Mathematics

Question 1:

Find the complement of each of the following angles:
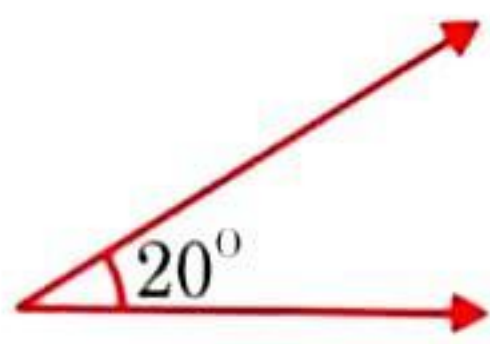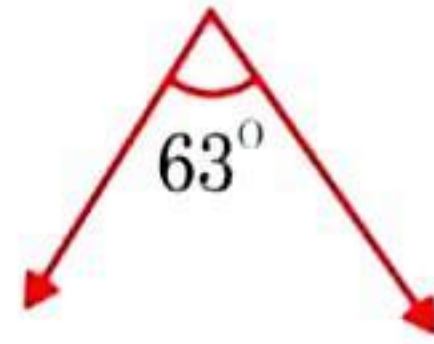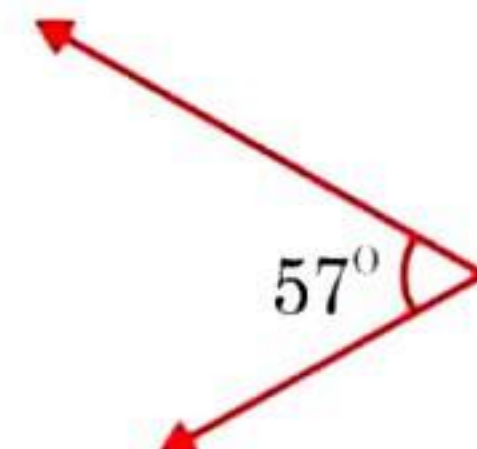
(i)   **(ii)**   **(iii)**

Answer 1:

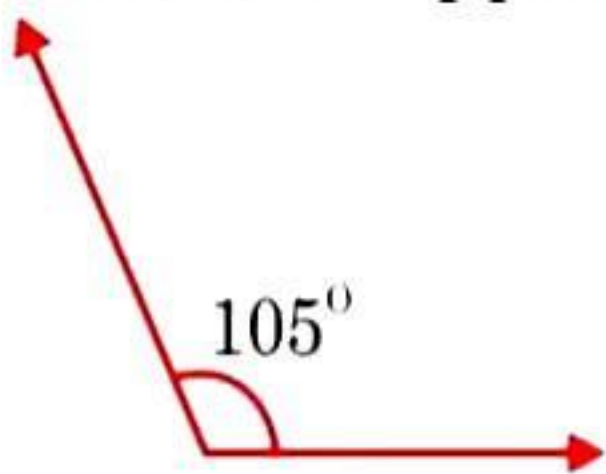Complementary angle = 90° − given angle

(i) Complement of $20^\circ = 90^\circ - 20^\circ = 70^\circ$

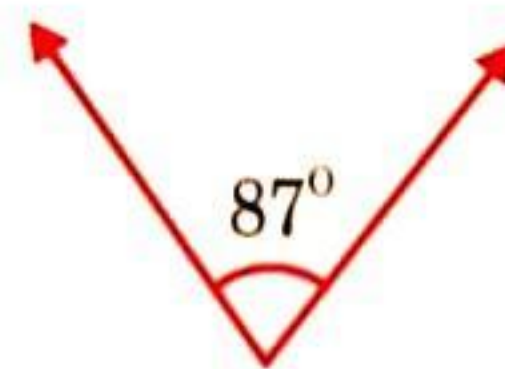**(ii)** Complement of $63^\circ = 90^\circ - 63^\circ = 27^\circ$

(iii) Complement of $57^\circ = 90^\circ - 57^\circ = 33^\circ$

Question 2:

Find the supplement of each of the following angles:

(i)   **(ii)**   **(iii)**

Answer 2:

Supplementary angle = 180° − 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.

