Basic Geometrical Concepts

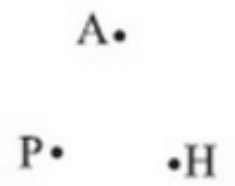
Exercise 10.1

Question: 1

Make three points in your notebook and name them.

Solution:

Three points, namely A, P and H can be marked as follows:



Question: 2

Draw a line in your notebook and name it using a small letter of the alphabet

Solution:

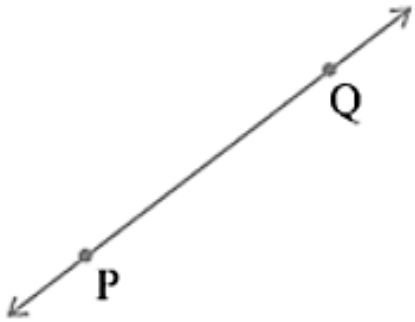
Let us draw a line and name it l

Question: 3

Draw a line in your notebook and name it by using two points on it

Solution:

Let us first draw a line. Two points on it are P and Q. now, the line can be written as line PQ



Question: 4

Give three examples from your environment of:

i) Points

ii) Portion of a line

iii) Plane of a surface

iv) Portion of a plane

v) Curved surface

Solution:

i) Points –

The period at the end of the sentence, a pinhole on the map and the point at which two walls and the floor meet at the corner of the room.

ii) Portion of a line –

Tightly stretched power cables, laser beams, and thin curtain rods

iii) Plane of a surface –

The surface of a smooth wall, the surface of the top of a table and the surface of a smooth white board

iv) Portion of a plane –

The surface of the sheet of the paper, the surface of calm water in a swimming pool and the surface of a mirror

v) Curved surface –

The surface of a gas cylinder, the surface of a tea pot and the surface of an ink pot.

Question: 5

There are a number of ways by which we can visualize a portion of a line. State whether the following represent a portion of line or not:

i) A piece of elastic stretched to the breaking point

ii) Wire between two electric poles

iii) The line thread by which a spider lowers itself

Solution:

i) Yes

ii) No

iii) Yes

Question: 6

Can you draw a line on the surface of a sphere which lies wholly on it?

Solution:

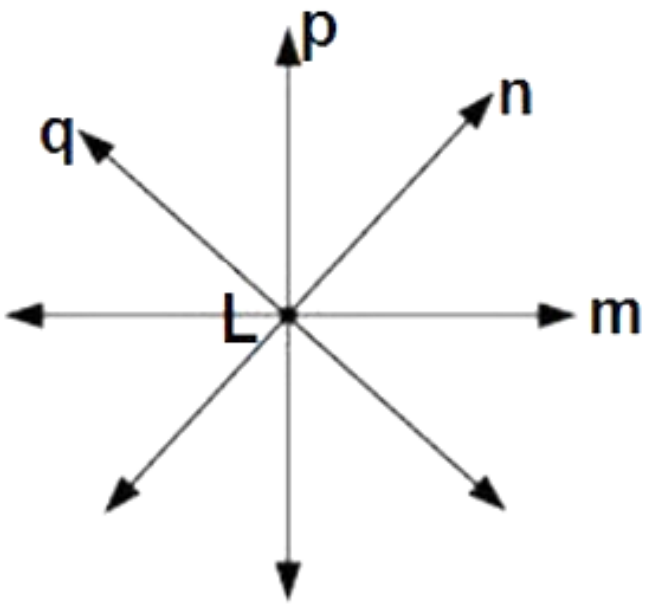
No, we cannot draw a line on the surface of the sphere, which lies wholly on it.

Question: 7

Make appoint on the sheet of a paper and draw a line passing through it. How many lines can you draw through this point?

Solution:

Unlimited number of lines can be drawn passing through a point L



Question: 8

Mark any two points P and Q in your notebook and draw a line passing through the points.

How many lines can you draw passing through this both points?

Solution:

We have two points P and Q and we draw a line passing through these two points.

Only one line can be drawn passing through these two points.

Question: 9

Give an example of the horizontal plane and a vertical plane from your environment.

Solution:

Ceiling of a room is an example of a horizontal plane in our environment.

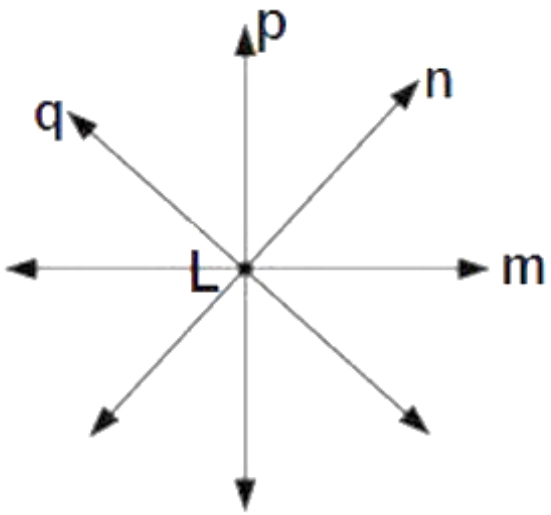
Wall of a room is an example of a vertical plane in our environment.

