

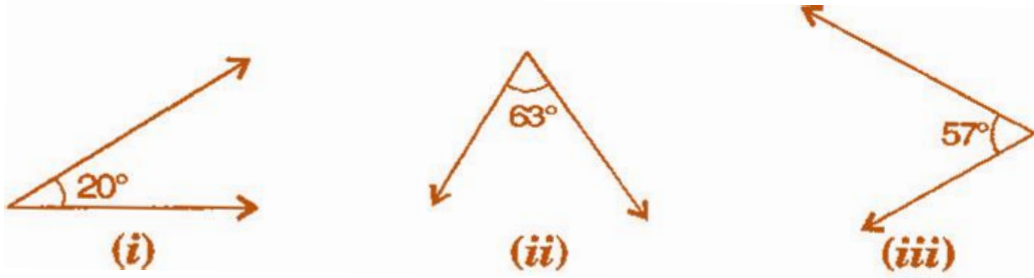
# Mathematics

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

## Exercise 5.1

### Question 1:

Find the complement of each of the following angles:



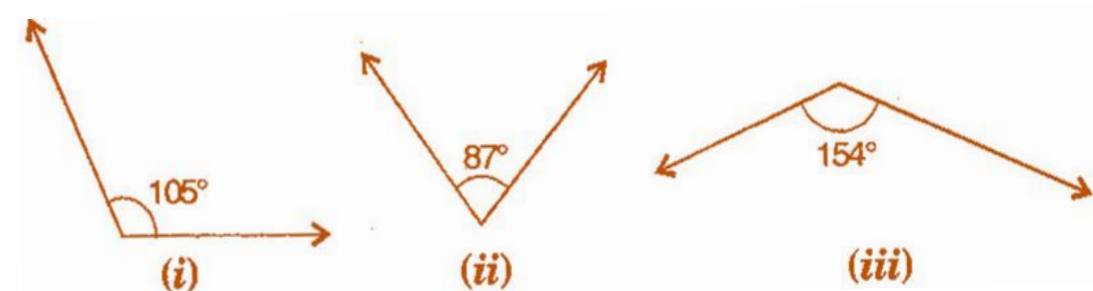
### Answer 1:

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  $180^\circ$ , then they are called supplementary angles.

If sum of two angles is  $90^\circ$ , 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,  $45^\circ$  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]

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

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

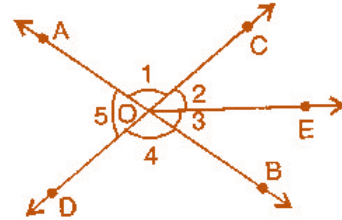
Thus,  $90^\circ$  is equal to its supplement.



### 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  $\angle 5$ ?



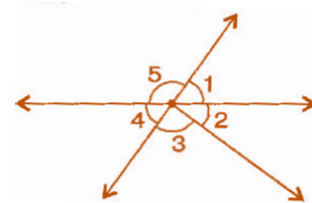
### Answer 9:

- (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?

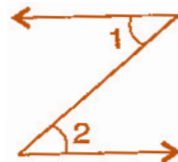


### Answer 10:

- (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.

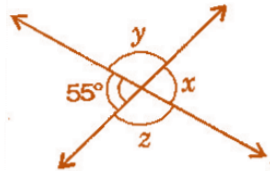


### Answer 11:

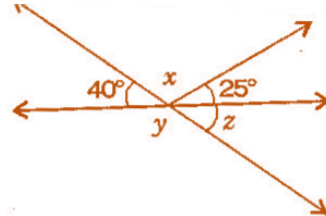
$\angle 1$  and  $\angle 2$  are not adjacent angles because their vertex is not common.

**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 \_\_\_\_\_.

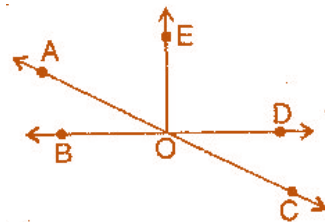
 **Answer 13:**

- (i)  $90^\circ$                       (ii)  $180^\circ$                       (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 14:**

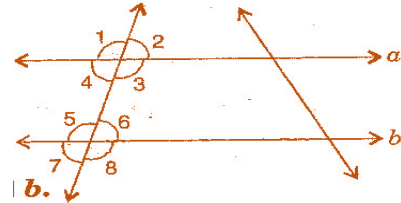
- (i) Obtuse vertically opposite angles means greater than  $90^\circ$  and equal  $\angle AOD = \angle BOC$ .
- (ii) Adjacent complementary angles means angles have common vertex, common arm, non-common arms are on either side of common arm and sum of angles is  $90^\circ$ .
- (iii) Equal supplementary angles means sum of angles is  $180^\circ$  and supplement angles are equal.
- (iv) Unequal supplementary angles means sum of angles is  $180^\circ$  and supplement angles are unequal.  
 i.e.,  $\angle AOE, \angle EOC$ ;  $\angle AOD, \angle DOC$  and  $\angle AOB, \angle BOC$
- (v) 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  $a \parallel b$ .



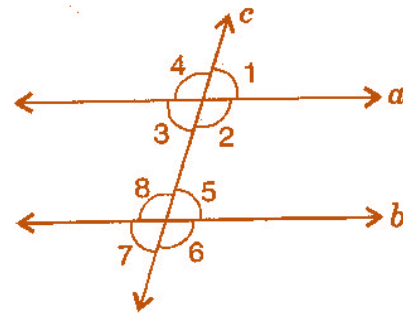
### Answer 1:

- (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.