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

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.
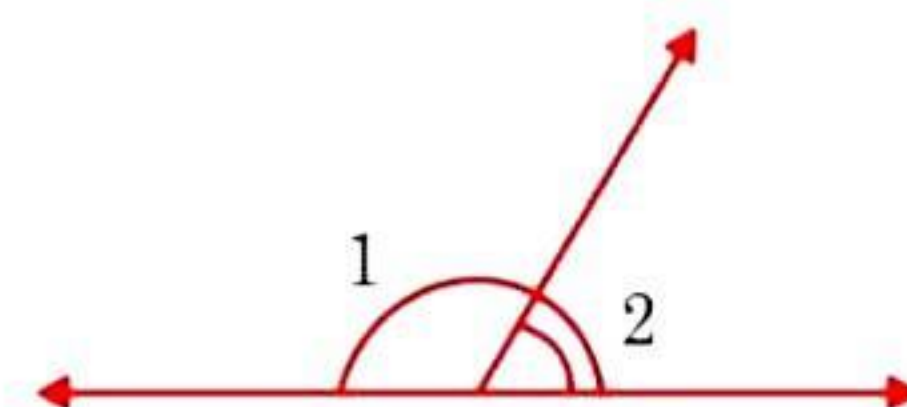Therefore, $\qquad x + x = 180°$ $\qquad\qquad$ [Supplementary angles]
$$\Rightarrow \qquad 2x = 180°$$
$$\Rightarrow \qquad x = \frac{180°}{2} = 90°$$

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 $\qquad\qquad\qquad$ **(ii)** obtuse $\qquad\qquad\qquad$ **(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, $\qquad\qquad x + y > 45^\circ + y$

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

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

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

Thus, its complementary angle is less than 45°.

Question 9:

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 _____.

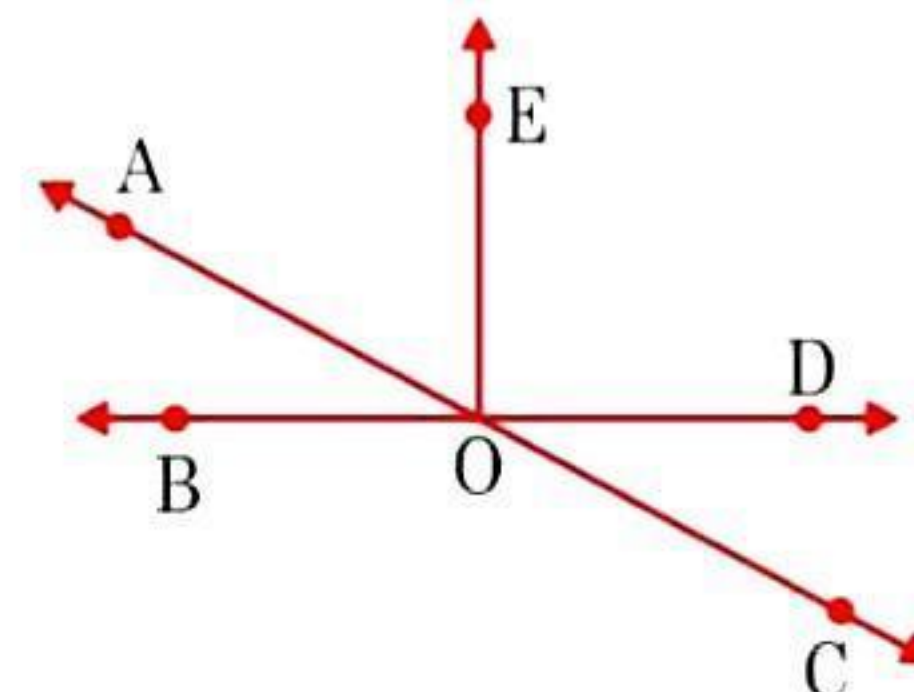**(iii)** If two adjacent angles are supplementary, they form a _____.

Answer 9:

(i) 90° **(ii)** $180°$

(iii) linear pair

Question 10:

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 10:

(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., $\angle AOE, \angle EOC;$ $\qquad \angle AOD, \angle DOC$ 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.