Question: 10

How many lines may pass through one given point, two given point, any three collinear points?

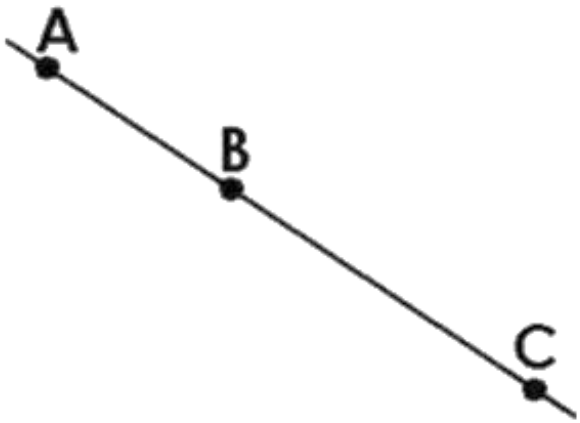
Solution:

Lines passing through one point – unlimited



Lines passing through two points – one

Lines passing through any three collinear points – one

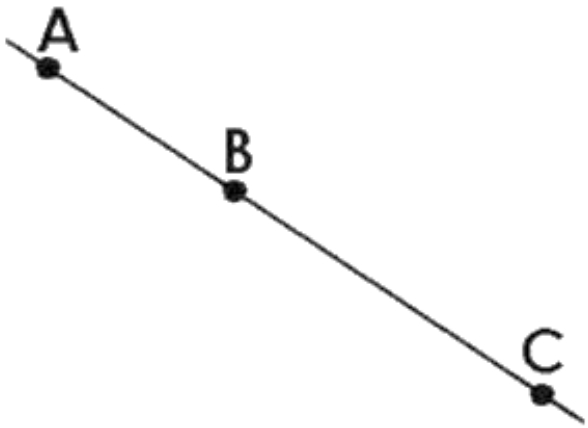


Question: 11

Is it ever possible for exactly one line to pass through three points?

Solution:

Yes, it is possible if three points lie on a straight line



Question: 12

Explain why is not possible for a line to have a mid point?

Solution:

The length of the line is infinite. Thus, it is not possible to find its midpoint. On the other hand, we can find, we can find the midpoint of a line segment

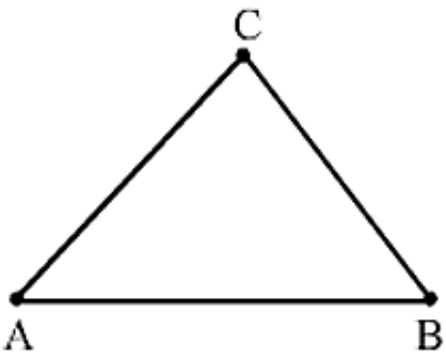
Question: 13

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

Solution:

These are three non – collinear points A, B, C

Three lines can be drawn through these points. These three lines are AB, BC and AC



Question: 14

Coplanar points are the points that are in the same plane. Thus,

i) Can 150 points be coplanar?

ii) Can 3 points be non – co planar?

Solution:

i) Yes,

A group of points that lie in the same plane are called co planar points.

Thus, it is possible that 150 points can be co-planar.

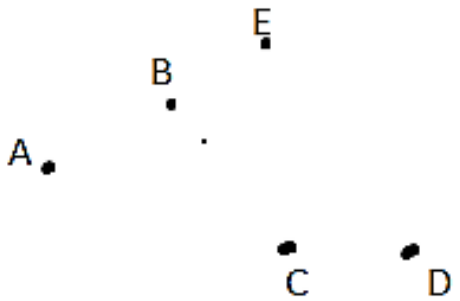
ii) No

Three points will be coplanar because we can have a plane that can contain 3 points on it.

Thus, it is not possible that 3 points will be non – coplanar.

Question: 15

Using a ruler, check whether the following points given in the figure are collinear or not?



Solution:

i) D, A and C are collinear points

ii) A, B and C are non – collinear points

iii) A, B and E are collinear points

iv) B, C and E are non – collinear points

Question: 16

Lines p, q is coplanar. So are the lines p, r. Can we conclude that the lines p, q, r are coplanar?

Solution:

No, p, q and r are not necessarily coplanar.

Example – If we take p as intersecting line of two consecutive walls of a room, q as a line on the first wall and r on the second wall whose (both walls) intersection is line p

Thus we can see that p, q and r are not coplanar.

