

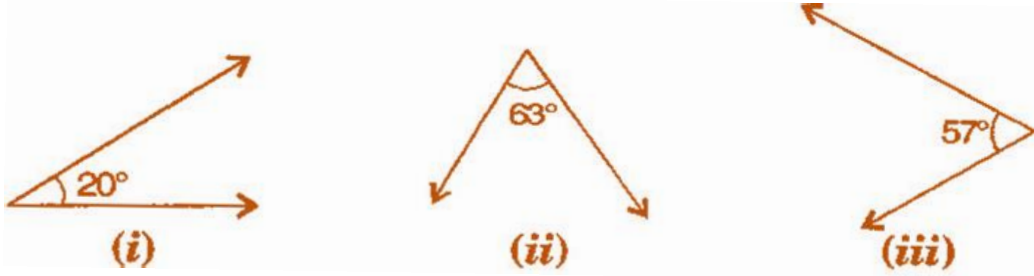
Mathematics

(Chapter – 5) (Lines and Angles)
(Class – VII)

Exercise 5.1

Question 1:

Find the complement of each of the following angles:



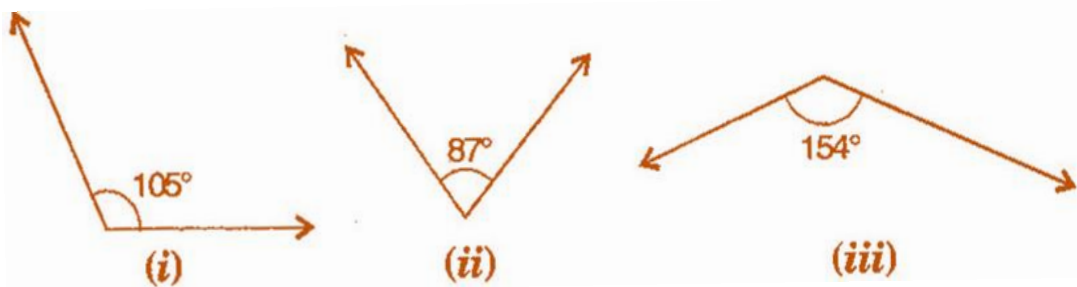
Answer 1:

Complementary angle = $90^\circ - \text{given angle}$

- (i) Complement of $20^\circ = 90^\circ - 20^\circ = 70^\circ$
- (ii) Complement of $63^\circ = 90^\circ - 63^\circ = 27^\circ$
- (iii) Complement of $57^\circ = 90^\circ - 57^\circ = 33^\circ$

Question 2:

Find the supplement of each of the following angles:



Answer 2:

Supplementary angle = $180^\circ - \text{given angle}$

- (i) Supplement of $105^\circ = 180^\circ - 105^\circ = 75^\circ$
- (ii) Supplement of $87^\circ = 180^\circ - 87^\circ = 93^\circ$
- (iii) Supplement of $154^\circ = 180^\circ - 154^\circ = 26^\circ$

Question 3:

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

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

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

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

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

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

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

Answer 3:

If sum of two angles is 180° , then they are called supplementary angles.

If sum of two angles is 90° , then they are called complementary angles.

(i) $65^\circ + 115^\circ = 180^\circ$

These are supplementary angles.

(ii) $63^\circ + 27^\circ = 90^\circ$

These are complementary angles.

(iii) $112^\circ + 68^\circ = 180^\circ$

These are supplementary angles.

(iv) $130^\circ + 50^\circ = 180^\circ$

These are supplementary angles.

(v) $45^\circ + 45^\circ = 90^\circ$

These are complementary angles.

(vi) $80^\circ + 10^\circ = 90^\circ$

These are complementary angles.

Question 4:

Find the angle which is equal to its complement.

Answer 4:

Let one of the two equal complementary angles be x .

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

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

$$\Rightarrow x = \frac{90^\circ}{2} = 45^\circ$$

Thus, 45° is equal to its complement.

Question 5:

Find the angle which is equal to its supplement.

Answer 5:

Let x be two equal angles of its supplement.

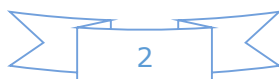
Therefore, $x + x = 180^\circ$

[Supplementary angles]

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

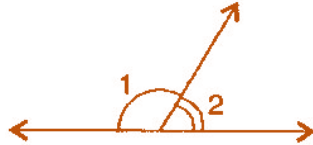
$$\Rightarrow x = \frac{180^\circ}{2} = 90^\circ$$

Thus, 90° is equal to its supplement.



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 the angles still remain supplementary?

**Answer 6:**

If $\angle 1$ is decreased then, $\angle 2$ will increase with the same measure, so that both the angles still remain supplementary.

Question 7:

Can two angles be supplementary if both of them are:

- (i) acute (ii) obtuse (iii) right?