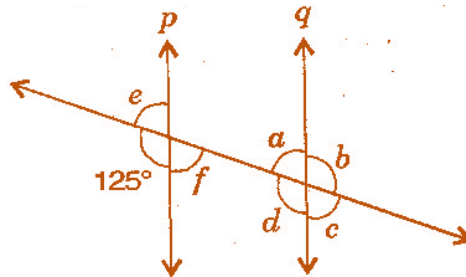


### Answer 2:

- (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)

$$\text{Now } e = f = 55^\circ$$

[Vertically opposite angles]

$$\text{Also } a = f = 55^\circ$$

[Alternate interior angles]

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

[Linear pair]

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

[From equation (i)]

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

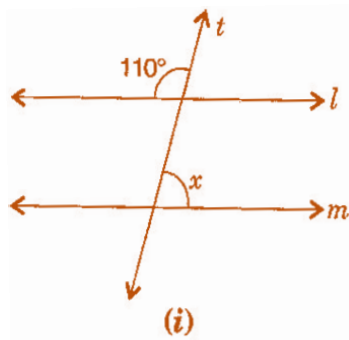
$$\text{Now } a = c = 55^\circ \text{ and } b = d = 125^\circ$$

[Vertically opposite angles]

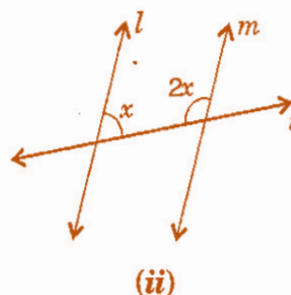
Thus,  $a = 55^\circ, b = 125^\circ, c = 55^\circ, d = 125^\circ, e = 55^\circ$  and  $f = 55^\circ$ .

### Question 4:

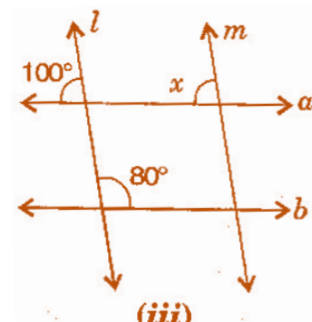
Find the values of  $x$  in each of the following figures if  $l \parallel m$



(i)



(ii)



(iii)

### Answer 4:

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

$\therefore$  Interior vertically opposite angle between lines  $l$  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.

$$x + 2x = 180 \quad \text{[Interior opposite angles]}$$

$$\Rightarrow 3x = 180^\circ$$

$$\Rightarrow x = \frac{180^\circ}{3} = 60^\circ$$

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

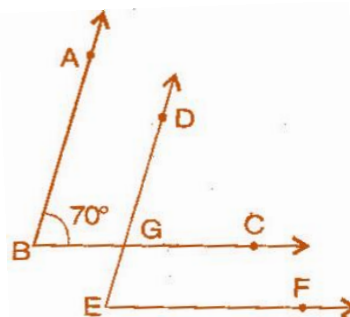
$$x = 100^\circ \quad \text{[Corresponding angles]}$$

### 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  $\angle ABC = 70^\circ$

$$\therefore \angle ABC = \angle DGC \quad \text{[Corresponding angles]}$$

$$\therefore \angle DGC = 70^\circ \quad \text{.....(i)}$$

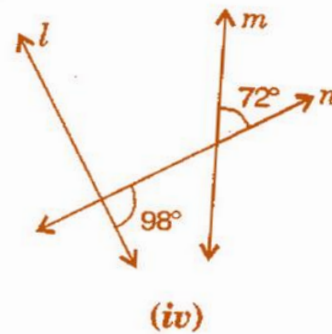
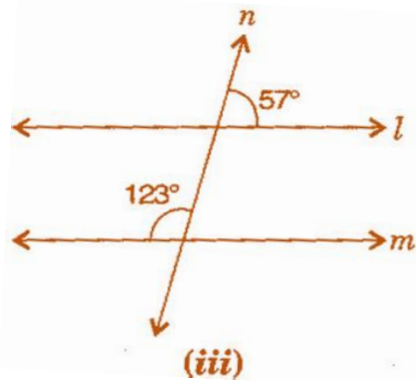
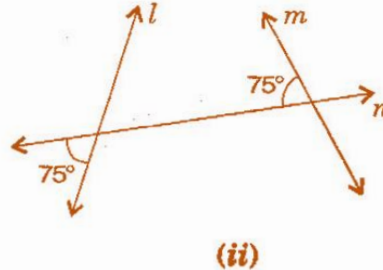
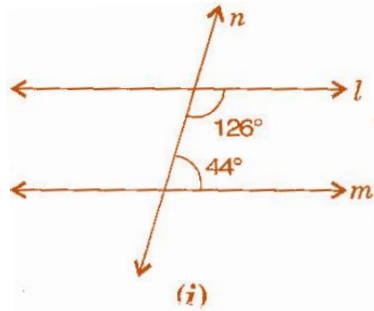
(ii) Given,  $BC \parallel EF$  and  $DE$  is a transversal line and  $\angle DGC = 70^\circ$

$$\therefore \angle DGC = \angle DEF \quad \text{[Corresponding angles]}$$

$$\therefore \angle DEF = 70^\circ \quad \text{[From equation (i)]}$$

**Question 6:**

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



**Answer 6:**

- (i)  $126^\circ + 44^\circ = 170^\circ$   
 $l \parallel m$  because sum of interior opposite angles should be  $180^\circ$ .
- (ii)  $75^\circ + 75^\circ = 150^\circ$   
 $l \parallel m$  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.