3. Introduction to Euclid's Geometry

Exercise 3A

1. Question

What is the difference between a theorem and an axiom?

Answer

A theorem is a statement that has been proven true while an axiom is a statement that is accepted as true.

Axiom is a statement that is assumed to be true without proof.

Theorem is a statement that has been proven through testing or calculation.

2. Question

Define the following terms :

(i) Line segment

(ii) Ray

(iii) Parallel Lines

(iv) Half-Line

(v) Collinear points

(vi) Plane

Answer

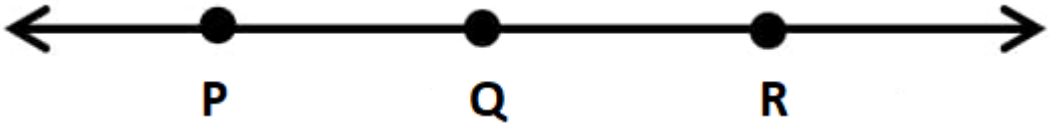
(i) In line segment two points are connected with a straight line.

A line segment has two end points with a definite length.

(ii) A ray is a part of line with one end point and infinitely extends in one direction. It can show by drawing an arrow at one end of the ray.

(iii) Parallel lines are lines that never cross one another. Parallel lines do not intersect to each other.

(iv) A straight line extends from a point indefinitely in one direction only. It is the set of all points on a line on a given side of a given point of the line.



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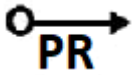
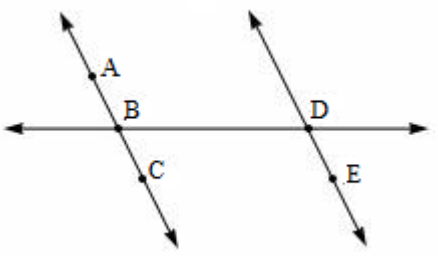


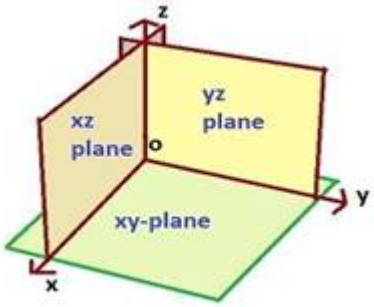
is the half-line.

(v) When three or more points lie on a straight line called collinear points. If the points lie on the same line then the points are called collinear points.



A, B and C the collinear points.

(vi) A plane is a flat surface with no thickness. A plane is two dimensional.



3. Question

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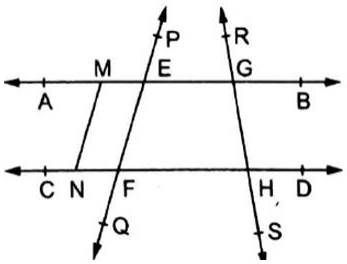


(i) Six Points

(ii) Five Line Segments

(iii) Four rays

(iv) Four lines

(v) Four collinear points

Answer

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

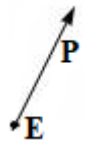
A point has location and it has no size.

(ii) $\overline{EG}$, $\overline{FH}$, $\overline{EF}$, $\overline{GH}$, $\overline{MN}$

A line segment has two end points with a definite length.

(iii) $\overrightarrow{EP}$, $\overrightarrow{GR}$, $\overrightarrow{GB}$, $\overrightarrow{HD}$

A ray is a part of line with one end point and infinitely extends in one direction.

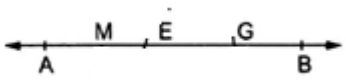


(iv) $\overleftrightarrow{AB}$, $\overleftrightarrow{CD}$, $\overleftrightarrow{PQ}$, $\overleftrightarrow{RS}$

A line has no beginning point or end point.

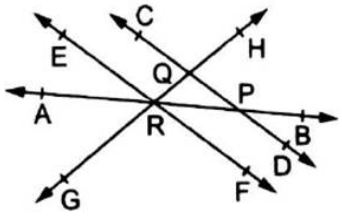
(v) M, E, G, B

If three or more points lie on a straight line called collinear points.



4. Question

In the adjoining figure, name :



(i) Two pairs of intersecting lines and their corresponding points of Intersection

(ii) Three concurrent lines and their points of intersection

(iii) Three rays

(iv) Two line segments

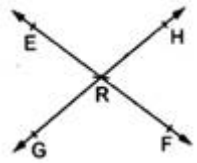
(v) Intersecting lines

(vi) Concurrent lines

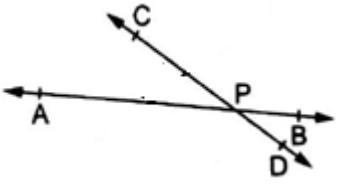
Answer

(i) $\{\overline{EF}, \overline{GH}, R\}, \{\overline{AB}, \overline{CD}, P\}$

Lines EF and GH cross to each other at point R, therefore EF and GH are intersecting lines at point R.