Answer 7:

- (i) No, because sum of two acute angles is less than 180° .
(ii) No, because sum of two obtuse angles is more than 180° .
(iii) Yes, because sum of two right angles is 180° .

Question 8:

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

Answer 8:

Let the complementary angles be x and y , i.e., $x + y = 90^\circ$

It is given that $x > 45^\circ$

Adding y both sides, $x + y > 45^\circ + y$

$$\Rightarrow 90^\circ > 45^\circ + y$$

$$\Rightarrow 90^\circ - 45^\circ > y$$

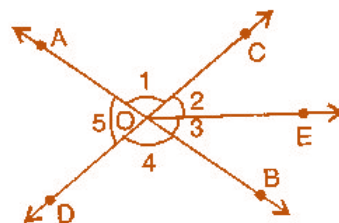
$$\Rightarrow y < 45^\circ$$

Thus, its complementary angle is less than 45° .

Question 9:

In the adjoining figure:

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

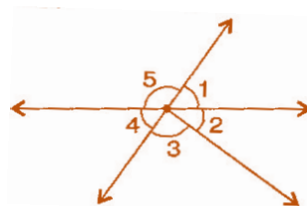
**Answer 9:**

- (i) Yes, in $\angle AOE$, OC is common arm.
- (ii) No, they have no non-common arms on opposite side of common arm.
- (iii) Yes, they form linear pair.
- (iv) Yes, they are supplementary.
- (v) Yes, they are vertically opposite angles.
- (vi) Vertically opposite angles of $\angle 5$ is $\angle COB$.

Question 10:

Indicate which pairs of angles are:

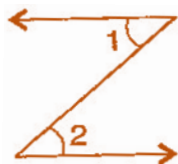
- (i) Vertically opposite angles?
- (ii) Linear pairs?

**Answer 10:**

- (i) Vertically opposite angles, $\angle 1$ and $\angle 4$; $\angle 5$ and $\angle 2 + \angle 3$.
- (ii) Linear pairs $\angle 1$ and $\angle 5$; $\angle 5$ and $\angle 4$.

Question 11:

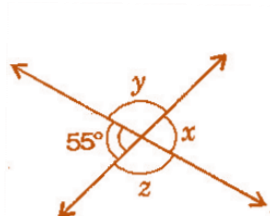
In the following figure, is $\angle 1$ adjacent to $\angle 2$? Give reasons.

**Answer 11:**

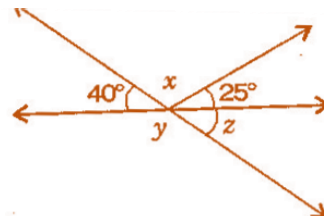
$\angle 1$ and $\angle 2$ are not adjacent angles because their vertex is not common.

Question 12:

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



(i)



(ii)

Answer 12:

- (i) $x = 55^\circ$ [Vertically opposite angles]
 Now $55^\circ + y = 180^\circ$ [Linear pair]
 $\Rightarrow y = 180^\circ - 55^\circ = 125^\circ$
 Also $y = z = 125^\circ$ [Vertically opposite angles]
 Thus, $x = 55^\circ$, $y = 125^\circ$ and $z = 125^\circ$.

- (ii) $40^\circ + x + 25^\circ = 180^\circ$ [Angles on straight line]
 $\Rightarrow 65^\circ + x = 180^\circ$
 $\Rightarrow x = 180^\circ - 65^\circ = 115^\circ$
 Now $40^\circ + y = 180^\circ$ [Linear pair]
 $\Rightarrow y = 180^\circ - 40^\circ = 140^\circ$ (i)
 Also $y + z = 180^\circ$ [Linear pair]
 $\Rightarrow 140^\circ + z = 180^\circ$ [From equation (i)]
 $\Rightarrow z = 180^\circ - 140^\circ = 40^\circ$
 Thus, $x = 115^\circ$, $y = 140^\circ$ and $z = 40^\circ$.

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 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 _____.

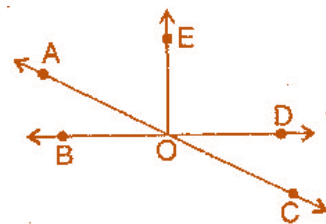
Answer 13:

- | | | | | | |
|------|-------------|------|-------------|-------|---------------|
| (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:

- Obtuse vertically opposite angles.
- Adjacent complementary angles.
- Equal supplementary angles.
- Unequal supplementary angles.
- Adjacent angles that do not form a linear pair.



