Chapter 10

Basic Geometrical Concept

Exercise 10.1

Question 1. How many lines can be drawn through a given point ?

Solution:

Unlimited number of lines.

Question 2.

How many lines can be drawn through two distinct given points ?

Solution:

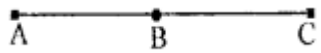
One

Question 3.

How many lines can be drawn through three collinear points ?

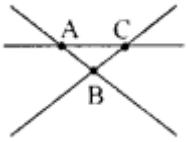
Solution:

One



Question 4.

Mark three non-collinear points A, B and C in your notebook. Draw lines through these points taking two at a time and name these lines. How many such different lines can be drawn ?



lines AB, BC and CA; three.

Question 5.

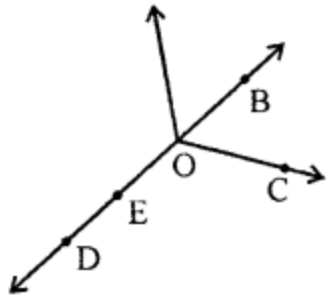
Use the figure to name :

(i) Five point

(ii) Aline

(iii) Four rays

(iv) Five line segments



Solution:

(i) O, B, C, D, E

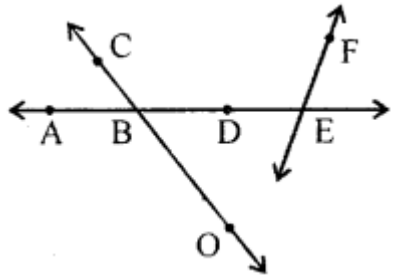
(ii) $\overleftrightarrow{DE}$, $\overleftrightarrow{DO}$, $\overleftrightarrow{DB}$, $\overleftrightarrow{EO}$, etc.

(iii) $\overleftrightarrow{DB}$, $\overleftrightarrow{DE}$, $\overleftrightarrow{OB}$, $\overleftrightarrow{OE}$, $\overleftrightarrow{EB}$, etc.

(iv) $\overleftrightarrow{DE}$, $\overleftrightarrow{DO}$, $\overleftrightarrow{EO}$, $\overleftrightarrow{OB}$, $\overleftrightarrow{EB}$, etc.

Question 6.

Use the figure to name :



(i) Line containing point E.

(ii) Line passing through A.

(iii) Line on which point O lies.

(iv) Two pairs of intersecting lines.

Solution:

(i) $\overleftrightarrow{AE}$, etc.

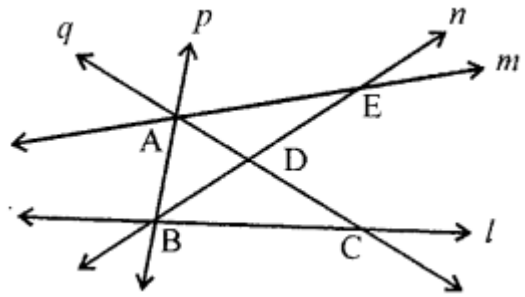
(ii) $\overleftrightarrow{AE}$, etc.

(iii) $\overleftrightarrow{CO}$ or $\overleftrightarrow{OC}$

(iv) $\overleftrightarrow{CO}, \overleftrightarrow{AE}$; $\overleftrightarrow{AE}$, $\overleftrightarrow{EF}$

Question 7.

From the given figure, write



(i) collinear points

(ii) Concurrent lines and their points of concurrence.

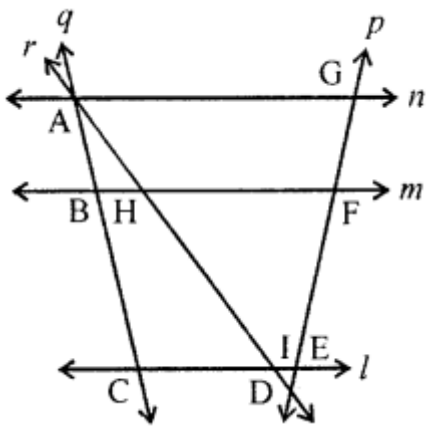
Solution:

(i) A, D, C; B, D, E

(ii) 1, n, p; point B and m, p, q; point A.