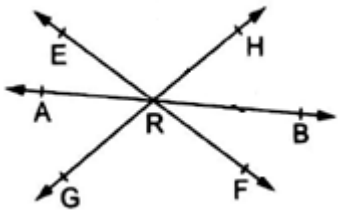


Similarly lines AB and CD cross to each other at point P, therefore EF and GH are intersecting lines at point P.



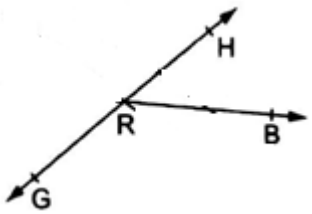
(ii) $\overline{AB}, \overline{EF}, \overline{GH}, R$

If the set of lines or curves intersect at the same point called concurrent lines. In this figure lines AB, EF and GH intersect at the point R.



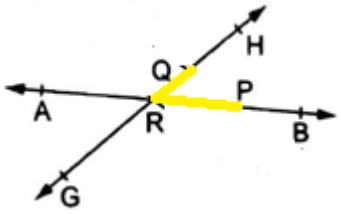
(iii) $\overrightarrow{RB}, \overrightarrow{RH}, \overrightarrow{RG}$

A ray is a part of line with one end point and infinitely extends in one direction.



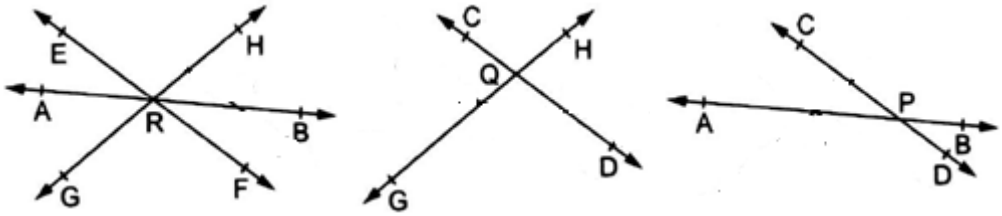
(iv) $\overline{RQ}, \overline{RP}$

A line segment has two end points with a definite length.



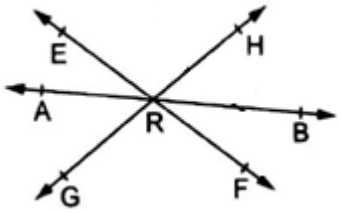
(v) { AB, EF, GH}, { CD, GH}, { AB, CD}

When two or more lines meet at a point, these are called intersecting lines. Intersecting lines share exactly one point.



(vi) $\overline{AB}, \overline{EF}, \overline{GH}$

If the set of lines or curves intersect at the same point, it is called concurrent lines.



5. Question

(i) How many lines can be drawn to pass through a given points?

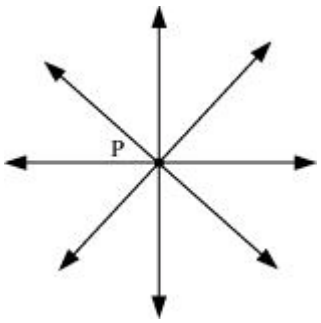
(ii) How many lines can be drawn to pass through two given points?

(iii) In how many points can the two lines at the most intersect?

(iv) If A, B,C are three collinear points , name all the line segments determined by them.

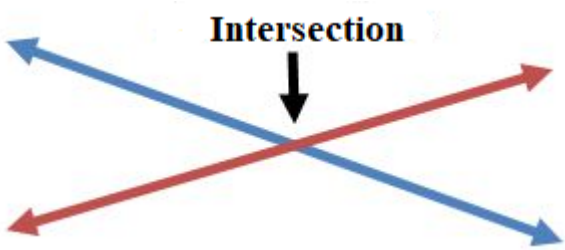
Answer

(i) Infinite number of lines can be drawn to pass through a given point.



(ii) Only one line can be drawn to pass through two given points.

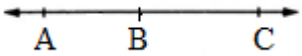
(iii) Two lines intersect in at most one point.



(iv) $\overline{AB}$, $\overline{BC}$, $\overline{AC}$

A line segment has two end points with a definite length.

If three or more points lie on a straight line, it is called collinear points.



6. Question

Which of the following statements are true?

(i) A line segment has no definite length.

(ii) A ray has no end point.

(iii) A line has a definite length.

(iv) A line $\overleftrightarrow{AB}$ is the same as line $\overleftrightarrow{BA}$.

(v) A ray $\overrightarrow{AB}$ is the same as ray $\overrightarrow{BA}$.

(vi) Two distinct points always determine a unique line.

(vii) Three lines are concurrent if they have a common point.

(viii) Two distinct lines cannot be both parallel to the same line.

(ix) Two intersecting lines cannot be both parallel to the same line.

(x) Open half-line OA is the same thing as ray $\overrightarrow{OA}$

(xi) Two lines may intersect in two points.

(xii) Two lines I and m are parallel only when they have no point in common.