Question: 17

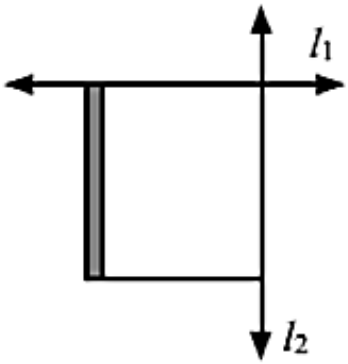
Give three examples of each:

i) Intersecting lines:

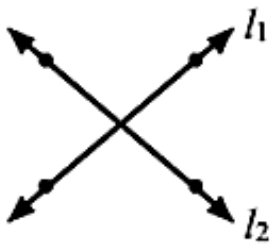
ii) Parallel lines from your environment:

Solution:

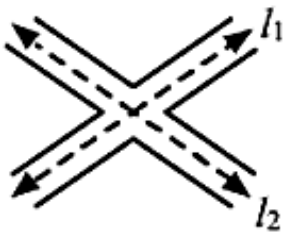
i) Intersecting lines:



Two adjacement edges of your notbook



The letter X of the english alphabet



Crossing-roads

ii) Parallel lines from your environment:

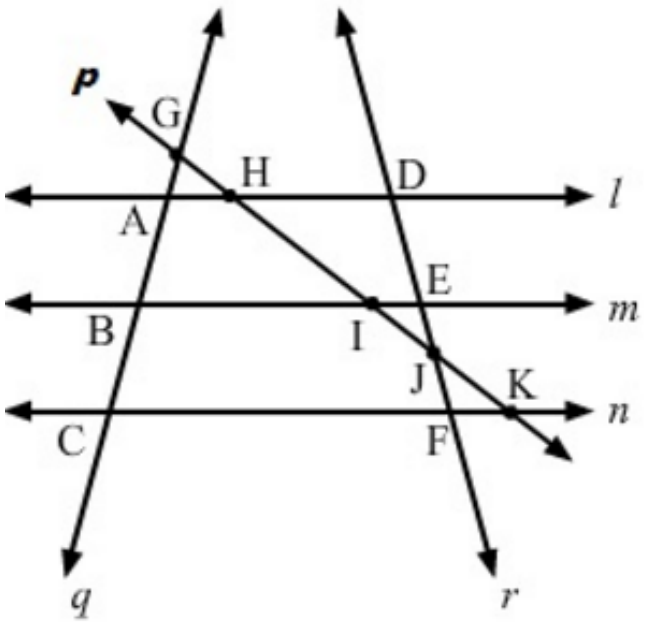
The cross-bars of this window

The opposite edges of ruler (scale)

Rail lines

Question: 18

From the figure write:



Solution:

i) All pairs of intersecting lines – (l, m), (m, n) and (l, n)

ii) All pairs of intersecting lines: (l, p), (m, p), (n, p), (l, r), (m, r), (n, r), (I, q), (m, q),(n, q), (q, p), (q, r)

iii) Lines whose point of intersection is l: (m, p)

iv) Lines whose point of intersection is D: (l, r)

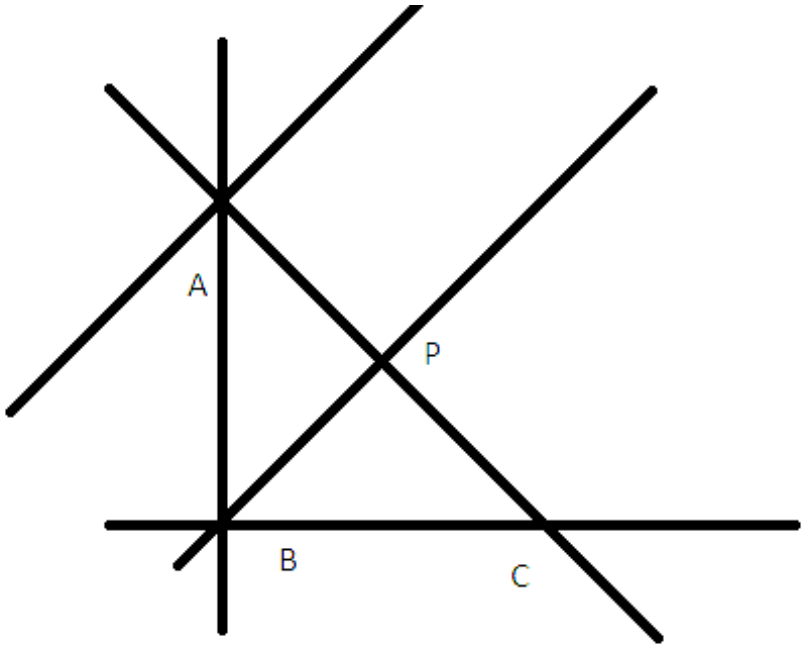
v) Lines whose point of intersection E: (m, r)

vi) Lines whose point of intersection is A: (l, q)

vii) Collinear points: (G, A, B and C) ,(D, E, J and F), (G, H, I and J, K), (A, H and D), (B, I and E) and (C, F and K)

Question: 19

Write concurrent lines and their and their point of concurrence:



Solution:

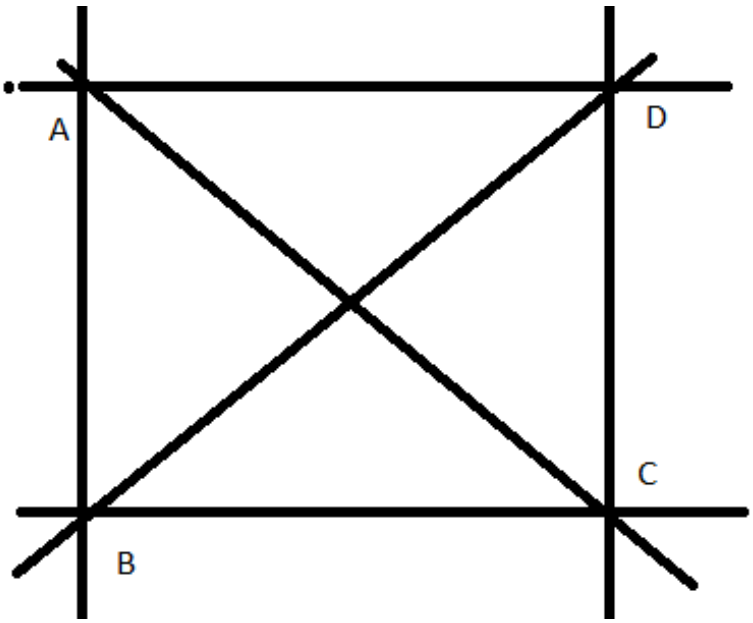
From the given figure, we have:

Concurrent lines can be defined as three or more lines which share the same meeting point. Clearly lines, n, q, and l are concurrent with A as the point of concurrence.

Lines, m, q and p are concurrent with B as the point of concurrence.

Question: 20

Mark four points A, B, C, D in your notebook such that no three of them are collinear. Draw all the lines which join them in pairs as shown



Solution:

i) How many such lines can be drawn

Six lines can be drawn through these four points as given in the figure.

ii) Write the names of these lines

These lines are AB, BC, CD, BD and AD

iii) Name the lines which are concurrent to A

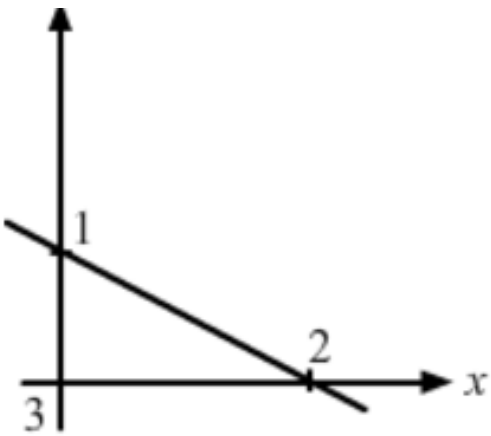
Lines which are concurrent at A are AC, AB and AD

Question: 21

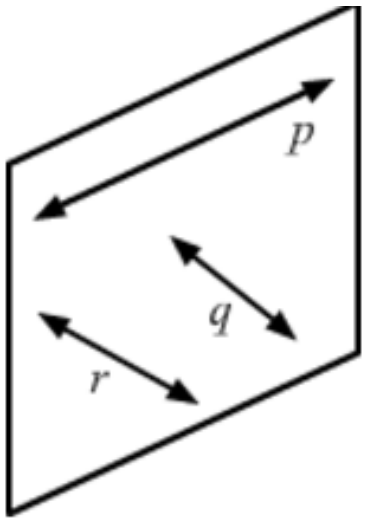
What is the maximum number of points of intersection of three lines in a plane? What is the minimum number?

Solution:

Maximum number of points of intersection of three lines in a plane will be three



Minimum number of points of intersection of three lines in a plane will be zero

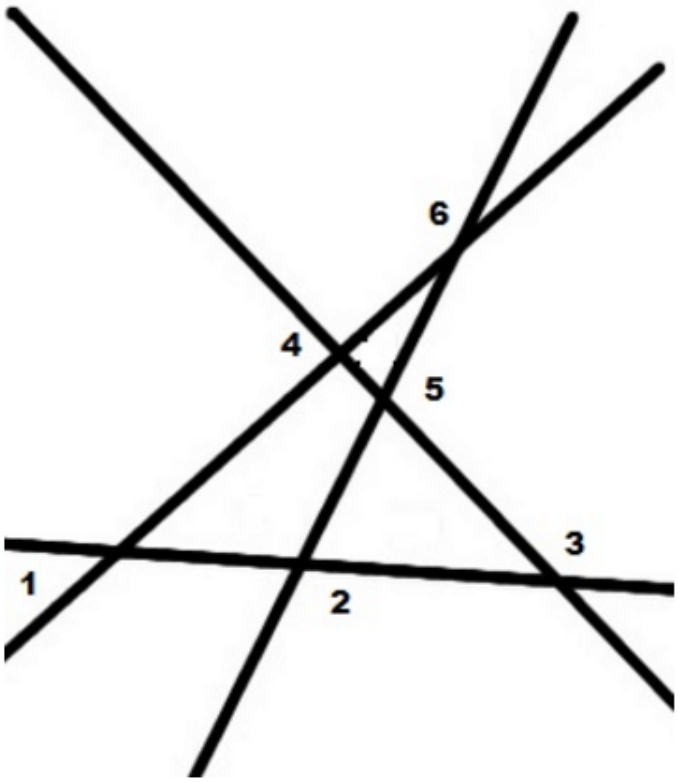


Question: 22

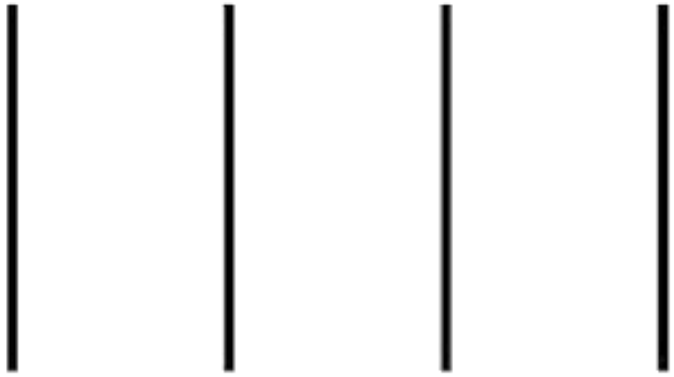
With the help of a figure, find the maximum and minimum number of points of intersection of four lines in a plane.

Solution:

Maximum number of points of intersection of four lines in a plane will be six



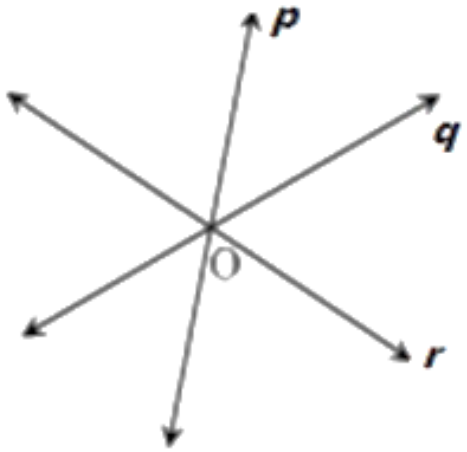
Minimum number of points of intersection of four lines in a plane will be zero.



Question: 23

Lines p, q and r are concurrent. Also, the lines p, r and s are concurrent. Draw a figure and state whether lines p, q, r and s are concurrent or not?

Solution:



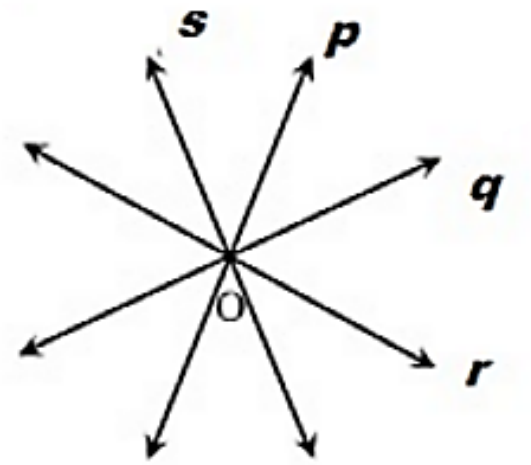
Thus, lines p, q and r intersect at a common point O

Also, lines p, r and s are concurrent

Therefore, lines p, r, and s intersect at a common point. But q and r intersect each other at O.

So, p, q and r intersect at O

Hence, p, q, r and s are concurrent. Lines p, q, r and s intersect at O.

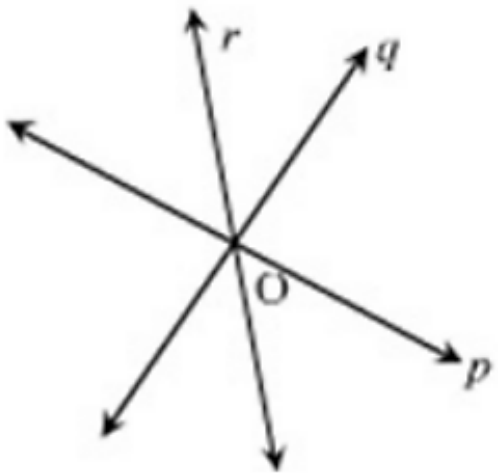


Question: 24

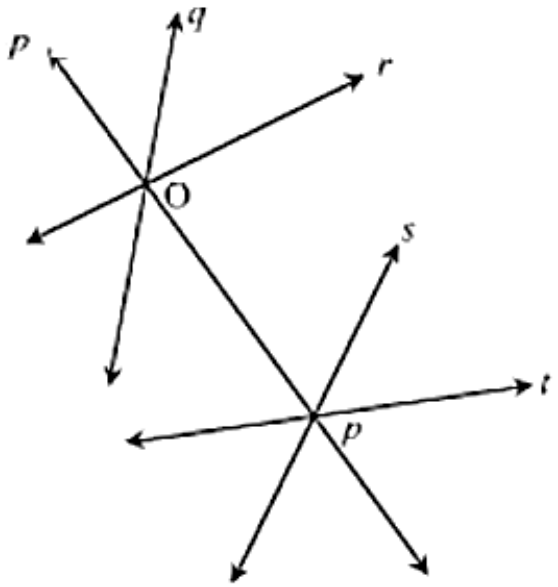
Lines p, q, and r are concurrent. Also lines p, s and t are concurrent. Is it always true that the lines q, r and s will be concurrent? Is it always true for lines q, r, and t?

