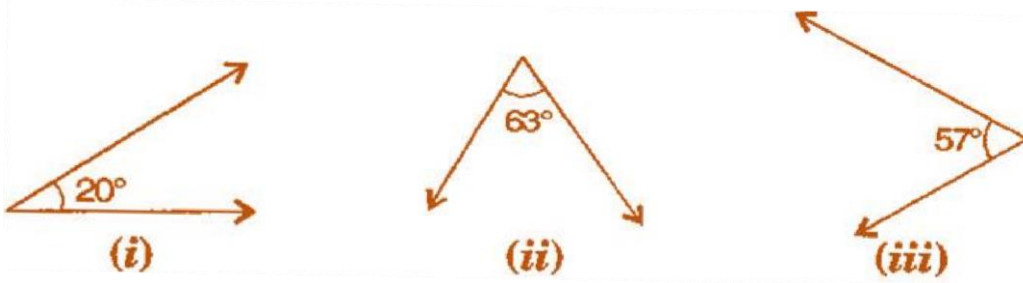# Mathematics

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

Exercise 5.1

Question 1:

Find the complement of each of the following angles:
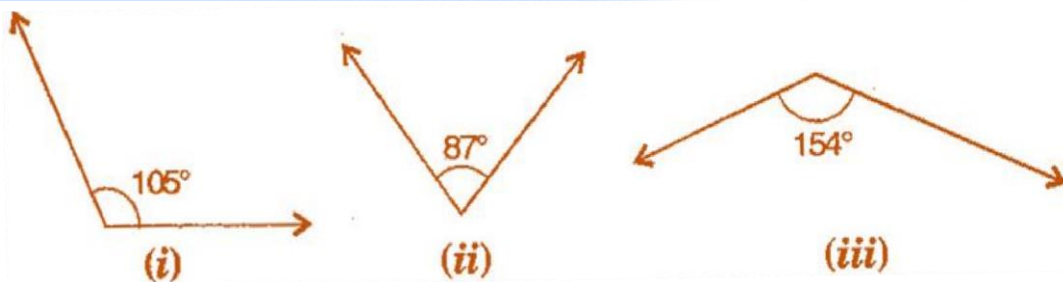

Answer 1:

Complementary angle = $90° -$ given angle

    (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:

Answer 2:

Supplementary angle = $180° -$ given angle

    (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)	$80°, 10°$

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)	$65° + 115° = 180°$	These are supplementary angles.
(ii)	$63° + 27° = 90°$	These are complementary angles.
(iii)	$112° + 68° = 180°$	These are supplementary angles.
(iv)	$130° + 50° = 180°$	These are supplementary angles.
(v)	$45° + 45° = 90°$	These are complementary angles.
(vi)	$80° + 10° = 90°$	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.

$$\therefore \quad x + x = 90°$$
$$\Rightarrow \quad 2x = 90°$$
$$\Rightarrow \quad x = \frac{90°}{2} = 45°$$

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.

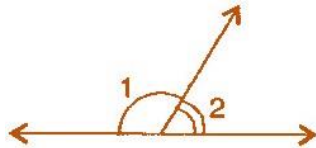Therefore, $\quad x + x = 180°$ [Supplementary angles]

$$\Rightarrow \quad 2x = 180°$$
$$\Rightarrow \quad x = \frac{180°}{2} = 90°$$

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., $x + y = 90°$

It is given that $x > 45°$

Adding y both sides, $x + y > 45° + y$

$\Rightarrow$ $90° > 45° + y$

$\Rightarrow$ $90° - 45° > y$
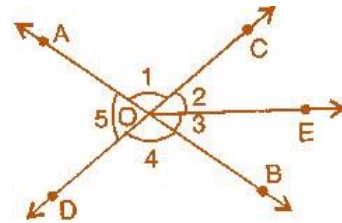
$\Rightarrow$ $y < 45°$

Thus, its complementary angle is less than $45°$.

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 9:

(i)   Yes, in ∠ 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.

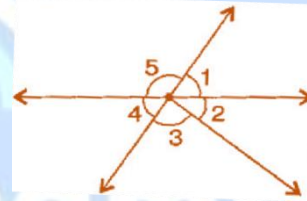(vi)   Vertically opposite angles of ∠ 5 is ∠ COB.

Question 10:

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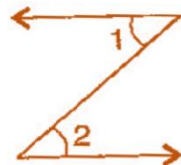
(i)   Vertically opposite angles?

(ii)   Linear pairs?

Answer 10:

(i)   Vertically opposite angles, ∠ 1 and ∠ 4;   ∠ 5 and ∠ 2 + ∠ 3.

(ii)   Linear pairs   ∠ 1 and ∠ 5; ∠ 5 and ∠4.