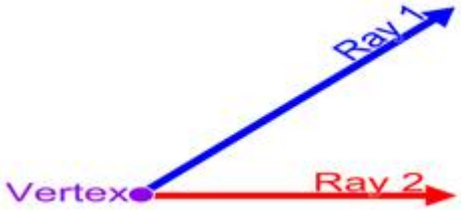
Answer

(i) False

Because a line segment has two end points with a definite length.

(ii) False

Because a ray has one end point and infinitely extends in one direction.



(iii) False

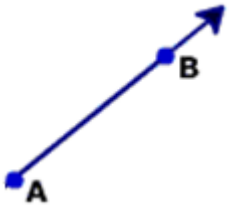
Because a line has no beginning point or end point therefore a line has not definite length.

(iv) True

Because a line has no beginning point or end point therefore line $\overrightarrow{AB}$ is the same as line $\overrightarrow{BA}$.

(v) False

Because a ray has one end point and infinitely extends in one direction therefore ray $\overrightarrow{AB}$ is not same as the ray $\overrightarrow{BA}$.



In this ray $\overrightarrow{AB}$ has the end point A.

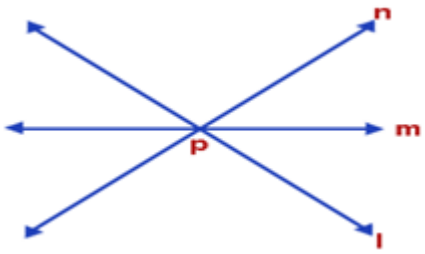
In this ray $\overrightarrow{BA}$ has the end point B.

(vi) True

Because a line has no beginning point or end point.

(vii) True

Because the set of lines intersect at the same point called concurrent lines.



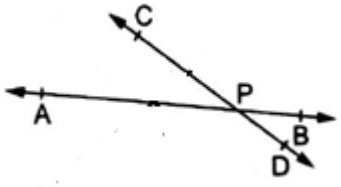
Lines l, m, and n are concurrent at the common point P.

(viii) True

Two lines in a plane that do not intersect or touch each other at any point, they are called parallel lines.

(ix) True

Because parallel lines never intersect or cross one another.

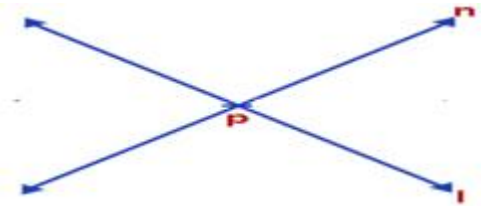


(x) False

Because half-line is the set of all points on a line on a given side of a given point of the line while ray is a part of line with one end point and infinitely extends in one direction.

(xi) False

Because two lines intersect at only one point.



Lines l and n intersect at only one point P.

(xii) False

Two lines are said to be parallel when

(a) they never meet

(b) they are coplanar

CCE Questions

1. Question

In ancient India, the shapes of altars used for household rituals were

A. Squares and circles

B. Rectangles and squares

C. Triangles and rectangles

D. Trapeziums and pyramids

Answer

In ancient India, the shapes of altars used for household rituals were Squares and circles.

The geometry of the Vedic period originated with the construction of altars (or vedis) and fireplaces for performing Vedic rites. Square and circular altars were used for household rituals, while altars,

whose shapes were combinations of rectangles, triangles and trapeziums, were required for public worship.

2. Question

The number of interwoven isosceles triangles in Sriyantra is

A. 11

B. 9

C. 8

D. 7

Answer

The number of interwoven isosceles triangles in Sriyantra is 9.

The Sri Yantra is a form of mystical diagram, known as a yantra. It consists of nine interlocking triangles that radiate out from the central point.

3. Question

Thales belongs to the country

A. Babylonia

B. Egypt

C. Greece

D. Rome

Answer

Thales belongs to the country Greece. He was a Greek philosopher, mathematician and astronomer. He was one of the seven sages of Greece.

4. Question

Euclid belongs to the country

A. India

B. Greece

C. Egypt

D. Babylonia

Answer

Euclid belongs to the country Greece

Euclid was born in 300 BCE, Alexandria, Egypt. He was the most prominent mathematician of Greece and was best known for his treatise on geometry.

5. Question

Pythagoras was a student of

A. Thales

B. Euclid

C. Archimedes

D. None of these

Answer

Pythagoras was a student of Thales

Pythagoras was born in about 570 BC on the Greek island of Samos. His father was a merchant. Pythagoras was taught mathematics by Thales, who brought mathematics to the Greeks from Ancient Egypt.

6. Question

In Indus Valley Civilization (about 300 BC) the bricks used for construction work were having dimensions in the ratio

A. 4:3:1

B. 4:2:1

C. 4:3:2

D. 4:4:1

Answer

In Indus Valley Civilization (about 300 BC) the bricks used for construction work were having dimensions in the ratio 4:2:1

In Indus Valley Civilization, the bricks used for construction work were having dimensions in the ratio length : breadth : thickness = 4 : 2 : 1.

7. Question

Which of the following needs a proof?

A. an axiom

B. a definition

C. a postulate

D. a theorem

Answer

A theorem needs a proof.