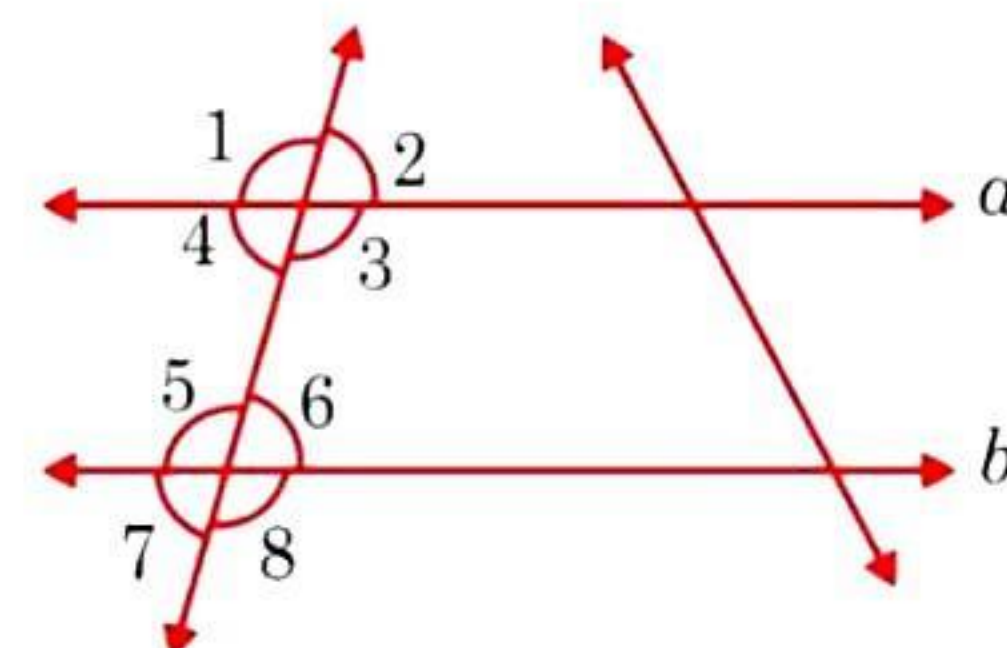i.e., $\angle AOB, \angle AOE;$ $\qquad \angle AOE, \angle EOD$ and $\angle EOD, \angle COD$

Mathematics

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.
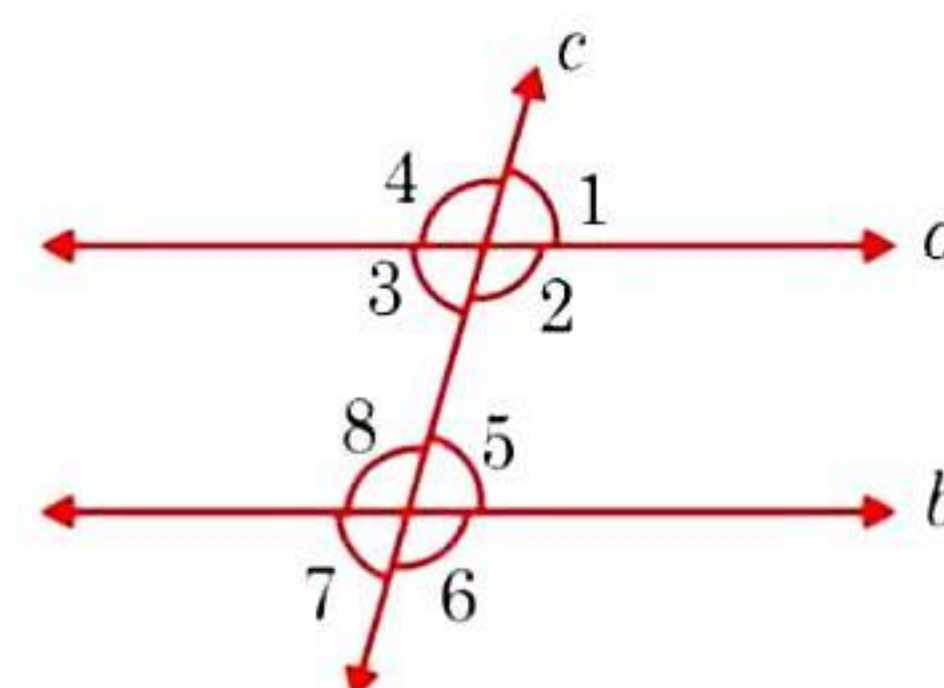
  Answer 2:

    (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.