Question 8.

In the given figure, write



(i) all pairs of parallel lines.

(ii) all pairs of intersecting lines,

(iii) Concurrent lines

(iv) Collinear points.

Solution:

(i) 1, m; 1, n; m, n

(ii) 1, p; m, p; n, p; 1, q; m, q;n, q; 1, r;m, r;n, r;p, q;p, r;q,r

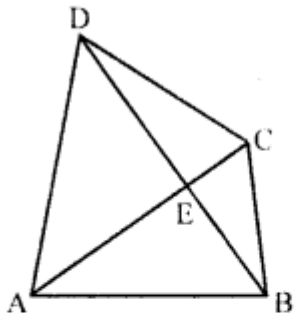
(iii) n, r, quad

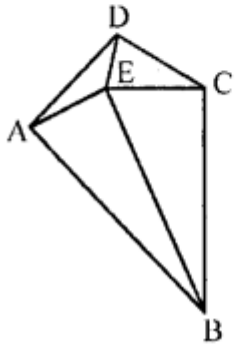
(iv) A, B, C; A, H, I, D; D, E, F, G; C, I, E; B, H, F

Question 9.

Count the number of line segments drawn in each of the following figures and name them :

(i) 

(ii) 

(iii) 

Solution:

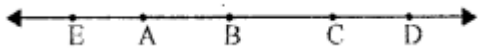
(i) $\overline{AB}$, $\overline{AC}$, $\overline{AD}$, $\overline{BC}$, $\overrightarrow{BD}$ and $\overrightarrow{CD}$; six.

(ii) $\overline{AB}$, $\overline{AE}$, $\overline{AC}$, $\overline{AD}$, $\overline{BC}$, $\overline{BE}$, $\overline{BD}$, $\overline{CD}$, $\overline{CE}$ and $\overline{DE}$; Ten.

(iii) $\overline{AB}$, $\overline{AE}$, $\overline{AD}$, $\overline{BC}$, $\overline{BE}$, $\overline{CE}$, $\overline{CD}$ or $\overline{ED}$ Eight.

Question 10.

(i) Name all the rays shown in the following whose initial points are A, B and C respectively.



(i) Is ray AB different from ray AD?

(ii) Is ray CA different from ray CE ?

(iii) Is ray BA different from ray CA ?

(iv) Is ray ED different from ray DE ?

Solution:

(i) Rays $\overrightarrow{AB}, \overrightarrow{AC}, \overrightarrow{AD}, \overrightarrow{AE}; \overrightarrow{BC}, \overrightarrow{BD}$

$\overrightarrow{BA}, \overrightarrow{BE}; \overrightarrow{CD}, \overrightarrow{CB}, \overrightarrow{CA}, \overrightarrow{CE}$

(i) No

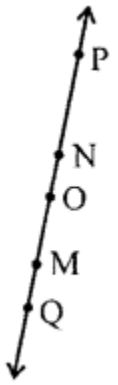
(ii) No

(iii) Yes.

(iv) Yes

Question 11.

Consider the following figure of line $\overleftrightarrow{MN}$. Says whether following statements are true or false in context of the given figure.



(i) Q, M, O, N and P are points on the line $\overleftrightarrow{MN}$

(ii) M, O and N are points on a line segment. $\overline{MN}$

(iii) M and N are end points of line segment. $\overline{MN}$

(iv) O and N are end points of line segment. $\overline{OP}$

(v) M is a point on the ray $\overline{OP}$

(vi) M is one of the end points of the line segment $\overline{QO}$

(vii) Ray $\overrightarrow{OP}$ is same as ray $\overrightarrow{OM}$

(viii)Ray $\overrightarrow{OM}$ is not opposite to ray $\overrightarrow{OP}$

(ix) Ray $\overrightarrow{OP}$ is different from ray $\overrightarrow{QP}$

(x) O is not an initial point of ray $\overrightarrow{OP}$.