Solution:

Lines p, q, and r are concurrent. So, lines p, q and r intersect at a common point O.



Given lines p, s, and t are concurrent. So, lines p, s and t also intersect at a common point. However, it is not always true that q, r and s or q, r and t are concurrent.



Question: 25

Fill in the blanks in the following statements using suitable words:

i) A page of a book is a physical example of a **_____.**

ii) An inkpot has both **_____**surfaces.

iii) Two lines in a plane are either **_____** or are **_____.**

Solution:

i) A page of a book is a physical example of a **plane**

ii) An inkpot has both **curved and plane** surfaces

iii) Two lines in a plane are either **parallel** or are **intersecting**

Question: 26

State which of the following statements are true and which are false:

i) Point has a size because we can see it as a thick dot on paper

ii) By lines in geometry, we mean only straight lines

iii) Two lines in a plane always intersect at a point

iv) Any plane through a vertical line is vertical

v) Any plane through a horizontal line is horizontal

vi) There cannot be a horizontal line in a vertical plane

vii) All lines in a horizontal plane are horizontal

viii) Two lines in a plane always intersect at a plane

ix) If two lines intersect at a point P, then P is called the point of concurrence of the two lines

x) If two lines intersect at a point P, then P is called the point of intersection of the two lines

xi) If A, B, C and D are collinear points D, P and Q are collinear, then points A, B, C, D, P and Q are always collinear

xii) Two different lines can be drawn passing through two given points

xiii) Through a given point only one line can be drawn

xiv) Four points are collinear if any three of them lie on them lie on the same line

xv) The maximum number of points of intersection of three lines is three

xvi) The minimum number of points of intersection of three lines is one

Solution:

i) False

ii) True

iii) False

iv) True

v) False

vi) False

vii) True

viii) False

ix) False

x) True

xi) False

xii) False

xiii) False

xiv) False

xv) True

xvi) False

Question: 27

Give the correct matching of the statements of column A and column B

Column A	Column B	Column B	
i	Points are collinear	a.	May be parallel or intersecting
ii	Line is completely known	b.	Undefined terms in geometry
iii	Two lines in a plane	c.	If they lie on the same line
iv	Relations between points and lines	d.	Can pass through a point
v	Three non-collinear points	e.	Determine a plane
vi	A plane extends	f.	Are called incidence properties
vii	Indefinite number of lines	g.	If two points are given
viii	Point, line and plane are	h	Indefinitely in all directions

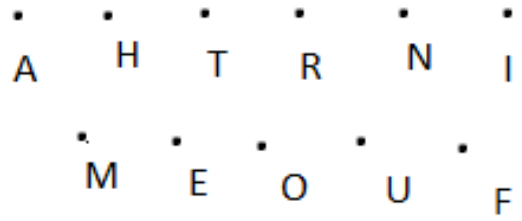
Solution:

Column A	Column B	Column B	
i	Points are collinear	c.	If they lie on the same line
ii	Line is completely known	g.	If two points are given
iii	Two lines in a plane	a.	May be parallel or intersecting
iv	Relations between points and lines	f.	Are called incidence properties
v	Three non-collinear points	e.	Determine a plane
vi	A plane extends	h.	Indefinitely in all directions
vii	Indefinite number of lines	d.	Can pass through a point
viii	Point, line and plane are	b.	Undefined terms in geometry

Exercise 10.2

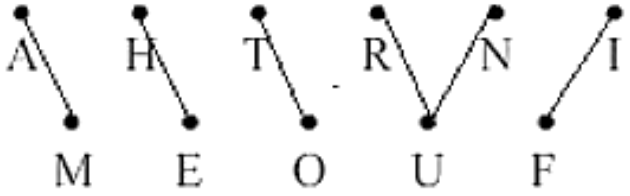
Question: 1

In the figure, points are given in two rows. Join the points AM, HE, TO, RUN, IF. How many line segments are formed?



Solution:

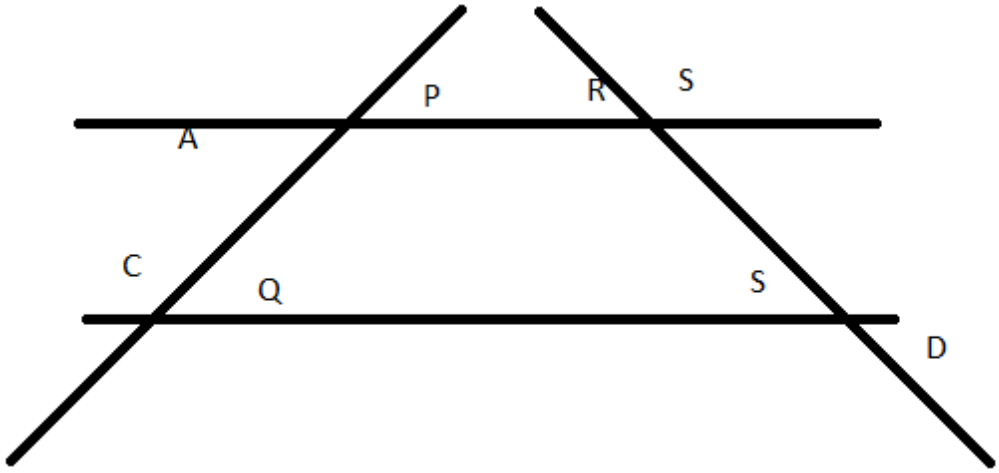
If we join the points AM, HE, RUN, IF, 6 line segments can be formed