    $\because$ $125° + e = 180°$ [Linear pair]

    $\therefore$ $e = 180° - 125° = 55°$ ....(i)

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

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

           $a + b = 180°$ [Linear pair]

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

    $\Rightarrow$ $b = 180° - 55° = 125°$

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

    Thus, $a = 55°, b = 125°, c = 55°, d = 125°, e = 55°$ and $f = 55°$.
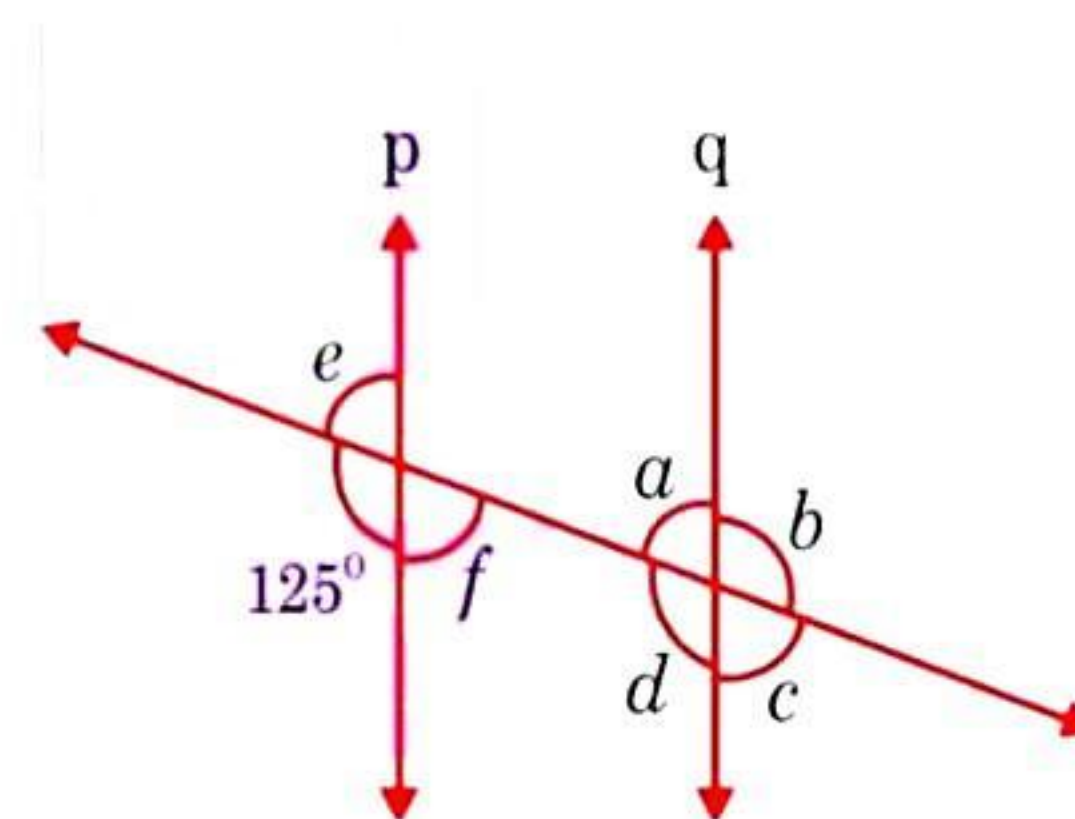
Question 4:

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

(i)