(xi) N is the initial point of $\vec{N}$ and $\overrightarrow{NM}$.

Solution:

(i) True

(ii) True

(iii) True

(iv) False

(v) False

(vi) False

(vii) False

(viii) False

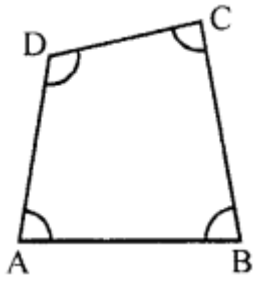
(ix) True

(x) False

(xi) True

Exercise 10.2

Question 1.
How many angles are shown in the following figure? Name them.



Solution:

$\angle A,\ \angle B, \angle C,$ ∠D. Four angles.

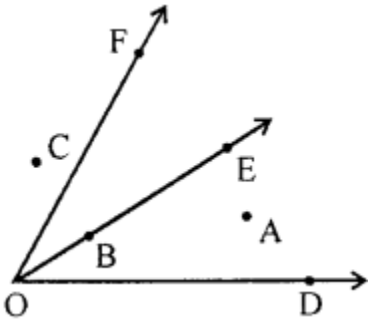
Question 2.

In the given figure, name the point(s)

(i) In the interior of ∠DOE

(ii) In the exterior of ∠EOF

(iii) On ∠EOF



Solution:

(i) A

(ii) C, A, D

(iii) E, B, O, F

Question 3.

Drawn rough diagrams of two angles such that they have

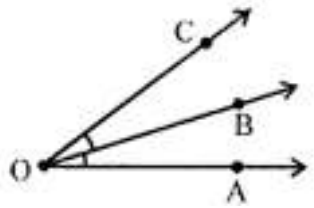
(i) One point in common.

(ii) Two points in common.

(iii) One ray in common.

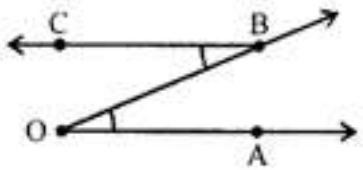
Solution:

(i)

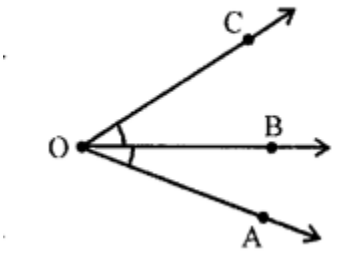


∠AOB and $\angle BOC$ have one point O in common.

(ii) ∠AOB and ∠OBC have two points O and B in common.



(iii)



$\angle$ AOB and $\angle$BOC have one ray $\overrightarrow{OB}$ in common.

Exercise 10.3

Question 1.

Draw rough diagrams to illustrate the following :

(i) Open simple curve

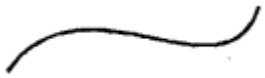
(ii) Closed simple curve

(iii) Open curve that is not simple.

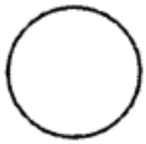
(iv) Closed curve that is not simple.

Solution:

(ii) Open simple curve



(ii) Closed simple curve



(iii) Open curve that is not simple.

(iv) closed curve that is not simple

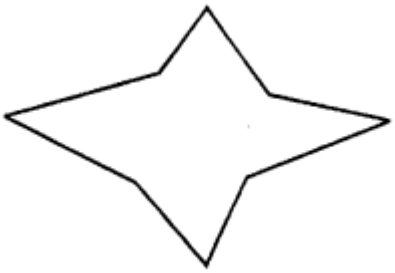
Question 2.

Consider the given figure and answer the following questions :

(i) Is it a curve ?

(ii) Is it a closed curve ?

(iii) Is it a polygon ?



Solution:

(i) Yes, it is a curve.

(ii) Yes, it is a closed curve.

