2) Give the geometric representation of $2x + 9 = 0$ as an equation

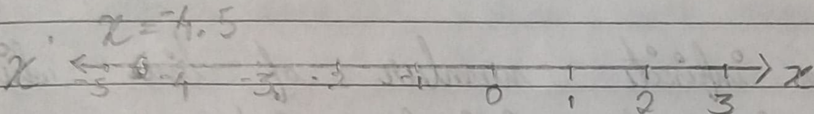
i- In one ~~varab~~ variable

ans) $2x + 9 = 0$

$2x = -9$

$x = \frac{-9}{2}$

$x = -4.5$



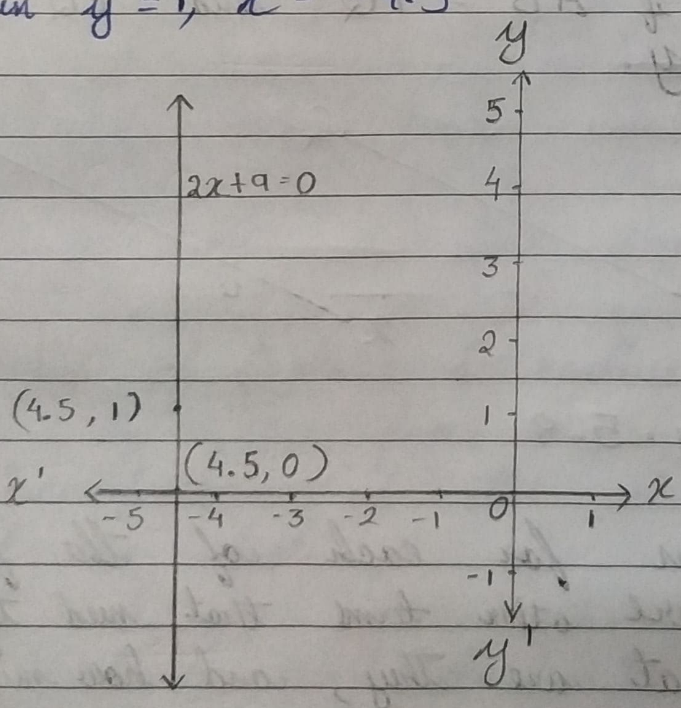
ii- In two variable

ans) $2x + 9 = 0$

$2x + 0y + 9 = 0$

When $y = 0$, $x = -4.5$

When $y = 1$, $x = -4.5$



Chapter :- 5

Introduction to Euclid's Geometry

Exercise 5.1

1) Which of The following statements are true and which are false? Give reasons for your answers.

i- Only one line can pass through a single point. False

ii- There are an infinite number of lines which pass through two distinct points. False

iii- A terminated line can be produced ~~of~~ indefinitely on both the sides. True

iv- If two circles are equal, then their radii are equal. True

v- In fig 5.9, if AB = PQ and PQ = XY, then AB = XY. True

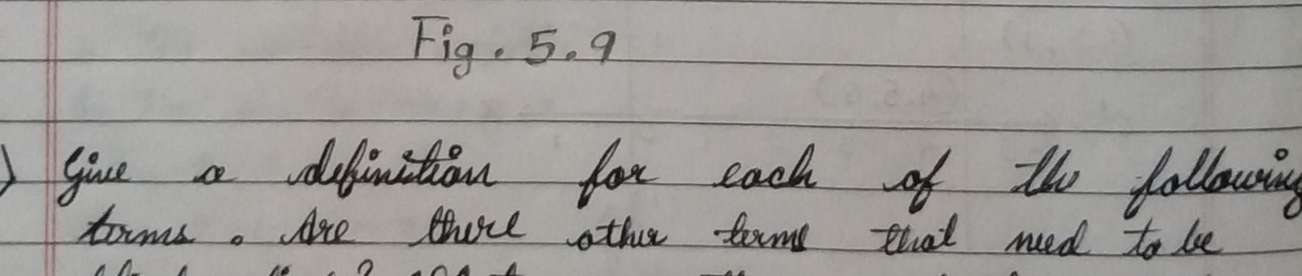


Fig. 5.9

2) Give a definition for each of the following terms. Are there other terms that need to be defined first? What are they, and how might you define them?

ans) Yes, there are other terms which are ~~to~~ need to be defined first, They are:

Plane :- Flat surface in which geometric fig. can be drawn ~~as~~ are known as plane.

Point :- A dimensionless dot which is drawn on a ~~point~~ plane surface is known as point.