(ii)
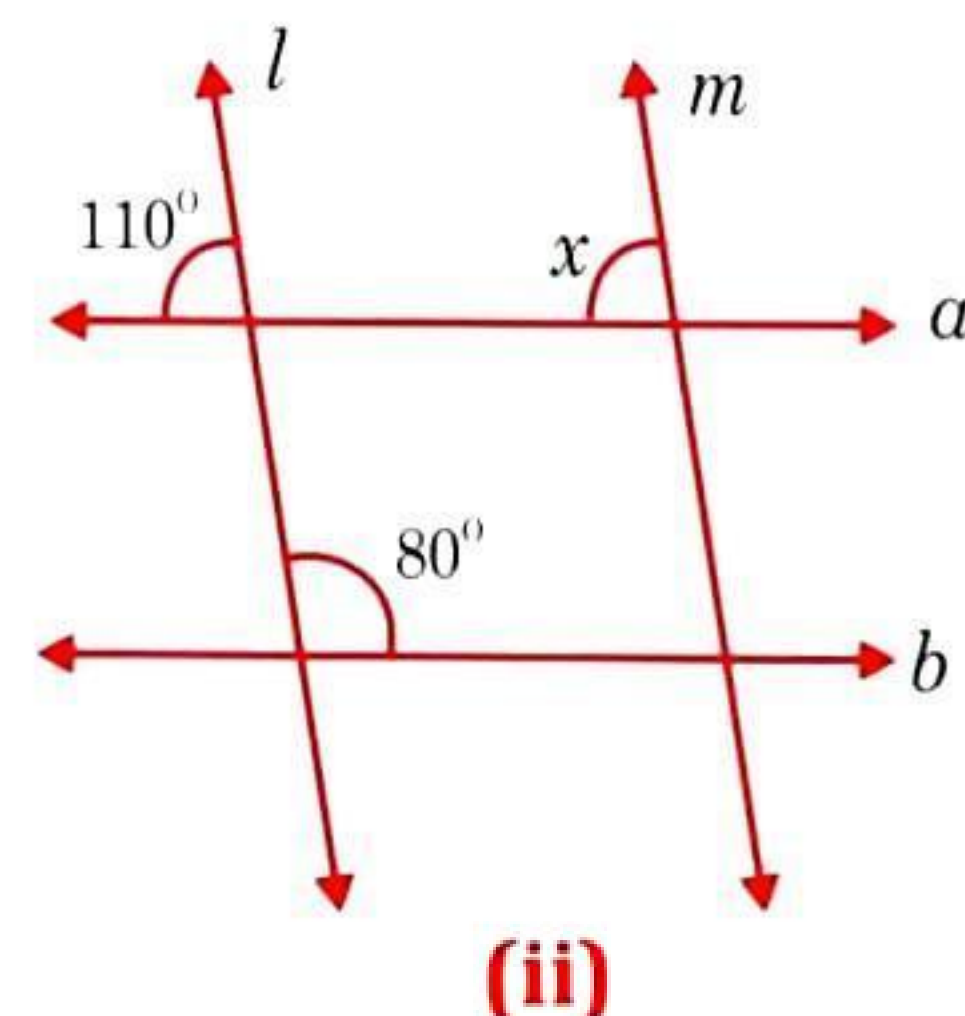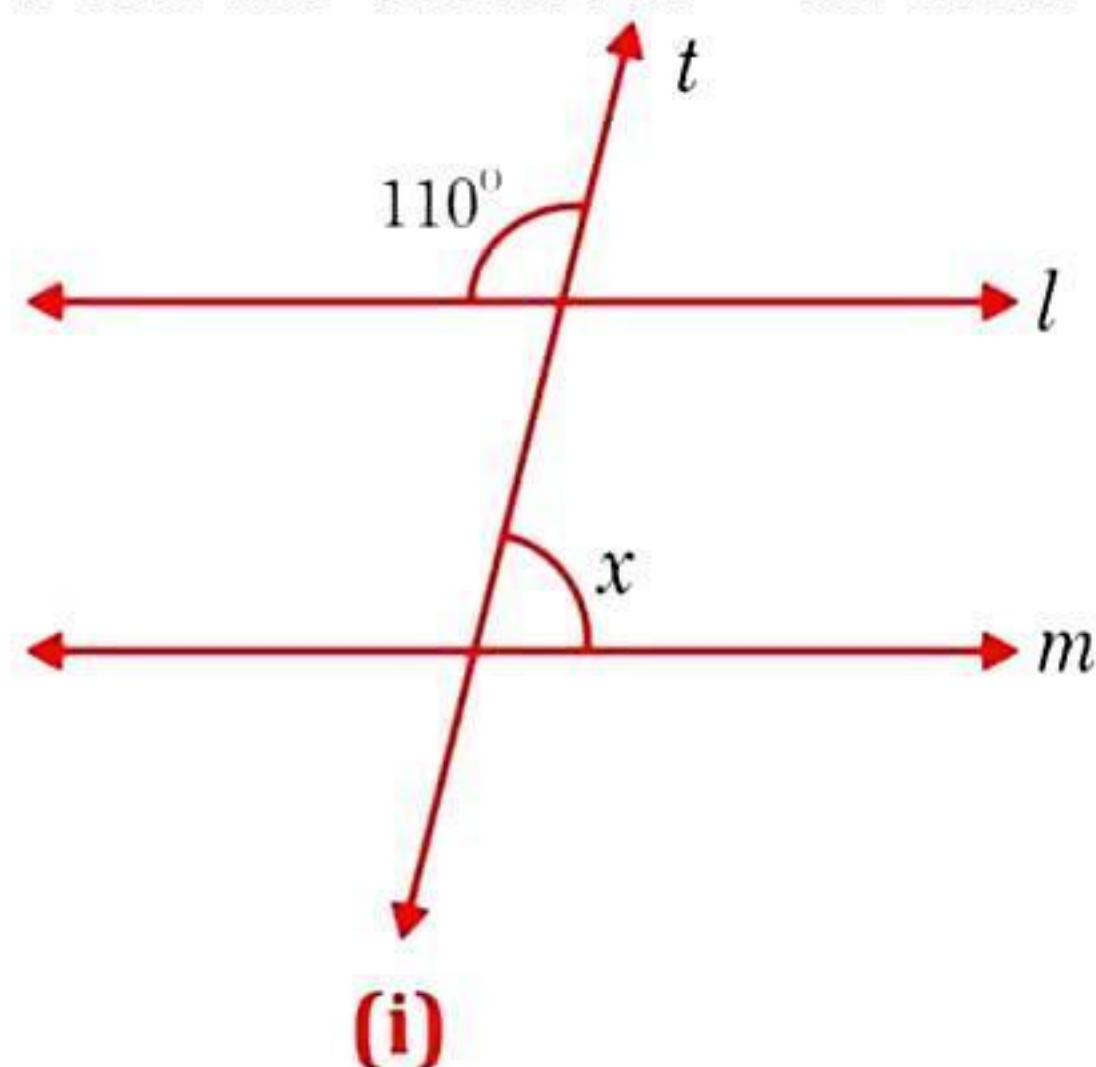
Answer 4:

(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 $a||b$.
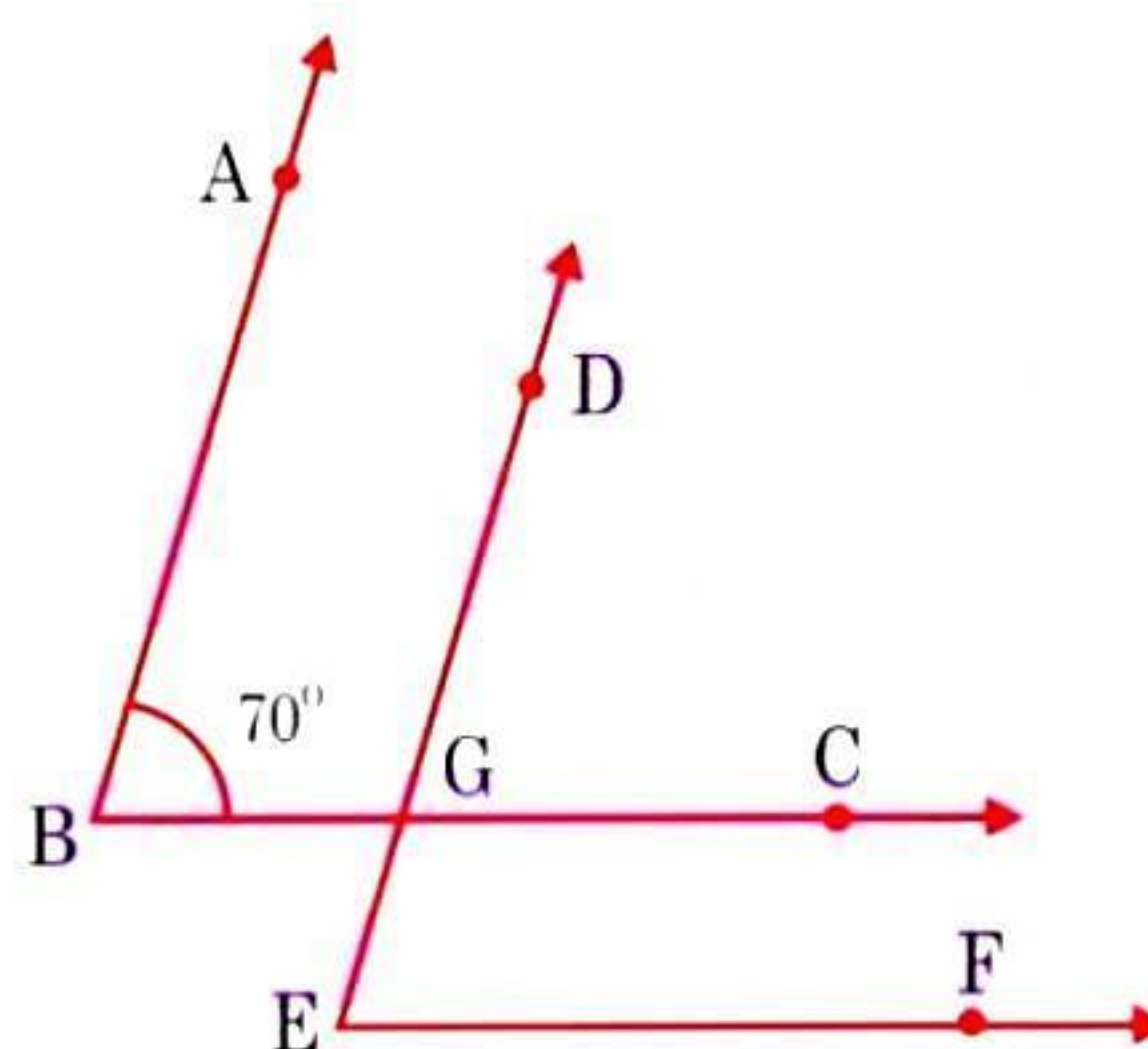
$x = 100°$ [Corresponding angles]

