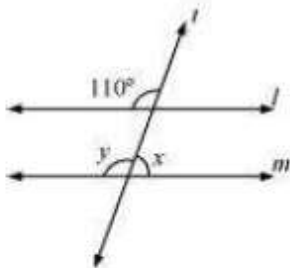
∠y = 110° (Corresponding angles)

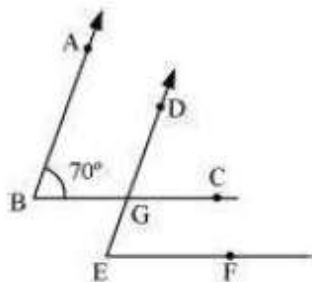∠x + ∠y = 180° (Linear pair)

∠y = 180° − 110°

= 70°
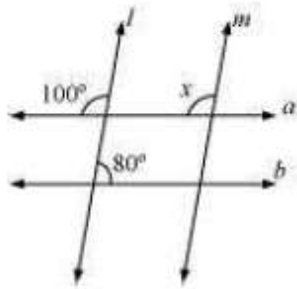
∠x = 100° (Corresponding angles)

Question 5:

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

If ∠ABC = 70°, then find

(i) ∠DGC

(ii) ∠DEF

Answer:

(i) Consider that AB|| DG and a transversal line BC is intersecting them.

∠DGC = ∠ABC (Corresponding angles)

∠DGC = 70°

(ii) Consider that BC|| EF and a transversal line DE is intersecting them.
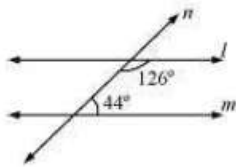
∠DEF = ∠DGC (Corresponding angles)

∠DEF = 70°

Question 6:

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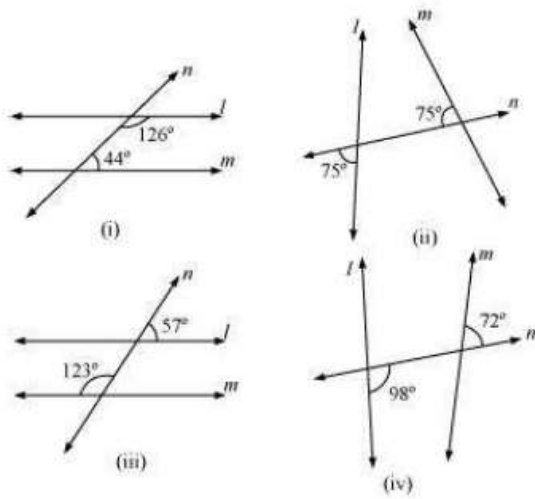
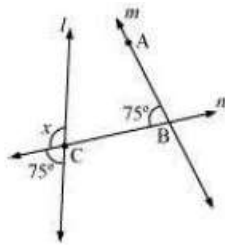
Answer:

(i)

Consider two lines, l and m, and a transversal line n which is intersecting them. Sum of the interior angles on the same side of transversal = 126° + 44° = 170° As the sum of interior angles on the same side of transversal is not 180°, therefore, l is not parallel to m.

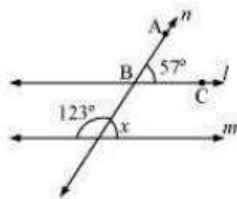x + 75° = 180° (Linear pair on line l)

x = 180° − 75° = 105°

For l and m to be parallel to each other, corresponding angles (∠ABC and ∠x)should be equal. However, here their measures are 75° and 105° respectively. Hence, these lines are not parallel to each other.
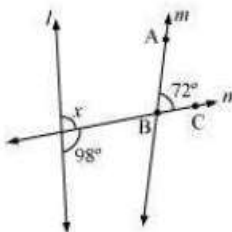
(iii)

∠x + 123° = 180° (Linear pair)

∠x = 180° − 123° = 57°

For l and m to be parallel to each other, corresponding angles (∠ABC and ∠x)should be equal. Here, their measures are 57° and 57° respectively. Hence, these lines are parallel to each other.

iv.

98 + ∠x = 180° (Linear pair)

∠x = 82°

For l and m to be parallel to each other, corresponding angles (∠ABC and ∠x)should be equal. However, here their measures are 72° and 82° respectively. Hence, these lines are not parallel to each other.