These six line segments are AM, HE, RU, IF, UN

Question: 2

In the figure name:



i) Five line segments

ii) Five rays

iii) non intersecting line segments

Solution:

i) Five line segments – PQ, RS, PR, QS, AP

ii) Five rays – QC->SD->PA->RB-> AND RA

iii) non intersecting line segments – PR , QS

Question: 3

In each of the following cases, state whether you can draw line segments on the given surfaces:

i) The face of the cuboids

ii) The surface of an egg or apple

iii) The curved surface area of the cylinder. Four points such that there no three of them belong to the same line

iv) The curved surface of the cone

v) The base of the cone

Solution:

i) Yes, we can draw line segments on the face of the cuboids.

ii) No, we cannot draw a line segment on the surface of an egg or apple

iii) Yes, we can draw line segments on the curved surface of a cylinder. Every line segment parallel to the axis of a cylinder on the curved surface will be a line segment.

iv) Yes we can draw line segments on the curved surface of the cone. Every line segment joining the vertex of a cone and any point on the circumference of the cone will be a line segment.

v) Yes , we can draw line segments on the base of the cone. Yes, , we can draw line segments on the curved surface area of the cone. Every line segment joining the vertex of a cone and any point on the circumference of the cone will form a line segment.

Question: 4

Mark the following points on the sheet of the paper. Tell how many line segments can be obtained in the each case:

Solution:

If there are n points in a plane and no three of them are collinear, the number of line segments obtained by joining these points is equal to n(n-1)2

On applying the above formula, we get,

i) Two points A, B – number of line segments = 2(2-1) 2 = 1

ii) Three non – collinear points A, B, C

The number of line segments = 3(3-1) 2 = 3(22) = 3

iii) For four points such that no three of them belong to the same line

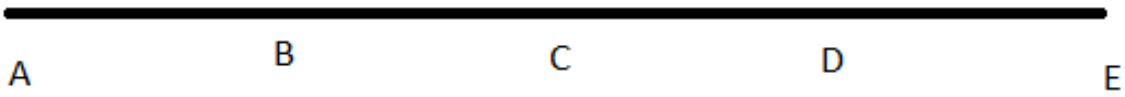
Number of line segments = 4(4-1)2 = 4(32) = 6

iv) Any five points so that no three of them are collinear

Number of line segments = 5(5-1) 2 = 5(42) = 10

Question: 5

Count the number of line segments in figure

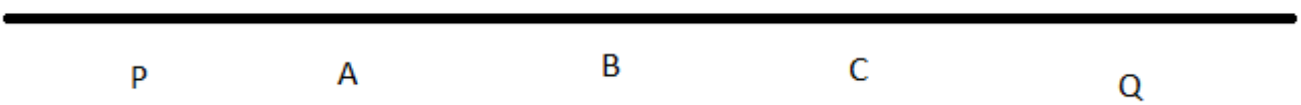


Solution:

Line segments in the given figure are AB, AC, AD, AE, BC, BD, BE, CD, CE and DE. Thus, there are 10 line segments

Question: 6

In the figure name all the rays with initial points as A, B, C respectively.



Solution:

Name of all the rays with initial point A:

AP, AB, AC, AQ

Name of all the rays with initial point B:

BP, BA, BC, BQ

Name of all the rays with initial point C:

CP, CA, CB, CQ

i) Is ray AB different from AC?

No, because the origin point of both the rays. AB, AC

ii) Is ray BA different from CA?

Yes, because the original point of both the rays. BA and CA are different

iii) Is ray CP different from ray CQ?

Yes, because both the rays. CP and CQ are different.

Question: 7

Give three examples of line segments from the environment

Solution:

Examples of line segments in our home are:

i) Grout lines in the tile floors

ii) Groves where wooden flooring connects

iii) Metal outline of a sliding glass door.