A theorem is a mathematical statement proved by different steps of mathematical reasoning.

8. Question

Axioms are assumed

A. definitions

B. theorems

C. universal truths in all branches of mathematics

D. universal truths specific to geometry

Answer

Axioms are assumed to be universal truths in all branches of mathematics.

Axioms are the derived and accepted true statements.

9. Question

'Lines are parallel if they do not intersect' is stated in the form of

A. an axiom

B. a definition

C. a postulate

D. a theorem

Answer

Lines are parallel if they do not intersect' is stated in the form of a definition.

Definition is a formal statement of the meaning of a word or a set of words.

10. Question

Euclid stated that 'all right angles are equal to each other', in the form of

A. an axiom

B. a definition

C. a postulate

D. a proof

Answer

Euclid stated that 'all right angles are equal to each other', in the form of an axiom.

A right angle means 90°. Thus, All right angles are equal to 90°. Therefore, all right angles ae equal is an axiom. This is because it is derived from a true statement.

11. Question

Greeks emphasized on

A. inductive reasoning

B. deductive reasoning

C. practical use of geometry

D. analytical geometry

Answer

Greeks emphasized ondeductive reasoning.

The Greeks were interested in establishing the truth of the statements they discovered using deductive reasoning.

12. Question

A solid has

A. 0 dimension

B. 1 dimension

C. 2 dimensions

D. 3 dimensions

Answer

A solid has 3 dimensions.

A solid figure is three dimensional because it has length, width and height.

13. Question

A surface has

A. 0 dimension

B. 1 dimension

C. 2 dimensions

D. 3 dimensions

Answer

A surface has 2 dimensions.

A surface is two dimensional because it has length and width only.

14. Question

A point has

A. 0 dimension

B. 1 dimension

C. 2 dimensions

D. 3 dimensions

Answer

A point has 0 dimension.

A point has no dimensions, only position

15. Question

Boundaries of solids are

A. line

B. curves

C. surfaces

D. points

Answer

Boundaries of solids are surfaces.

The solids are three dimensional but their surfaces are two dimensional.

16. Question

Boundaries of surfaces are

A. line

B. curves

C. points

D. none of these

Answer

Boundaries of surfaces are curves.

Boundaries of surfaces are curves because surfaces are two dimensional figures and their boundaries are one-dimensional i.e. curves.

17. Question

The side faces of a pyramid are

A. triangles

B. squares

C. trapeziums

D. polygons

Answer

The side faces of a pyramid are triangles

A pyramid is a figure with triangular surfaces which converge to one single point.

18. Question

The base of a pyramid is

A. a triangle only

B. a square only

C. a rectangle only

D. any polygon

Answer

The base of a pyramid is any polygon.

In geometry, a pyramid is a polyhedron formed by connecting a polygonal base and a point, called the apex.

19. Question

The number of planes passing through three non-collinear points is

A. 2

B. 3

C. 4

D. 1

Answer

The number of planes passing through three non-collinear points is 1.

If the points are collinear then an infinite number of planes can be made to pass through them. If three distinct points are non-collinear then exactly one plane passes through them.

20. Question

Euclid divided his book 'Elements' into how many chapters?

A. 9

B. 11

C. 12

D. 13

Answer

Euclid divided his book 'Elements' into 13 chapters.

The book name is: "The Elements"

It is divided into thirteen chapters. The chapters are as follows: -

Books VII-IX -- Theory of Numbers

Book X -- Incommensurables

Book XI-XIII -- Solid Geometry

21. Question

Which of the following is a true statement?

A. The floor and a wall of a room are parallel planes.

B. The ceiling and a wall of a room are parallel planes.

C. The floor and the ceiling of a room are parallel planes.

D. Two adjacent walls of a room are the parallel planes.

Answer

The floor and the ceiling of a room are parallel planes.

The floor and the ceiling of the room are parallel planes.

22. Question

Which of the following is a true statement?

A. Only a unique line can be drawn to pass through a given point.

B. Infinitely many lines can be drawn to pass through two given points.

C. If two circles are equal, then their radii are equal.

D. A line has a definite length.

Answer

If two circles are equal, then their radii are equal.

A circle is formed by taking a radius. If the radius of two circles are same, means the two circles are equal.

23. Question

Which of the following is a false statement?

A. An infinite number of lines can be drawn to pass through a given point.

B. unique line can be drawn to pass through two given points.

C. $\text{Ray } \overline{AB} = \text{Ray } \overline{BA}$

D. A ray has one end point.

Answer

Ray AB =ray BA.

Because ray is a part of a line that has one endpoint and extends in one direction without ending.

24. Question

A point C is called the midpoint of a line segment AB, if

A. C is an interior point of AB

B. AC=CB

C. C is an interior point of AB such that AC=CB

D. AC+CB=AB

Answer

A point C is called the midpoint of a line segment AB, if C is an interior point of AB such that AC=CB

25. Question

A point C is said to lie between the points A and B if

A. AC = CB

B. AC +C B = AB

C. points A, C and B are collinear

D. none of these

Answer

A point C is said to lie between the points A and B if points A, C and B are collinear.