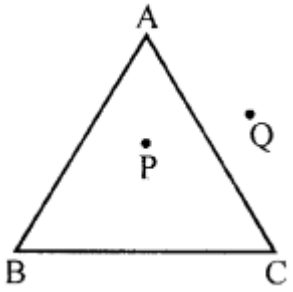
(iii) Yes, it is a polygon.

Question 3.

Draw a rough sketch of a triangle ABC. Mark a point P in its interior and a point Q in its exterior. Is the point A in its exterior or in its interior ?

Solution:

The point A is neither in the exterior nor in the interior of triangle ABC. It is on the triangle ABC.

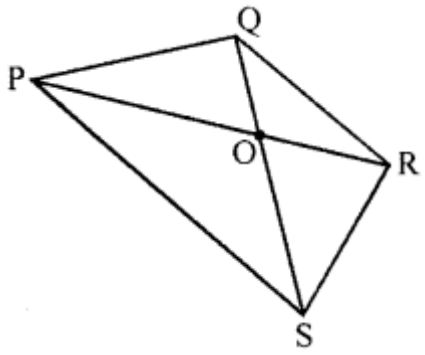


Question 4:

Draw a rough sketch of a quadrilateral PQRS. Draw its diagonals. Name them.

Solution:

The meeting point O of the diagonals PR and QS of the quadrilateral PQRS is in the interior of the quadrilatreal PQRS.



Question 5.

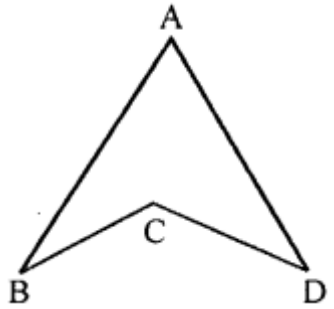
In context of the given figure :

(i) Is it a simple closed curve ?

(ii) Is it a quadrilateral ?

(iii) Draw its diagonals and name them.

(iv) State which diagonal lies in the interior and which diagonal lies in the exterior of the quadrilateral.



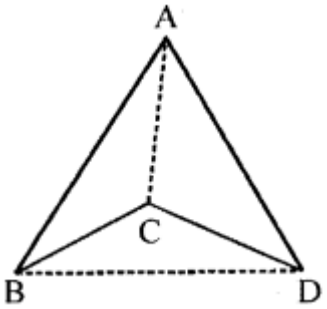
Solution:

(i) Yes.

(ii) Yes.

(iii) Its diagonals are AC _____and BD_____.

(iv) Diagonal AC _____ is in the interior and diagonal BD ____ is in the exterior of quadrilateral ABCD.



Question 6.

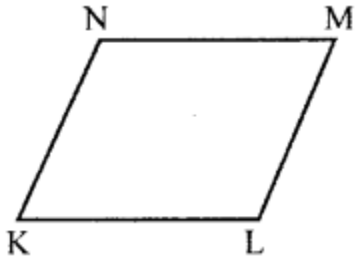
Draw a rough sketch of a quadrilateral KLMN. State,

(i) two pairs of opposite sides

(ii) two pairs of opposite angles

(iii) two pairs of adjacent sides

(iv) two pairs of adjacent angles.



Solution:

(i) $\overline{KL}, \overline{MN}$ and $\overline{KN}, \overline{ML}$

(ii) $\angle K, \angle M$ and $\angle N, \angle L$

(iii) $\overline{KL}, \overline{KN}$ and $\overline{MM}, \overline{ML}$ or $\overline{KL}, \overline{LM}$ and $\overline{NM}, \overline{ML}$

(iv) $\angle K, \angle L$ and $\angle M, \angle N$ or $\angle K, \angle L$ and $\angle L, \angle M$ etc.

Exercise 10.4

Question 1.