Exercise 10.3

Question: 1

Draw rough diagrams to illustrate the following:

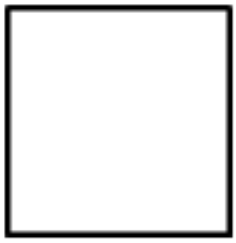
i) Open curve

ii) Closed curve

Solution:

i) Open curve:

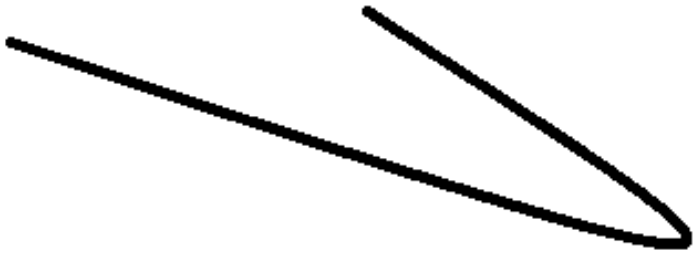
ii) Closed curve:



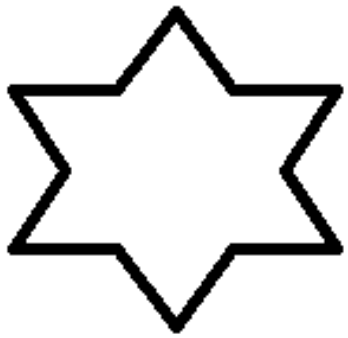
Question: 2

Classify the following curves as open or closed?

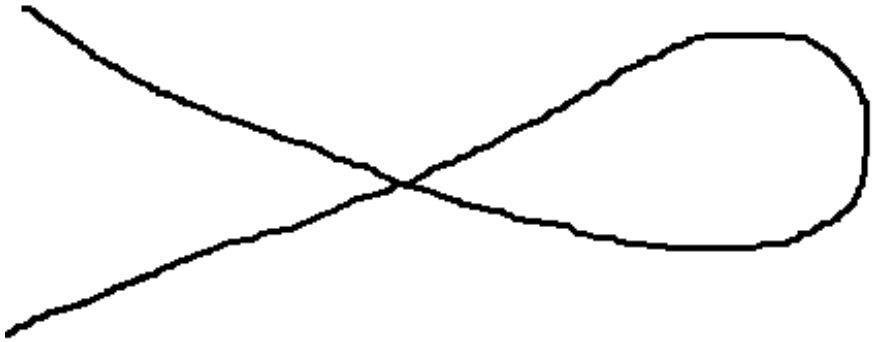
i)



ii)



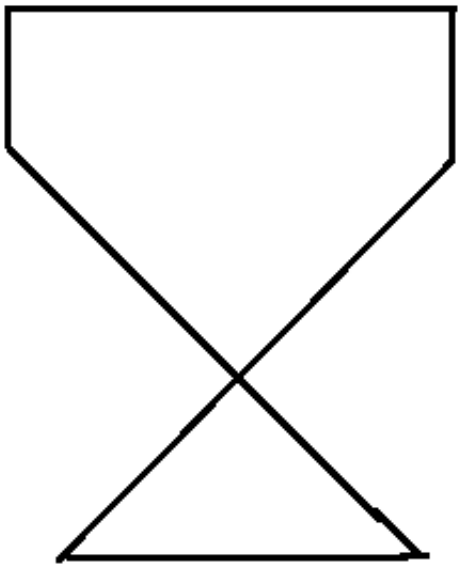
iii)



iv)

v)

vi)



Solution:

i) Open

ii) Closed

iii) Closed

iv) Open

v) Open

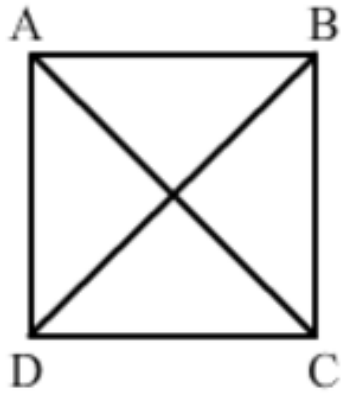
vi) Closed

Question: 3

Draw a polygon and shade its interior. Also draw its diagonals, if any

Solution:

ABCD is a polygon and AC and BD are its two diagonals.



Question: 4

Illustrate, if possible, each one of the following with a rough diagram:

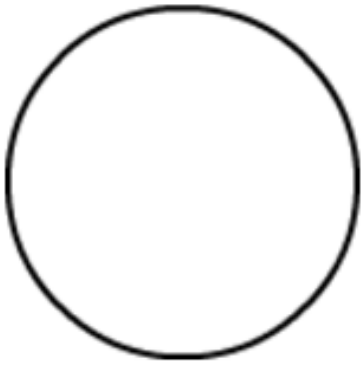
i) A closed curve that is not a polygon

ii) An open curve made up entirely of line segments

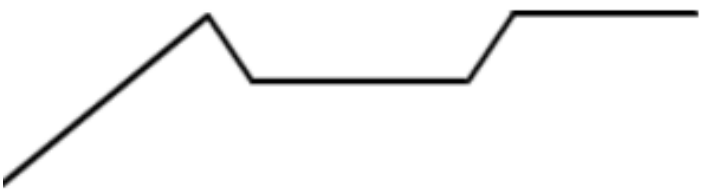
iii) A polygon with two sides

Solution:

i) A circle is a simple closed curve but not a polygon. A polygon has line segments, but a circle has only curve



ii) Rough diagram of an open curve made up entirely of line segments



iii) A polygon with two sides is not possible.