26. Question

The question consists of two statements, namely, Assertion (A) and Reason (R), Please select the correct answer.

Assertion (A)	Reason (R)
Every line segment has a unique mid-point.	A point C is called the mid-point of a line segment A/B, if C is an interior point of AB and AC=CB.

A. Both Assertion (A) and (R) are true and Reason (R) is a correct explanation of Assertion (A).

B. Both Assertion (A) and Reason (R) are true but Reason (R) is a correct explanation of Assertion (A).

C. Assertion (A) is true and Reason (R) is false.

D. Assertion (A) is false and Reason (R) is true.

Answer

Let us consider, a line segment AB.Assume that it has two midpoints say C and D

Recall that the midpoint of a line segment divides it into two equal partsThat is AC = BC and AD = DBSince C is midpoint of AB, we have A, C and B are collinear∴ AC + BC = AB → (1)Similarly, we get AD + DB = AB → (2)From (1) and (2), we getAC + BC = AD + DB2 AC = 2AD∴ AC = ADThis is a contradiction unless C and D coincide.Therefore our assumption that a line segment AB has two midpoints is incorrect.Thus every line segment has one and only one midpoint.

27. Question

The question consists of two statements, namely, Assertion (A) and Reason (R), Please select the correct answer.

Assertion (A)	Reason (R)
An infinite number of lines can be drawn to pass through a given point.	A line segment has two end points.

A. Both Assertion (A) and (R) are true and Reason (R) is a correct explanation of Assertion (A).

B. Both Assertion (A) and Reason (R) are true but Reason (R) is a correct explanation of Assertion (A).

C. Assertion (A) is true and Reason (R) is false.

D. Assertion (A) is false and Reason (R) is true.

Answer

Let us consider, a line segment AB.A and B are two different points from which infinite number of lines can be drawn.

28. Question

The question consists of two statements, namely, Assertion (A) and Reason (R), Please select the correct answer.

Assertion (A)	Reason (R)
3+7=9 is a statement.	A sentence which can be judged to be true or false but not both, is called a statement.

A. Both Assertion (A) and (R) are true and Reason (R) is a correct explanation of Assertion (A).

B. Both Assertion (A) and Reason (R) are true but Reason (R) is a correct explanation of Assertion (A).

C. Assertion (A) is true and Reason (R) is false.

D. Assertion (A) is false and Reason (R) is true.

Answer

A sentence that can be judged to be true or false is called a statement.

3+7 = 9 is false statement.

29. Question

The question consists of two statements, namely, Assertion (A) and Reason (R), Please select the correct answer.

Assertion (A)	Reason (R)
Ray $\overline{AB}$ has one end point.	Line segment $\overline{AB}$ has two end points A and B.

A. Both Assertion (A) and (R) are true and Reason (R) is a correct explanation of Assertion (A).

B. Both Assertion (A) and Reason (R) are true but Reason (R) is a correct explanation of Assertion (A).

C. Assertion (A) is true and Reason (R) is false.

D. Assertion (A) is false and Reason (R) is true.

Answer

A line goes without end in both directions but a ray has one endpoint and goes without end in one direction.

The line AB is same as the line BA. But the ray AB is different than the ray BA.

30. Question

The question consists of two statements, namely, Assertion (A) and Reason (R), Please select the correct answer.

Assertion (A)	Reason (R)
A circle is a rectilinear figure.	A figure formed of line segments only is called a rectilinear figure.

A. Both Assertion (A) and (R) are true and Reason (R) is a correct explanation of Assertion (A).

B. Both Assertion (A) and Reason (R) are true but Reason (R) is a correct explanation of Assertion (A).

C. Assertion (A) is true and Reason (R) is false.

D. Assertion (A) is false and Reason (R) is true.

Answer

A rectilinear figure is a figure all of whose edges meet at right angles.

So, Assertion false but the reason is true.

31. Question

Match the following columns:

Column I	Column II
(a)A line segment has a	(p) Infinitely many
(b) A ray $\overline{BA}$ has the end point	(q) definite length
(c) How many lines can be drawn to pass through a given point?	(r) B
	(s) Only one
(d) How many lines can be drawn to pass through two given points?	

The correct answer is:

(a)-……, (b)-……., (c)-……., (d)……

Answer

(A)-(q), (B)-(r), (C)-(p), (D)-(s)

(A)-(q): A line segment has definite length.

Its length can be measured. A line segment AB has two end points A and B. It starts from point A and ends at point B. One and only one line-segment can be between two given points A and B.

(B) – (r): A ray $\overline{BA}$ has the end point "B"

A ray is a line with one end. It starts at a given point and goes off in a certain direction forever. Here, the end point is B and it extends infinitely in the direction A.

(C)-(p) Through a point, infinitely many lines can be drawn.

In 1 dimension, only one line can be drawn passing through a single point. However, in 2 or more dimension, uncountably many lines can be draw which pass through one point.