In the given figure, identify:

(i) the centre of the circle

(ii) three radii

(iii) a diameter

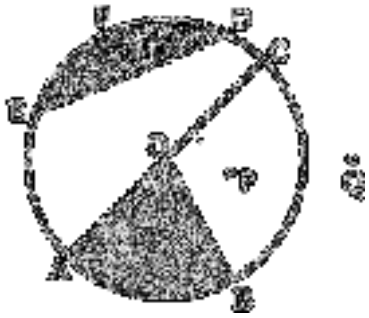
(iv) a chord

(v) two points in the interior

(vi) a point in the exterior

(vii) a sector

(viii) a segment



Solution:

(i) O is the centre of the circle.

(ii) $\overline{OA}$, $\overline{OB}$, $\overline{OC}$ are three radii of the circle.

(iii) $\overline{AC}$ _____ is a diameter of the circle.

(iv) $\overline{ED}$ _____ is a chord of the circle.

(v) O and P are two points in the interior.

(vi) Q is a point in the exterior.

(vii) OAB (shaded portion) is a sector of the circle.

(viii) Shaded portion of the circular region enclosed by line segment ED and the corresponding arc.

Question 2.

State whether the following statement are true (T) or False (F):

(i) Every diameter of a circle is also a chord.

(ii) Every chord of a circle is also a diameter.

(iii) Two diameters of a circle will necessarily intersect.

(iv) The centre of the circle is always in its interior.

Solution:

(i) True.

(ii) False.

(iii) True

(iv) True.

Objective Type Questions

Mental Maths

Question 1.

Fill in the blanks:

(i) There is exactly one line passing through …… distinct points in a plane.

(ii) Two different lines in a plane either…… at exactly one point or are parallel.

(iii) The Curves which have different beginning and end points are called …… curves.

(iv) A curve which does not cross itself at any point is called a …… curve.

(v) A curve which does not cross itself at any point is called a…….. curve.

(v) A simple closed curve made up entirely of line segments is called a ……

(vi) A line segment formed by joining two non- adjacent vertices of a polygon is called its…….

(vii) A quadrilateral has ……..diagonals.

(viii) A lines segment has a ……. length.

Solution:

(i) There is exactly one line passing through **Two** distinct points in a plane.

(ii) Two different lines in a plane either **intersect** at exactly one point or are parallel.

(iii) The Curves which have different beginning and end points are called **Open** curves.

(iv) A curve which does not cross itself at any point is called a **Simple** curve.

(v) A simple closed curve made up entirely of line segments is called a **Polygon.**

(vi) A line segment formed by joining two non- adjacent vertices of a polygon is called its **diagonal.**

(vii) A quadrilateral has **two** diagonals.

(viii) A lines segment has a **definite** length.

Question 2.

Fill in the blanks with correct word(s) to make the statement true.

(i) Radius of a circle is one-halg of its…….

(ii) A radius of a circle is a line segment with one end point at …….. and the Other end-point on

(iii) A chord of a circle is a line segment with one end point at …… and the other end-point on

(iv) A diameter of a circle is a chord that …….. the centre of the circle.

(v) All radii of a circle are……..

Solution:

(i) Radius of a circle is one-half of its diameter.

(ii) A radius of a circle is a line segment with one end point at the centre and the other end-point on the circle.

(iii) A chord of a circle isa line segment with its end points on the circle.

(iv) A diameter of a circle is a chord that passes through the centre of the circle.

(v) All radii of a circle are equal.

Question 3.

State whether the following statements are true (T) or false (F):

(i) The line segment $\overline{AB}$ is the shortest route from A to B.

(ii) A line cannot be drawn wholly on a sheet of paper.

(iii) A line segment is made of infinite (uncountable) number of points.

(iv) Two lines in a plane always intersect.

(v) Through a given point only one line can be drawn.

(vi) Two different lines can be drawn passing through two distinct points.

(vii) Every simple closed curve is a polygon.

(viii) Every polygon has atleast three sides.

(ix) A vertex of a quadrilateral lies in its interior.

(x) A line segment with its end-points lying on a circle is called a diameter of the circle.

