



CHAPTER-5

TOPIC: LINES AND ANGLES

SOLUTIONS:

EXERCISE 5.1

1. Find the complement of each of the following angles :

Soln: Let x° be the complement of the given angles, then

(i). $20^{\circ} + x^{\circ} = 90^{\circ} \Rightarrow x^{\circ} = 90^{\circ} - 20^{\circ} = 70^{\circ}$

ii). $63^{\circ} + x^{\circ} = 90^{\circ} \Rightarrow x^{\circ} = 90^{\circ} - 63^{\circ} = 27^{\circ}$

iii). $57^{\circ} + x^{\circ} = 90^{\circ} \Rightarrow x^{\circ} = 90^{\circ} - 57^{\circ} = 33^{\circ}$

2. Find the supplement of each of the following angles :

Soln: Let x° be the supplement of the given angles, then

(i) $105^{\circ} + x^{\circ} = 180^{\circ}$ [By supplementary criteria.]

$\Rightarrow x^{\circ} = 180^{\circ} - 105^{\circ} = 75^{\circ}$.

(ii) $87^{\circ} + x^{\circ} = 180^{\circ}$

$\Rightarrow x^{\circ} = 180^{\circ} - 87^{\circ} = 93^{\circ}$

(iii). $154^{\circ} + x^{\circ} = 180^{\circ}$

$\Rightarrow x^{\circ} = 180^{\circ} - 154^{\circ} = 26^{\circ}$.

3. Identities which of the following pairs of angles are complementary and which are supplementary?

(i) $65^{\circ} + 115^{\circ} = 180^{\circ}$, Supplementary

(ii) $63^{\circ} + 27^{\circ} = 90^{\circ}$, Complementary

(iii) $112^{\circ} + 68^{\circ} = 180^{\circ}$, Supplementary

(iv) $130^{\circ} + 50^{\circ} = 180^{\circ}$, Supplementary

(v) $45^{\circ} + 45^{\circ} = 90^{\circ}$, Complementary

(vi) $80^{\circ} + 10^{\circ} = 90^{\circ}$, Complementary

1. Soln: The angle which is equal to its complement is 45° .
2. Soln: The angle which is equal to its supplement is 90° .
3. Soln : From the figure if $L1$ is decreased then $L2$ will be increased in the same measures.
4. Soln: (i) No, since their sum is less than 180° .
(ii) No, since their sum is greater than 180° .
(iii) Yes, since the sum of two right angles triangle is 180° .
5. Soln: An angled is greater than 45° , then its complementary angle is less than 45° .
6. In the adjoining figure we have

Soln: (i) Yes, $L1$ adjacent to $L2$, since they have a common arm OC.

(ii) No, since OC and OE are in one side of OA.

(iii) Yes, they are linear pair.

(iv) Yes, they are supplementary.

(v) Yes, $L1$ is vertically opposite to $L4$.

(vi) Vertically opposite angle of $L5$ is $LBOC$.

7. Indicate which pair of angles are

Soln: From the given figure, we see that

(i) $L1$ and $L4$ & $L5$ and $L2+L3$ are vertically opposite angles.

(ii) $L1$ and $L5$ & $L4$ and $L5$ are linear pair because their sum is 180° .

11 Soln: In the given figure $L1$ and $L2$ are not adjacent angles because they do not have common vertex.

12. Soln: From the figure, we have

(i) $55^\circ + y = 180^\circ$ [Linear Pairs of angles]
 $\Rightarrow y = 180^\circ - 55^\circ = 125^\circ$
 $\Rightarrow Ly = Lz$ [Vertically Opposite angles]
 $\Rightarrow Lx = 55^\circ$

Then, $x = 55^\circ$, $y = 125^\circ$, & $z = 125^\circ$,

(ii) $40^\circ + x + 25^\circ = 180^\circ$ [Straight angles]
 $\Rightarrow x + 65^\circ = 180^\circ$
 $\Rightarrow x = 180^\circ - 65^\circ = 115^\circ$

$\Rightarrow z = 40^\circ$ [Vertically opposite angles]

Then, $y + z = 180^\circ$ [Linear pair angles]

$\Rightarrow y + 40^\circ = 180^\circ$

$\Rightarrow y = 180^\circ - 40^\circ = 140^\circ$

Hence, $x = 115^\circ$, $y = 140^\circ$ and $z = 40^\circ$.