(D)-(s) Only one lines can be drawn to pass through two given points.

Through two given points only one unique line can be drawn.

32. Question

Fill in the blanks (2 marks)

(A) Concurrent lines……through a given point.

(B) Two distinct……in a plane cannot have more than one point in common.

(C) Two distinct points in a plane determine a……line.

(D) A line segment has…….end points.

Answer

(A) Concurrent lines passthrough a given point.

If three or more lines pass through the same point then they are called concurrent lines and the common point is called the point of concurrency or concurrent point.

(B) Two distinct lines in a plane cannot have more than one point in common.

Let us suppose that the two lines intersect at two distinct points P and Q. But this assumption clashes with the axiom that only one line can pass through two distinct points. So, the assumption that we started with, that two lines can pass through two distinct points is wrong.

(C) Two distinct points in a plane determine a unique line.

For any two distinct points in space there is a unique line that passes through both of them.

(D) A line segment has two end points

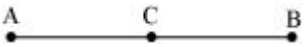
A line segment has definite length. Its length can be measured. A line segment AB has two end points A and B. It starts from point A and ends at point B. One and only one line-segment can be between two given points A and B.

33. Question

A point C lies between two points A and B such that AC=CB. Prove that AC= $\frac{1}{2}$ AB.

Answer

According to question, C lies between points A and B and AC = BC



Adding AC both side we get,

AC + AC = BC + AC

According to definition of Euclid, if equals are added to equals, whole will equal.

Here, (BC + AC) will coincides with AB.

2AC = AB

So, AC = $\frac{1}{2}$ AB

34. Question

Prove that every line segment has a unique mid-point.

Answer

Let us consider, a line segment AB.Assume that it has two midpoints say C and D

Midpoint of a line segment divides it into two equal partsSo, AC = BC and AD = DBSince, C is midpoint of AB, we have A, C and B are collinearThus, AC + BC = AB …… (i)

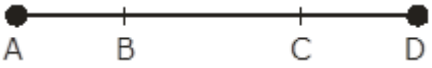
Similarly, we get AD + DB = AB ……(ii)

From eq(i) and (ii), we getAC + BC = AD + DB2 AC = 2ADAC = ADThis is a contradiction unless C and D coincide.Therefore our assumption that a line segment AB has two midpoints is incorrect.Thus every line segment has one and only one midpoint.

35. Question

In the given figure, AC=BD.

Prove that AB=CD.



Answer

From the above figure we get that,

AC = AB + BC

BD = BC + CD

And it is given is that AC = BD

So, AB + BC = BC + CD …….(i)

According to Euclid's axiom, when equals are subtracted from equals, the remainders are also equal.

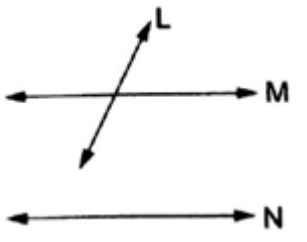
Subtracting BC from both side in eq(i), we get

AB + BC − BC = BC + CD − BC

AB = CD

36. Question

L, M, N are three lines in the same plane such that L intersects M and M∥N. Show that L intersects N also.



Answer

Assume L will not intersect N.

Then, L ||N and it is given that M || N.

According to our assumption, L || M which is contradictory to given statement that L intersects M.

So, our assumption is wrong.

Thus, L will intersect N also.

37. Question

Find the measure of an angle which is 20° more than its complement.

Answer

Let x be the angle.

According to question, x is 20° more than its complement.

So, another angle is x - 20°

As we know that, sum of compliment is 90°

So,

x + x - 20° = 90°

2x = 110°

x =55°

38. Question

Find the measure of an angle which is 20° less than its supplement.

Answer

Let x be the angle.

According to question, x is 20° less than its supplement.

So, another angle is x + 20°

As we know that, sum of compliment is 180°

So,

x + x + 20° = 180°

2x = 160°

x =80°

39. Question

Find the measure of an angle, if five times its complement is 12° less than twice its supplement.

Answer

Let x be the angle.

According to question,

(90 - x)° is the complementary angle.

(180 - x)° is the supplementary angle.

According to question,

5 X (90 - x) =2 X (180 -x) -12

450 – 5x = 360 – 2x – 12

3x = 450 – 348

3x = 102

x = 34°

Formative Assessment (Unit Test)

1. Question

Which of the following needs a proof?

A. Postulate

B. Axiom

C. Definition

D. Theorem

Answer

A theorem needs a proof.

2. Question

Number of planes passing through three non-collinear points is

A. 3

B. 1

C. 2

D. infinitely many

Answer

If three distinct points are non-collinear then exactly one plane passes through them

3. Question

How many lines can be drawn to pass through

(A) a given point (B) two given points?

Answer

(A) and (B)

(A) Infinite lines can be drawn through a given point.

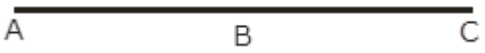
(B) Only a single line can be drawn through two given points.

4. Question

A, B and C are three collinear points. How many line segments can be determined by them? Name these line segments.