Line :- A collection of points that has only length and no breadth is known as a line.

i- Parallel lines :- Parallel lines are those lines which never intersect each other and always at a constant distance perpendicular to each other.

ii- Perpendicular lines :- Perpendicular lines are those lines which are said to be perpendicular to each other i.e., at an angle of 90°.

iii- Line Segment :- When a line ~~segment~~ cannot be extended any further because of its ~~two~~ two end points then the line is known as a line segment.

iv- Radius of circle :- A radius of a circle is the line from any point on the circumference of the circle to the center of the circle.

v- Square :- A quadrilateral in which all the sides are said to be equal and each of its internal angles is right angles is called as square.

3) Consider two 'postulates' given below:

i- Given any two distinct points A and B, there exists a third point C which is between A and B.

ii- There exist at least three points that are not on the same line.

Do these postulates contain any undefined terms? Are these postulates consistent? Do they follow from Euclid's postulates? Explain.

ans) Yes, these postulates contains undefined terms.

Undefined terms in the postulates are :-

→ There are many points that lie in a plane. But, in the postulates given here, the position in the point C is not given, as of whether it lies on the line segment joining AB or not. On the top of that, there is no information ~~abat~~ about whether the points are in same plane or not.

AND

⇒ Yes, these postulates are ~~consiste~~ consistent when we deal with these two ~~two~~ situation:

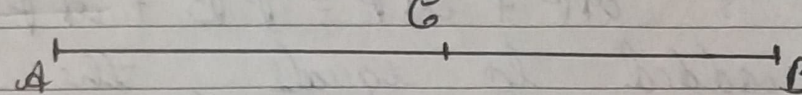
→ Point C is lying on the line segment AB ~~in~~ in between A and B.

→ Point C does not lie on the line segment AB.

No, they don't follow Euclid's postulates. They follow axioms.

4) If a point C lies between two points A and B such that AB = BC, then prove that $AC = \frac{1}{2} AB$. Explain by drawing the figure.

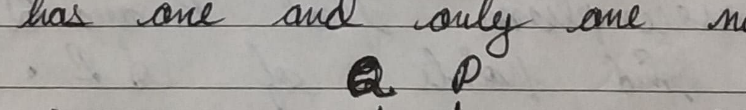
Ans)



Given that, AB = BC.
Now, adding AC both side.
$L.H.S + AC = R.H.S + AC$
$AC + AC = BC + AC$
$2AC = BC + AC$
We know that BC + AC (as it coincides with ~~line~~ line segment AB)
$\therefore 2AC = AB$ (if equals are added to equals, the whole are equal.)
$\Rightarrow AC = \left(\frac{1}{2}\right) AB$

5) In Question 4, point C is called a mid-point of line segment AB. Prove that every line segment has one and only one mid-point.

Ans)



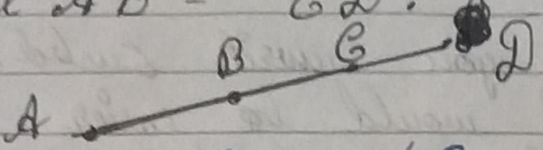
Let, AB be the line segment
Assume that points P and Q are the two different mid points of AB.
Now,
$\because$ P and Q are the midpoints of AB.
Therefore,
$AP = PB$ and $AQ = QB$.
Also,
$PB + AP = AB$ (as it coincides with AB)
Similarly,
$QB + AQ = AB$.

Now,
adding AP to the L.H.S and R.H.S of the equation $AP = PB$.
We get,
$AP + AP = PB + AP$ (If equals are added to equals, the wholes are equal)
$\Rightarrow 2AP = AB$ ------ (i)
Similarly,
$2AQ = AB$ ------ (ii)
From (i) and (ii),
Since R.H.S are same, we equate the L.H.S
$2AP = 2AQ$ (Things which are equal to the same thing are equal to one another)
$\Rightarrow AP = AQ$ (Things which are double of the same thing are equal to one another)
Thus, we conclude that P and Q are the same thing. This contradicts our assumption that P and Q are two different mid points of AB.
Thus, it is proved that every line segment has an and only one mid-point.

∴ Hence Proved

6) In Fig. 5.10, if $AC = BD$, then prove that $AB = CD$.

ans)



It is given that, $AC = BD$
From the given fig., we get,
$AC = AB + BC$
$BD = BC + CD$
$\Rightarrow AB + BC = BC + CD$ [$AC = BD$, given]
We know that, according to Euclid's axiom, when equals are subtracted from equals, reminders are equal.
Subtracting BC from the L.H.S and R.H.S of the ~~equal~~ equation
$AB + BC$
$= AB + BC - BC = BC + CD - BC$
$AB = CD$
Hence Proved.

7) Why is Axiom 5, in the list of Euclid's axiom, considered a 'universal truth'? (Note that ~~to the~~ ~~are~~ ~~not~~ question is not about the fifth postulate.)

ans) Axiom 5: The whole is always greater than the part.