13. Fill in the blanks:

Soln :

(i). If the two angles are complementary, then the sum of their measure is 90° .

(ii). If two angles are supplementary, then the sum of their measure is 180° .

(iii). Two angles forming a Linear pair are supplementary.

(iv). If two adjacent angles are supplementary, then they form a Linear Pair.

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

(vi). If two lines intersect at a point, and if one pair of vertically opposite angles are acute angles, then the other pair of the vertically opposite angles are **Obtuse angle**.

14. Soln: From the figure, we see that

(i). $\angle AOD$ & $\angle BOC$ are obtuse vertically opposite angles.

(ii). $\angle EOA$ & $\angle AOB$ are adjacent complementary angles.

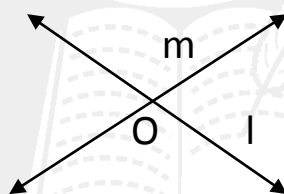
(iii). $\angle EOB$ & $\angle EOD$ are equal supplementary angles.

(iv). $\angle EOA$ & $\angle EOC$ are unequal supplementary angles.

(v). $\angle AOB$ & $\angle AOE$, $\angle AOE$ & $\angle EOD$, $\angle COD$ & $\angle EOD$.

PAIRS OF LINE:

Intersecting Lines



Here l and m are two lines intersecting at the point O which is the point of intersection of the two lines l and m .



TRY THESE:

1. Find examples from your surroundings where lines intersect at right angles.

Ans: Road junction, one wall meets another in our house etc.

2. Find the measures of the angles made by the intersecting lines at the vertices of an equilateral triangle.

Ans: Let x° be one angle of an equilateral triangle, then

$$\Rightarrow x + x + x = 180^\circ \quad [\text{Sum of three angles of a triangle}]$$

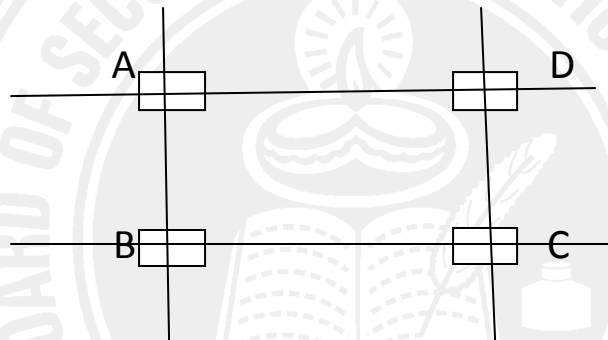
$$\Rightarrow 3x = 180^\circ$$

$$\Rightarrow x = 180^\circ/3 = 60^\circ$$

Therefore, the measure of the angles of an equilateral triangle is 60° .

3. Draw any rectangle and find the measures of angles at the four vertices made by the intersecting lines.

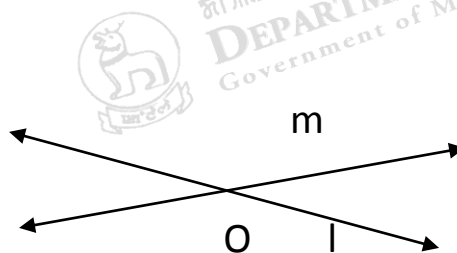
Ans: All the vertically opposite angles are equal and its measure is 90° .



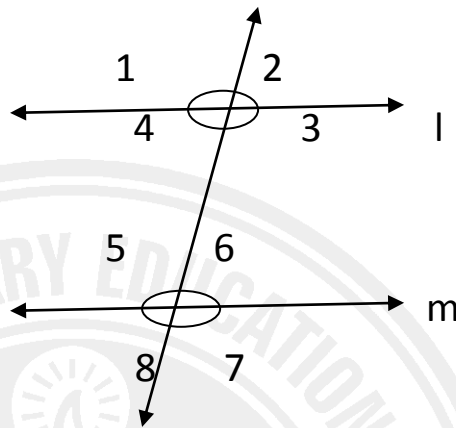
$$\text{Then, } 90^\circ + 90^\circ + 90^\circ + 90^\circ = 360^\circ.$$

4. If two lines intersect, do they always intersect at right angles?

Ans : No,



ANGLES MADE BY TRANSVERSAL



If a line intersect at two or more lines at distinct points is called a transversal.