(xi) Diameter is the longest chord of the circle.

(xii) The end-points of a diameter of a circle divide the circle into two points, each part is called a semi-circle.

(xiii) A diameter of a circle divides the circular region into two parts, each part is called a semi-circle.

(xiii) A diameter of a circle divides the circular region into two parts, each part is called a semi-circular region.

(xiv) The diameter's of a circle are concurrent the centre of the circle is the point common to all diameters.

(xv) Every circle has unique centre and it lies inside the circle.

(xvi) Every circle has unique diameter.

Multiple Choice Questions

Choose the correct answer from the given four options (4 to 20):

Question 4.

Which of the following has no end points ?

(a) a line

(b) a ray

(c) a line segment

(d) none of these

Solution:

Aline

Because it cannot be drawn on a paper.(a)

Question 5.

Which of the following has definite length ?

(a) a line

(b) a ray

(c) a line segment

(d) none of these

Solution:

a line segment

Because a line segment can be drawn on a paper and it has two end points. (c)

Question 6.

The number of points required to name a line if

(a) 1

(b) 2

(c) 3

(d) 4

Solution: 2

A line has no definite length but. It requires $\overrightarrow{AB}$ to represent it. (b)

Question 7.

The number of lines that can be drawn through a given point is

(a) 1

(b) 2

(c) 3

(d) infinitely many

Solution:

(d) infinitely many

Question 8.
The number of lines that can be drawn passing through two distinct points is
(a) 1
(b) 2
(c) 3
(d) infinitely many
Solution :
(a) 1

Question 9.

The maximum number of points of intersection of three lines drawn in a plane is

(a) 1

(b) 2

(c) 3

(d) 6

Solution:

(c) 3

Question 10.

The minimum number of points of intersection of three lines drawn in a plane is

(a) 0

(b) 1

(c) 2

(d) 3

Solution:

(a) 0

Question 11. In the given figure, the number of line segment is

(a) 5

(b) 10

(c) 12

(d) 15

Solution:

(a) 5

Question 12. In a polygon with 5 sides, the number of diagonals is

(a) 3

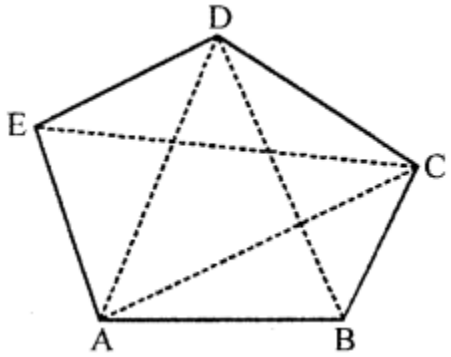
(b) 4

(c) 5

(d) 10

Solution:

(c) 5



Question 13.

The number of lines passing through 5 points such that no three of them are collinear are

(a) 10

(b) 5

(c) 8

(d) 20

Solution:

(a) 10

Question 14.

In context of the given figure, which of the following statement is correct ?

(a) B is not a point on segment $\overline{AC}$

(b) B is the initial point of the ray $\overrightarrow{AC}$

(c) D is a point on the ray $\overrightarrow{CA}$

(d) C is a point on the ray $\overrightarrow{BD}$

Solution:
C is a point on the ray BD (d).

Question 15.

The figure formed by two rays with same initial point is known as

(a) a line

(b) a line segment

(c) a ray

(d) an angle

Solution:

(d) an angle

Question 16.

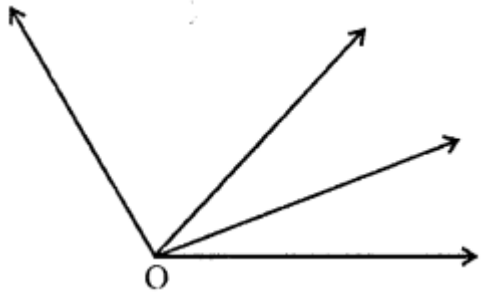
In the given figure, the number of angles is

(a) 3

(b) 4

(c) 5

(d) 6



Solution:

(d) 6

Question 17.