For ~~eg~~ example:- A cake. When it is whole, assume that it measures 2 pounds but when a part ~~of~~ from it is taken out and measured, it weight will be smaller ~~that~~ than previous one. So, the fifth axiom is true for all the fifth axiom of Euclid is true for all the material in the universe. Hence, Axiom 5 is the list of Euclid's axiom, is considered a '~~universale~~ universal truth'.

Exercise 5.2

1) How would you rewrite Euclid's fifth postulate so that it would be easier to understand?

ans) Euclid's fifth postulate : If a straight line falling on two straight lines makes the interior angles on the same side of ~~the~~ it taken together less than two right angles, then the two straight lines, if produced ~~indifinitely~~ indefinitely, meet on that side ~~of~~ on which the sum of angles is ~~th~~ less than two right right angles. i.e., the Euclid's fifth postulate is about parallel lines.

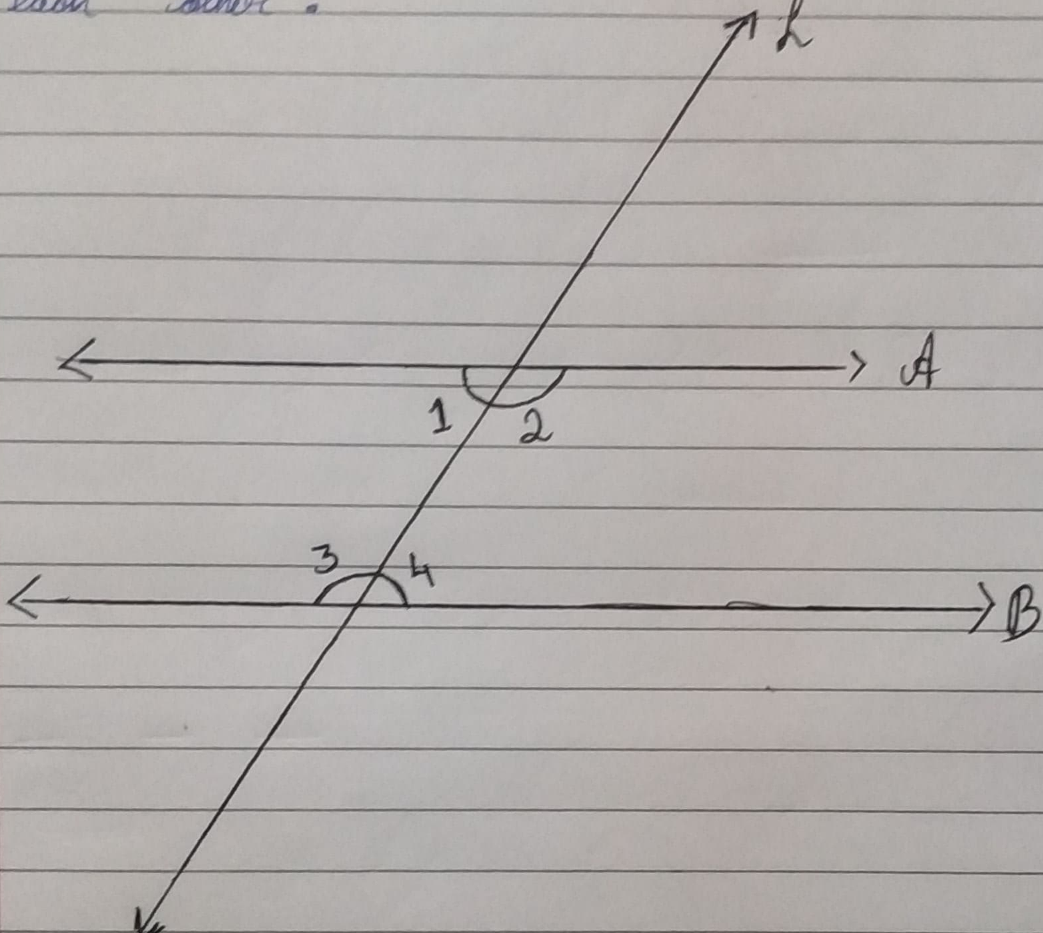
Parallel lines are the lines which ~~are~~ do not intersect each other ever and are always at a constant perpendicular distance apart from each other. Parallel lines can be two or more lines.

A :- If x does not lie on the line A then we can ~~shows~~ ~~show~~ ~~that~~ draw a line through x which will be parallel to that of the line A.

B :- There can be only one line that can be drawn through the point X which is parallel to the line A.

2) Does Euclid's ~~geometry~~ fifth postulate imply the existence of parallel lines? Explain:

ans) Yes, Euclid's fifth postulate does imply the existence of the parallel lines. ~~It~~ If the sum of the interior ~~right~~ angles is equal to the sum of the right angles, then the two lines will not meet each other at any given point, hence making them ~~parallel~~ parallel to each other.



$\angle 1 + \angle 3 = 180^\circ$

Or $\angle 3 + \angle 4 = 180^\circ$