Question 11:

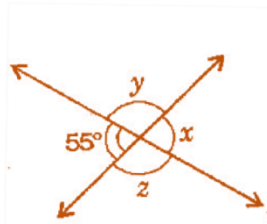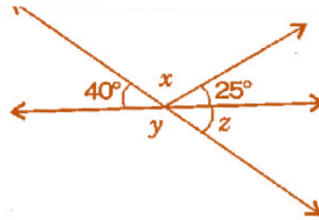In the following figure, is ∠ 1 adjacent to ∠ 2? Give reasons.

Answer 11:

∠ 1 and ∠ 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) $x = 55°$ [Vertically opposite angles]

        Now $55° + y = 180°$ [Linear pair]

$\Rightarrow$ $y = 180° - 55° = 125°$

        Also $y = z = 125°$ [Vertically opposite angles]

        Thus, $x = 55°$, $y = 125°$ and $z = 125°$.

(ii) $40° + x + 25° = 180°$ [Angles on straight line]

$\Rightarrow$ $65° + x = 180°$

$\Rightarrow$ $x = 180° - 65° = 115°$

        Now $40° + y = 180°$ [Linear pair]

$\Rightarrow$ $y = 180° - 40° = 140°$ ....(i)

        Also $y + z = 180°$ [Linear pair]

$\Rightarrow$ $140° + z = 180°$ [From equation (i)]

$\Rightarrow$ $z = 180° - 140° = 40°$

        Thus, $x = 115°$, $y = 140°$ 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 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 _____.
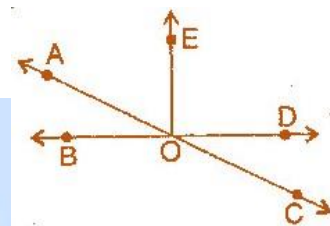
Answer 13:

(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:

(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° 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°.

(iii)   Equal supplementary angles means sum of angles is 180° and supplement angles are equal.

(iv)   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

(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 $a\|b$, then $\angle 1 = \angle 5$.
    (ii)   If $\angle 4 = \angle 6$, then $a\|b$.
   *(iii)*   If $\angle 4 + \angle 5 + 180°$, then $a\|b$.
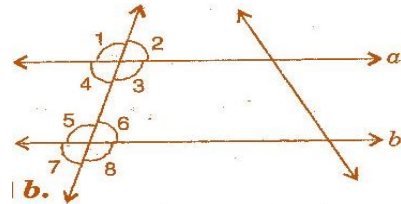
Answer 1:

    (i)   Given, $a\|b$, 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 $a\|b$ [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, $\angle 4 + \angle 5 = 180°$, then $a\|b$ [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.
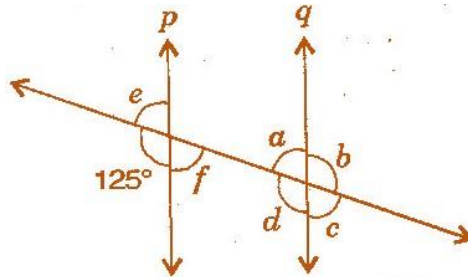   (iv)   the vertically opposite angles.
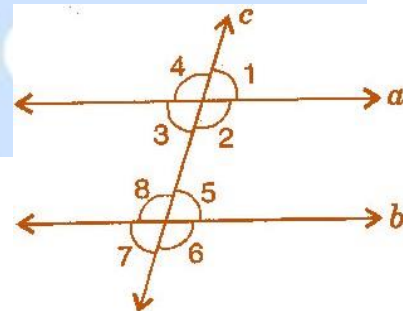
Answer 2:

    (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, $p\|q$. Find the unknown angles.

Answer 3:

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

∵ $125° + e = 180°$ [Linear pair]

∴ $e = 180° - 125° = 55°$ (i)

Now $e = f = 55°$ [Vertically opposite angles]

Also $a = f = 55°$ [Alternate interior angles]

$a + b = 180°$ [Linear pair]

⟹ $55° + b = 180°$ [From equation (i)]

⟹ $b = 180° - 55° = 125°$

Now $a = c = 55°$ and $b = d = 125°$ [Vertically opposite angles]

Thus, $a = 55°, b = 125°, c = 55°, d = 125°, e = 55°$ and $f = 55°$.