Answer

Three, AB, BC, AC



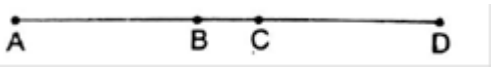
If A, B and C are three collinear points. Then there will be only 3 line segments.

AB, BC and AC.

5. Question

In the given figure, it is given that AC=BD,

Prove that AB=CD.



Answer

From the above figure we get that,

AC = AB + BC

BD = BC + CD

And it is given is that AC = BD

So, AB + BC = BC + CD …….(i)

According to Euclid’s axiom,when equals are subtracted from equals, the remainders are also equal.

Subtracting BC from both side in eq(i), we get

AB + BC − BC = BC + CD − BC

AB = CD

6. Question

Show that every line segment has one and only one middle point.

Answer

Let us consider, a line segment AB.Assume that it has two midpoints say C and D

Midpoint of a line segment divides it into two equal partsSo, AC = BC and AD = DBSince, C is midpoint of AB, we have A, C and B are collinearThus, AC + BC = AB …… (i)

Similarly, we get AD + DB = AB ……(ii)

From eq (i) and (ii), we getAC + BC = AD + DB2 AC = 2ADAC = ADThis is a contradiction unless C and D coincide.Therefore our assumption that a line segment AB has two midpoints is incorrect.Thus every line segment has one and only one midpoint.

7. Question

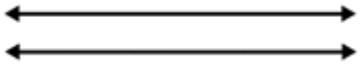
Define the following terms:

(A) Parallel lines (B) Intersecting lines

(C) Concurrent lines

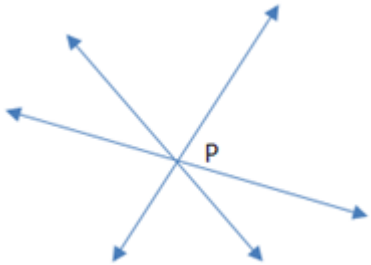
Answer

(A) Parallel Lines: Two lines in a plane that do not intersect or touch each other at any point are said to be parallel lines.



(B) Intersecting Lines: Two lines in a plane that intersect or cross each other at any point are said to be intersecting lines.

(C) Concurrent Lines: If three or more lines intersect each other at a single point then they are said to be concurrent.



8. Question

If L, M and N are three straight lines such that L || M and L || N, then prove that M|| N.

Answer

L || M M|| L.

Now, M||L and L||N M||N.

Assume M will intersect N.

It is given that L ||M and L ||N

According to our assumption, M will intersect N which is contradictory to parallel axiom.

So, our assumption is wrong.

Thus, M|| N

9. Question

Which of the following is a statement or which of the following statement is true?

A. A line has a definite length.

B. A ray has two end points.

C. A point always determines a unique line.

D. Three lines are concurrent when they have only one point in common.

Answer

If three or more lines pass through the same point then they are called concurrent lines and the common point is called the point of concurrency or concurrent point.

10. Question

Which is true?

A. A line segment $\overline{AB}$ when extended in both directions is called $ray\overline{AB}$ Ray AB.

B. Ray $\overline{AB}$ =ray $\overline{BA}$

C. Ray $\overline{AB}$ has one end point A.

D. Ray $\overline{AB}$ has two end points A and B.

Answer

Ray is a part of a line that has one endpoint.

11. Question

Which is false?

A. Two circles are equal only when their radii are equal.

B. A figure formed by line segments is called a rectilinear figure.

C. Only one line can pass through a single point.

D. A terminated line can be produced indefinitely on both the sides.

Answer

Infinite number of lines can be passed through a single point.

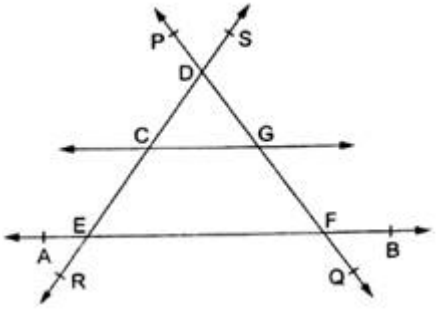
12. Question

From the given figure, name the following:

(A) Three lines

(B) One rectilinear figure

(C) Four concurrent points



Answer

(A) $\overline{AB}, \overline{PQ}, \overline{RS}$

(A) Lines will be AB, PQ and RS.

(B) CEFG

A rectilinear figure is a figure all of whose edges meet at right angles.

(C) Concurrent Points: A, E, F, B

If a set of lines pass through the same point then they are called concurrent lines and the common point is called the point of concurrency or concurrent point.

13. Question

A point C is the

I. AC=CB.

II. C is the interior point of AB.

III. AC=CB and C is the interior point of AB.

The given statement is true only when

(A) I holds (B) II holds

(C) III holds (D) none holds

NOTE The given question is followed by two statements I and II. The answer is

(A) If the question be answered by using only one statement and not the other.

(B) If the question be answered by using either of the two statements alone.

(C) If the question be answered by using both the statements only.