Answer 14:

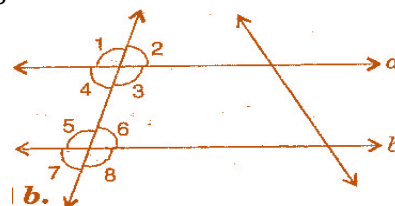
- Obtuse vertically opposite angles means greater than 90° and equal $\angle AOD = \angle BOC$.
- Adjacent complementary angles means angles have common vertex, common arm, non-common arms are on either side of common arm and sum of angles is 90° .
- Equal supplementary angles means sum of angles is 180° and supplement angles are equal.
- Unequal supplementary angles means sum of angles is 180° and supplement angles are unequal.
i.e., $\angle AOE, \angle EOC$; $\angle AOD, \angle DOC$ and $\angle AOB, \angle BOC$
- Adjacent angles that do not form a linear pair mean, angles have common ray but the angles in a linear pair are not supplementary.
i.e., $\angle AOB, \angle AOE$; $\angle AOE, \angle EOD$ and $\angle EOD, \angle COD$

Exercise 5.2

Question 1:

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

- (i) If $a \parallel b$, then $\angle 1 = \angle 5$.
- (ii) If $\angle 4 = \angle 6$, then $a \parallel b$.
- (iii) If $\angle 4 + \angle 5 = 180^\circ$, then $a \parallel b$.



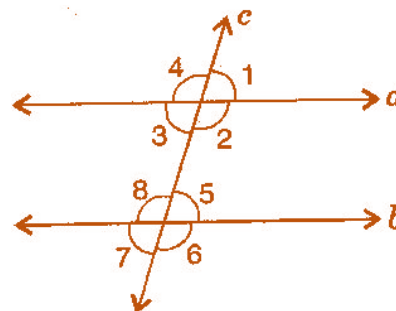
Answer 1:

- (i) Given, $a \parallel b$, then $\angle 1 = \angle 5$ [Corresponding angles]
If two parallel lines are cut by a transversal, each pair of corresponding angles are equal in measure.
- (ii) Given, $\angle 4 = \angle 6$, then $a \parallel b$ [Alternate interior angles]
When a transversal cuts two lines such that pairs of alternate interior angles are equal, the lines have to be parallel.
- (iii) Given, $\angle 4 + \angle 5 = 180^\circ$, then $a \parallel b$ [Co-interior Angles]
When a transversal cuts two lines, such that pairs of interior angles on the same side of transversal are supplementary, the lines have to be parallel.

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.

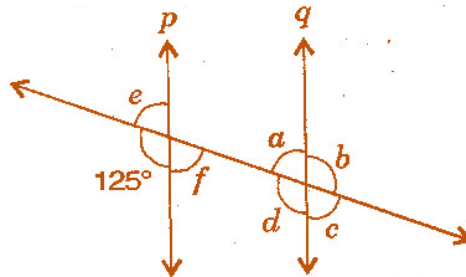


Answer 2:

- (i) The pairs of corresponding angles:
 $\angle 1, \angle 5$; $\angle 2, \angle 6$; $\angle 4, \angle 8$ and $\angle 3, \angle 7$
- (ii) The pairs of alternate interior angles are:
 $\angle 3, \angle 5$ and $\angle 2, \angle 8$
- (iii) The pair of interior angles on the same side of the transversal:
 $\angle 3, \angle 8$ and $\angle 2, \angle 5$
- (iv) The vertically opposite angles are:
 $\angle 1, \angle 3$; $\angle 2, \angle 4$; $\angle 6, \angle 8$ and $\angle 5, \angle 7$

Question 3:

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

**Answer 3:**

Given, $p \parallel q$ and cut by a transversal line.

$$\therefore 125^\circ + e = 180^\circ$$

[Linear pair]

$$\therefore e = 180^\circ - 125^\circ = 55^\circ$$

.....(i)

Now $e = f = 55^\circ$

[Vertically opposite angles]

Also $a = f = 55^\circ$

[Alternate interior angles]

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

[Linear pair]

$$\Rightarrow 55^\circ + b = 180^\circ$$

[From equation (i)]

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

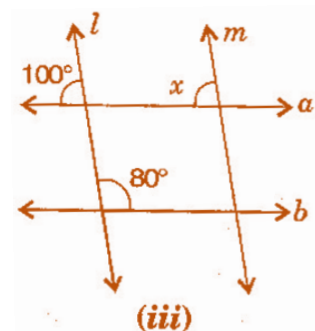
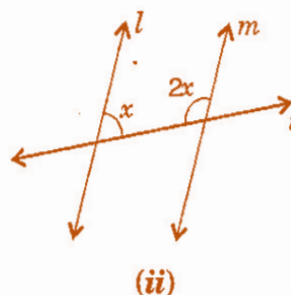
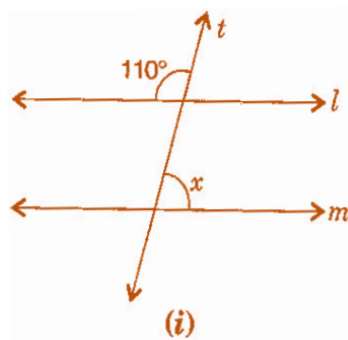
Now $a = c = 55^\circ$ and $b = d = 125^\circ$

[Vertically opposite angles]

Thus, $a = 55^\circ, b = 125^\circ, c = 55^\circ, d = 125^\circ, e = 55^\circ$ and $f = 55^\circ$.