From the above figure, we see that

- (i). $L3, L4, L5$ and $L6$ are called interior angles.
- (ii). $L1, L2, L7$ and $L8$ are called exterior angles.
- (iii). $L1$ and $L5, L2$ and $L6, L3$ and $L7$ and $L4$ and $L8$ are called corresponding angles.
- (iv). $L3$ and $L5, L4$ and $L6$ are called Pairs of alternate interior angles.
- (v). $L1$ and $L7, L2$ and $L8$ are called Pairs of alternate exterior angles.



IMPORTANT NOTES: (PROPERTIES)

If two parallel lines are cut by a transversal, then

- (i). Each pair of corresponding angles are equal in measure.
- (ii). Each pair of alternate angles are equal in measure.
- (iii). Each pair of interior angles on the same side of the transversal and supplementary (180^0).

When does two lines are said to be parallel?

Ans : When a transversal cuts two lines such that the Pairs of Corresponding angles are equal or Pairs of Alternate interior angles are equal, then the lines are said to be parallel.

EXERCISE 5.2

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

(i). If $a \parallel b$, then $L1 = L5$.

Ans: corresponding angles property.

(ii). If $L4 = L6$, then $a \parallel b$.

Ans: Since $L4$ and $L6$ are Pairs of alternate interior angles.

(iii). If $L4 + L5 = 180^0$, then $a \parallel b$.

Ans: Here, $L4$ and $L5$ are interior angles on the same side of the transversal which is supplementary.

2. In the adjoining figure, identify

(i) The Pairs of corresponding angles are $L4$ and $L8$, $L1$ and $L5$, $L2$ and $L6$, $L3$ and $L7$.

(ii) The pairs of Alternate interior angles are $L2$ and $L8$, and $L3$ and $L5$.

(iii) The pair of interior angles on the same side of the transversal are $L3$ and $L8$, $L2$ and $L5$.

- (iv) The vertically opposite angles are $L4$ and $L2$, $L1$ and $L3$, $L5$ and $L7$, and $L6$ and $L8$.

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

Ans: As we know that

125° and f are Linear Pairs of angles, then

$$125^\circ + f = 180^\circ$$

$$\Rightarrow f = 180^\circ - 125^\circ$$

$$\Rightarrow f = 55^\circ$$

Again $L_f = L_c = 55^\circ$ [corresponding angles]

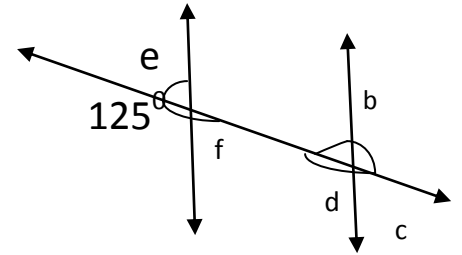
$$\Rightarrow 125^\circ = L_d \text{ [corresponding angles]}$$

$$\Rightarrow L_b = L_d \text{ [vertically opposite angles]}$$

$$\Rightarrow L_a = L_c$$

$$\Rightarrow L_e = L_f$$

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



4. Find the value of x in each of the following figures if $l \parallel m$.

(i). Soln: As we know that

110° and x are pair of alternate angle, then

$$110^\circ + x = 180^\circ \text{ [} x \text{ is the corresponding angle just adjacent to } 110^\circ \text{]}$$

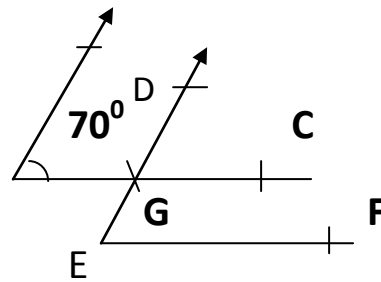
$$\Rightarrow x = 180^\circ - 110^\circ = 70^\circ$$

(ii). $x = 100^\circ$ [55° and x are corresponding]



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



(i). $\angle DGC$

Soln: Since $\angle B$ and $\angle G$ are corresponding angles then $\angle DGC = 70^\circ$

(ii). $\angle DEF = 70^\circ$ [$AB \parallel DE$]

6. In this given figure below decide whether l is parallel to m .

Soln:

(i). Here, the lines l and m are not parallel because the sum of two alternate interior angles is not equal to 180° .

i.e. $126^\circ + 44^\circ = 170^\circ \neq 180^\circ$

(ii). l and m are not parallel.

(iii). Here, the two lines l and m are parallel because the sum of alternate angles is 180° ,

i.e. $123^\circ + 57^\circ = 180^\circ$

(iv). l is not parallel to m [alternate angles are not equal]



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