(D) If the question cannot be answered even by using both of the given statements.

Answer

(C)

A point C is called the midpoint of a line segment AB, if C is an interior point of AB such that AC=CB

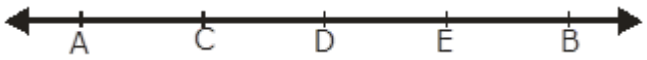
14. Question

Is D the mid-point of the line segment AB?

It is given that

I.AE=CB II.DE=CD

HINT (I)-(II) gives (AE-DE) = (CB-CD) AD=DB



Answer

(C)

From the above figure we get that,

AE = AD + DE

CB = CD + DB

And it is given is that AE = CB

So,

AD + DE = CD + DB

AD + CD= CD + DB…….(i) [DE = CD as given]

According to Euclid's axiom, when equals are subtracted from equals, the remainders are also equal.

Subtracting CD from both side in eq (i), we get

AD + CD − CD = CD + DB − CD

AD = DB

So, D is the mid-point of line segment AB.

15. Question

Given 4 distinct points in a plane. How many lines can be drawn using them, when

(A) all the 4 points are collinear?

(B) When no three of the four lines are collinear?

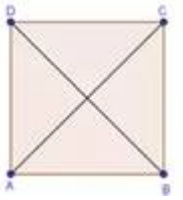
Answer

(A) one

If all the 4 points are collinear then exactly one line can be drawn from them

(B)

6 lines can be drawn when no three of the four lines are collinear.



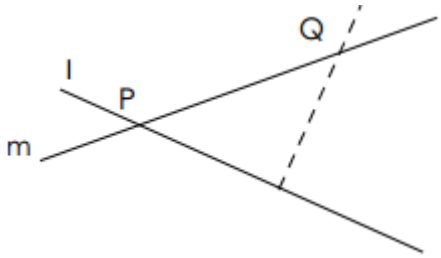
16. Question

Prove that two distinct lines cannot have more than one point in common.

Answer

Suppose lines "l" and "m" intersect at two points P and Q. Then, line P must contain both the points P and Q.

Also, line m must contain both the points P and Q.



But only one line can pass through two different points.

Thus, the assumption we started with that two lines can pass through two distinct point is wrong.

17. Question

Let us define a statement as the sentence which can be judged to be true or false.

Which of the following is not a statement?

(A) 3+5=7.

(B Kunal is a tall boy.

(C)The sum of the angles of a triangle is 90°.

(D)The angles opposite to equal sides of a triangle are equal.

Answer

(B)

It is given in the question as hint that: (A) and (C) are false sentences and (D) is a true sentence.

Then, "Kunal is a tall boy" is not a statement because this sentence is true for someone and it is false for other one. So, it is not a statement.

18. Question

State Euclid's axioms.

Answer

The basic facts which are taken for granted without proof are called axioms.

Some Euclid's axioms are:

1. The things which are equal to the same thing are equal to one another.

2. If equals be added to the equals, the wholes are equal.

3. If equals be subtracted from equals, the remainders are equals.

4. Things which coincide with one another are equal to one another.

5. The whole is greater than the part.

6. Things which are double of the same thing are equal to one another.

7. Things which are halves of the same thing are equal to one another

19. Question

Match the following columns.

Column I	Column II
(a)How many lines can be drawn to pass through one given point?	(p) One only
(b) How many lines can be drawn to pass through two given points?	(q) Infinitely many
(c) How many end-points does aline $\overline{AB}$ have?	(r) Two only
(d) How many end-points does a line segment $\overline{AB}$ have?	(s) None

The correct answers are:

Answer

(A)-(q)

An infinite number of lines can be drawn to pass through a given point.

(B)-(p)

Only one line can be drawn to pass through two given point.

(C)-(s)

A line is a straight set of points that extend in opposite directions without ending.

(D)-(r)

Line segment $\overline{AB}$ has two end points A and B

20 A. Question

The question consists of two statements, namely, Assertion (A) and Reason (R). Please select the correct answer.

Assertion (A)	Reason (R)
A circle is not a rectilinear figure.	A figure formed by straight lines only is called a rectilinear figure.

A. Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).

B. Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).

C. Assertion (A) is true and Reason (R) is false.

D. Assertion (A) is false and Reason (R) is true.

Answer

A rectilinear figure is a figure all of whose edges meet at right angles.

So, Assertion& Reason both are true.

20 B. Question

The question consists of two statements, namely, Assertion (A) and Reason (R). Please select the correct answer.

Assertion (A)	Reason (R)
All right angles are equal to one another.	A unique line passes through a single point.

A. Both Assertion (A) and Reason (R) are true and Reason (R) is a correct explanation of Assertion (A).

B. Both Assertion (A) and Reason (R) are true but Reason (R) is not a correct explanation of Assertion (A).

C. Assertion (A) is true and Reason (R) is false.

D. Assertion (A) is false and Reason (R) is true.

Answer

According to Euclid’s Fourth Postulate Assertion is right but reason given is not linked to right angle.