Which of the following statement is false ?

(a) A triangle has three sides

(b) A triangle has three vertices

(c) A triangle has three angles

(d) A triangle has two diagonals

Solution:

(d) A triangle has two diagonals

Question 18.

Which of the following statements is false ?

(a) A quadrilateral has four sides and four vertices

(b) A quadrilateral has four angles

(c) A quadrilateral has four diagonals

(d) A quadrilateral has two diagonals

Solution:
(c) A quadrilateral has four diagonals

Question 19.

By joining any two points of a circle, we obtains its
(a) radius
(b) chord
(c) diameter
(d) circumference
Solution :
(b) chord

Question 20.

If the radius of a circle is 4cm, then the length of its diameter is

(a) 2 cm

(b) 4 cm

(c) 8 cm

(d) 16cm

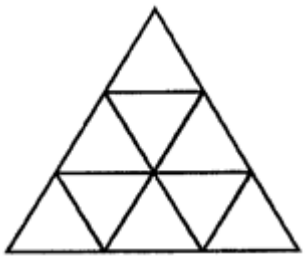
Solution:

(c) 8 cm

Higher Order Thinking Skills (HOTS)

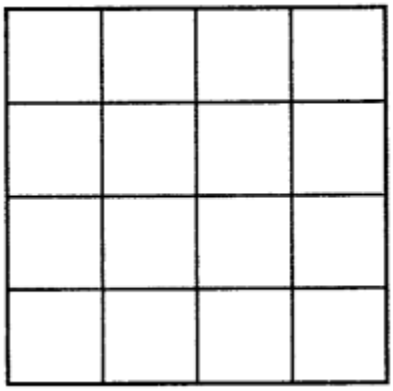
Question 1.
Can a sector and segment of a circle coincide ? If so, name it.
Solution:
Yes, a cemicircle.

Question 2.
In the given figure, find:
(i) the number of triangles pointing up.
(ii) The total number of triangles.



Solution:
(i) The number of triangles pointing up are = 1 + 3 + 6 = 10
(ii) Total number of triangles = 13

Question 3.
In the given figure, find the total number of squares
Solution:



Solution:

Total number of squares in the given figure are

= 1 + 4 + 9 + 16 = 30

Check Your Progress

Question 1.

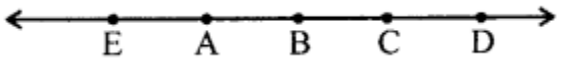
(i) Name all the rays shown in thegiven figure whose initial point is A.

(ii) Is ray $\overrightarrow{AB}$ different from ray $\overrightarrow{AD}$?

(iii) Is ray $\overrightarrow{CA}$ different from ray $\overrightarrow{CE}$?

(iv) Is ray $\overrightarrow{BA}$ different from ray $\overrightarrow{CA}$?

(v) Is ray $\overrightarrow{ED}$ different from ray $\overrightarrow{DE}$?



Solution:

(i) $\overrightarrow{AB}$, $\overrightarrow{AC}$, $\overrightarrow{AD}$, $\overrightarrow{AE}$

(ii) No

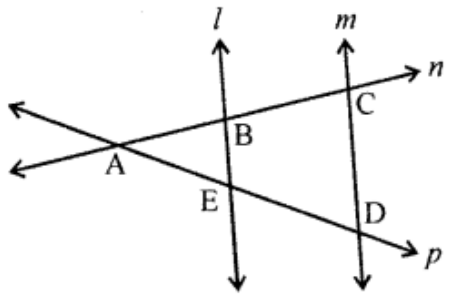
(iii) No

(iv)Yes

(v) Yes

Question 2

From, the given figure, write



(i) all pairs of parallel lines.

(ii) All pairs of intersecting lines.

(iii) liners whose point of inersting is E.