Question 4:

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

(i)   (ii)   (iii)
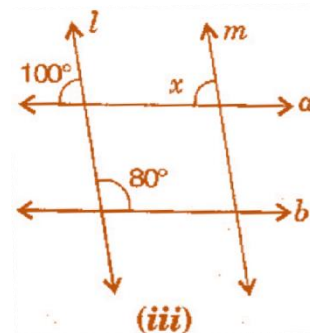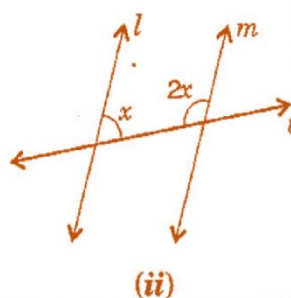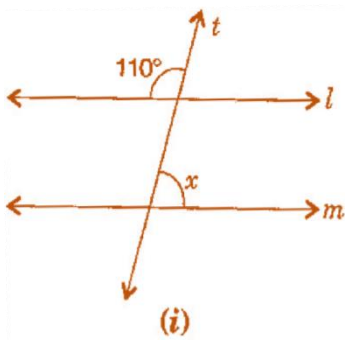
Answer 4:

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

∴   Interior vertically opposite angle between lines l and $t = 110°$.

∴ $110° + x = 180°$ [Supplementary angles]

⇒ $x = 180° - 110° = 70°$

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

        $x + 2x = 180$ [Interior opposite angles]

        ⇒ $3x = 180°$

        ⇒ $x = \dfrac{180°}{3} = 60°$

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

        $x = 100°$ [Corresponding angles]

Question 5:

In the given figure, the arms of two angles are parallel. If ∆ABC = 70°, then find:

    (i) ∠DGC   (ii) ∠DEF
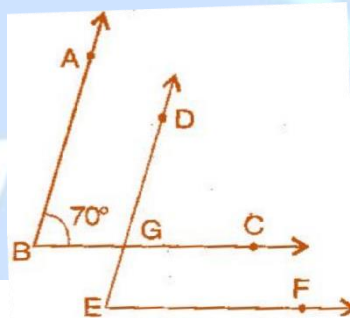
Answer 5:

(i)   Given, AB || DE and BC is a transversal line and ∠ABC = 70°

        ∵   ∠ ABC = ∠ DGC   [Corresponding angles]

        ∴   ∠ DGC = 70°   ....(i)

(ii)   Given, BC || EF and DE is a transversal line and ∠DGC = 70°

        ∵   ∠ DGC = ∠ DEF   [Corresponding angles]

        ∴   ∠ DEF = 70°   [From equation (i)]

Question 6:

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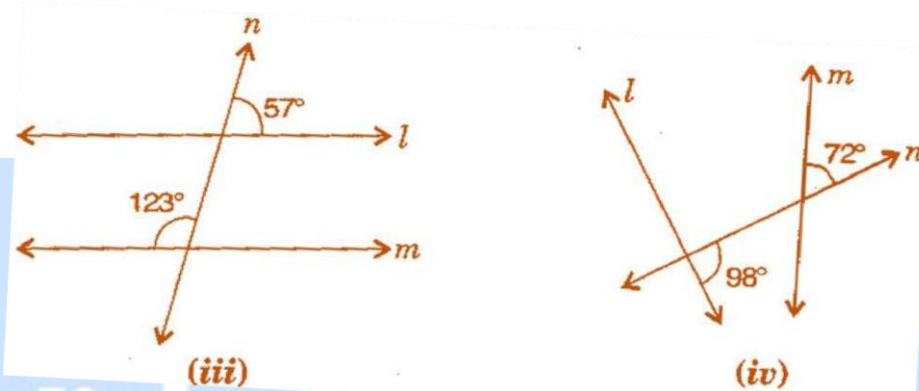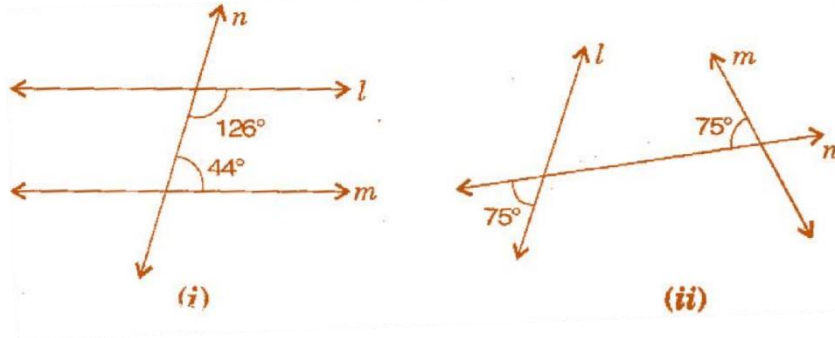
Answer 6:

(i) $126° + 44° = 170°$

$l \parallel m$ because sum of interior opposite angles should be 180°.

(ii) $75° + 75° = 150°$

$l \parallel m$ because sum of angles does not obey the property of parallel lines.

(iii) $57° + 123° = 180°$

$l \parallel m$ due to supplementary angles property of parallel lines.

(iv) $98° + 72° = 170°$

l is not parallel to m because sum of angles does not obey the property of parallel lines.