Question 4:

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

**Answer 4:**

(i) Given, $l \parallel m$ and t is transversal line.

$$\therefore \text{Interior vertically opposite angle between lines } l \text{ and } t = 110^\circ.$$

$$\begin{aligned}\therefore 110^\circ + x &= 180^\circ && \text{[Supplementary angles]} \\ \Rightarrow x &= 180^\circ - 110^\circ = 70^\circ\end{aligned}$$

(ii) Given, $l \parallel m$ and t is transversal line.

$$\begin{aligned}x + 2x &= 180 && \text{[Interior opposite angles]} \\ \Rightarrow 3x &= 180^\circ \\ \Rightarrow x &= \frac{180^\circ}{3} = 60^\circ\end{aligned}$$

(iii) Given, $l \parallel m$ and $a \parallel b$.

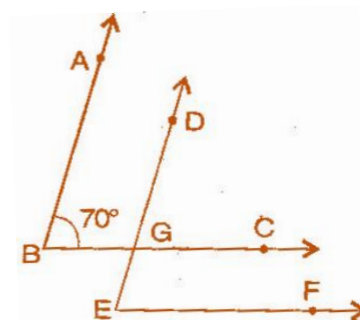
$$x = 100^\circ \quad \text{[Corresponding angles]}$$

Question 5:

In the given figure, the arms of two angles are parallel. If $\angle ABC = 70^\circ$, then find:

(i) $\angle DGC$

(ii) $\angle DEF$



Answer 5:

(i) Given, $AB \parallel DE$ and BC is a transversal line and $\angle ABC = 70^\circ$

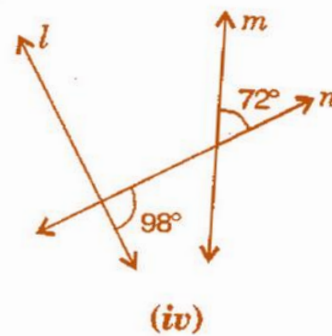
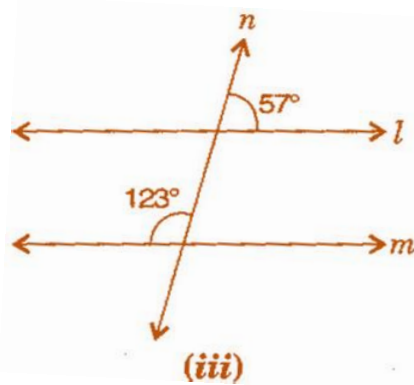
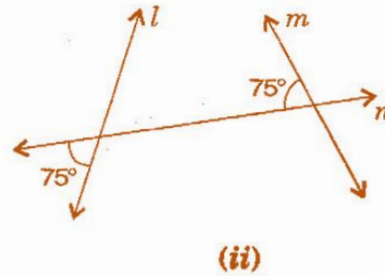
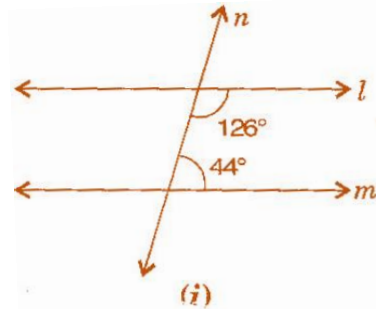
$$\begin{aligned}\therefore \angle ABC &= \angle DGC && \text{[Corresponding angles]} \\ \therefore \angle DGC &= 70^\circ && \text{.....(i)}\end{aligned}$$

(ii) Given, $BC \parallel EF$ and DE is a transversal line and $\angle DGC = 70^\circ$

$$\begin{aligned}\therefore \angle DGC &= \angle DEF && \text{[Corresponding angles]} \\ \therefore \angle DEF &= 70^\circ && \text{[From equation (i)]}\end{aligned}$$

Question 6:

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

**Answer 6:**

- (i) $126^\circ + 44^\circ = 170^\circ$
 $l \nparallel m$ because sum of interior opposite angles should be 180° .
- (ii) $75^\circ + 75^\circ = 150^\circ$
 $l \nparallel m$ because sum of angles does not obey the property of parallel lines.
- (iii) $57^\circ + 123^\circ = 180^\circ$
 $l \parallel m$ due to supplementary angles property of parallel lines.
- (iv) $98^\circ + 72^\circ = 170^\circ$
 l is not parallel to m because sum of angles does not obey the property of parallel lines.