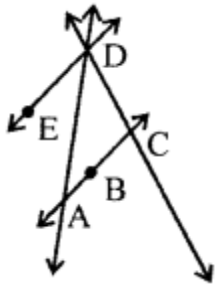
(iv) Collinear points

Solution:

(i) l, m
(ii) l, n; l, p; m, n; m, p; n, p
(iii) l, p
(iv) {A, B, C} and {A, E, D}

Question 3.

In the given figure :



(a) Name;

(i) Parallel lines.

(ii) All pairs of intersecting lines.

(iii) concurrent lines.

(b) State wheather true or false:

(i) points A, B and D are colllinear.

(ii) lines AB and ED interesect at C.

Solution:

(a) (i) AB, ED are parallel lines.

(ii) $\overrightarrow{AB}$, $\overrightarrow{AD}$; $\overrightarrow{AB}, \overrightarrow{CD}$; $\overrightarrow{AD}, \overrightarrow{ED}$; $\overrightarrow{ED}, \overrightarrow{CD}$; $\overrightarrow{AD}, \overrightarrow{CD}$

(b)

(i) False.

(ii) False.

Question 4.

In context of the given figure, state whether the following statements are true (T) or False (F):

(i) Point A is in the interior of $\angle AOD$.

(ii) Point B is in the interior of $\angle AOC$.

(iii) Point C is in the exterior of ∠AOB.

(iv) Point D is in the exterior of $\angle AOC$.

Solution:

(i) False.

Correct : Point A is exterior of $\angle AOD$.

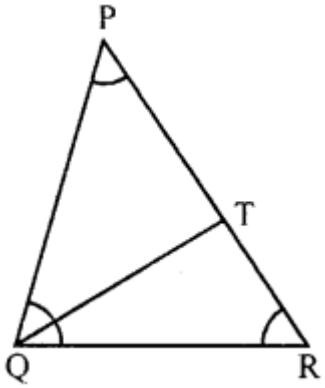
(ii) True

(iii) True

(iv) True

Question 5.

How many angles are marked in the given figure ? Name them ?



Solution:

Five angles.

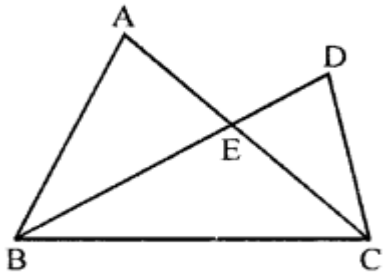
Names are: $\angle QPR,\ \angle PRQ, \angle$ TQR, $\angle PQT$, $\angle$PQR.

Question 6.

In context of the given figure, name

(i) all triangle

(ii) all triangles having point E as common vertex.



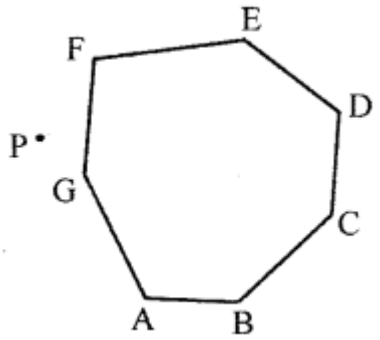
Solution:

(i) $\Delta ABC, \Delta DBC, \Delta EBC, \Delta EAB, \Delta DEC$.

(ii) $\Delta EBC, \Delta EAB, \Delta DEC$.

Question 7.

In context of the given figure, answer the following questions :



(i) Is ABCDEFG a polygon ?

(ii) How many sides does it have ?

(iii) How many vertices does it have ?

(iv) Are $\overline{AB}$ and $\overline{FE}$ adjacent sides ?

(v) Is $\overline{GF}$ a diagonal of the polygon ?

(vi) Are $\overline{AC}$, $\overline{AD}$ and $\overline{AE}$ diagonals of the polygon ?

(vii) Is point P in the interior of the polygon ?

(viii) Is point A in the exterior of the polygon ?

Solution:

(i) Yes

(ii) Seven

(iii) Seven

(iv) No

(v) No

(vi) Yes

(vii) No

(viii) No