Question 5:

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

(i) $\angle DGC$

(ii) $\angle DEF$

Answer 5:

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

∵ $\angle ABC = \angle DGC$ [Corresponding angles]

∴ $\angle DGC = 70°$ ....(i)

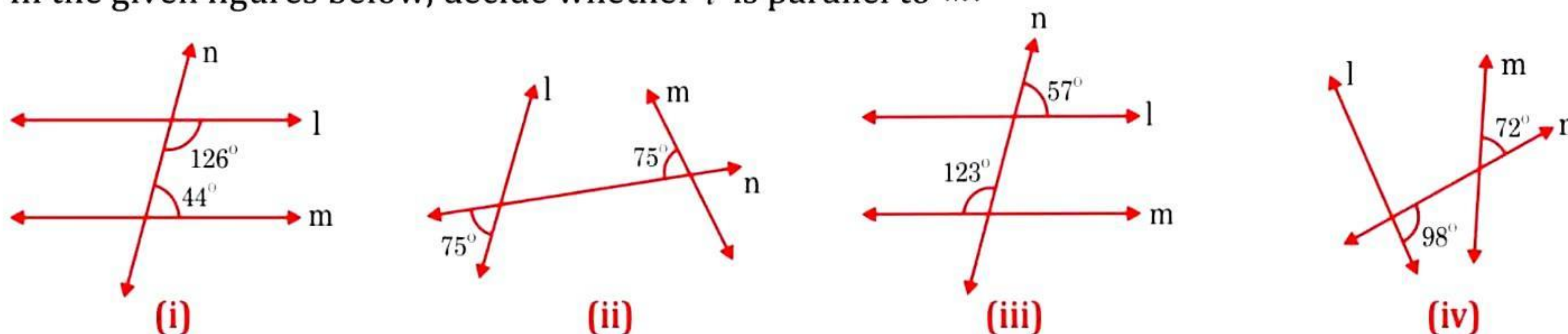**(ii)** Given, BC || EF and DE is a transversal line and $\angle DGC = 70°$

∵ $\angle DGC = \angle DEF$ [Corresponding angles]

∴ $\angle DEF = 70°$ [From equation (i)]

Question 6:

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

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

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.