INTRODUCTION TO EUCLID'S GEOMETRY.

11-W
12.5.21

Exercise 5.1

Q1) True or False

i) Only one line can pass through a single point.
False,
There can be infinite number of lines that can be drawn through a single point.

ii) There are an infinite number of lines which pass through two distinct points.
False.
Through two distinct points there can be only one line that can be drawn.

iii) A terminated line can be produced indefinitely on both the sides.
True,
A line that is terminated can be indefinitely produced on both sides as a line can be extended on both its sides infinitely.

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

True,

The radii of two circles are equal when the two circles ~~are~~ equal. The circumference and the centre of both the circles co-incide, and thus, the radius of the ~~the~~ two circles should be equal.

v) In fig 5.9, if AB = PQ = XY ~~AB~~, then AB = XY

True,

According to Euclid's 1st axiom - "Things which are equal to the same thing are also equal to one another."

Q2) Definitions:-

i) Parallel lines:-

Parallel lines are those lines which never intersect each other ~~is~~ and are always at a constant distance perpendicular to each other. Parallel lines can be two or more lines.

ii) Perpendicular lines:-

Perpendicular lines are those lines which intersect each other at right angle, then the lines are said to be perpendicular to each other.

iii) Line segment:-

When a line cannot be extended any further because of its two end points then the line is known as a line segment. A line segment has 2 end points.

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 four sides are said to be equal and each of its internal angle is right angles.

Q3) i) Given any two distinct points A & B, there exists a third point C which is in between A & B.

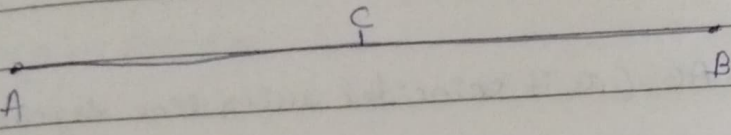
ans Yes, these postulates contain undefined terms.
undefined terms in the postulates are:-
⇒ There are many points that lie in a plane. But, in the postulates given here, the position of the point C is not given, as of whether it lies on the line segment joining AB or not.
⇒ On top of that, there is no information about whether the points are in same plane or not.

Yes, these postulates are consistent when we deal with these two situations:-

- Point C is lying on the line segment AB in between A & B.
- Point C does not lie on the line segment AB.

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

Q4) If a point lies between two points A & B such that AC = BC, then prove that AC = ½ AB. Explain by drawing the figure.



Given that, AC = BC

Now adding AC both sides.

LHS + AC = RHS + AC

AC + AC = BC + AC

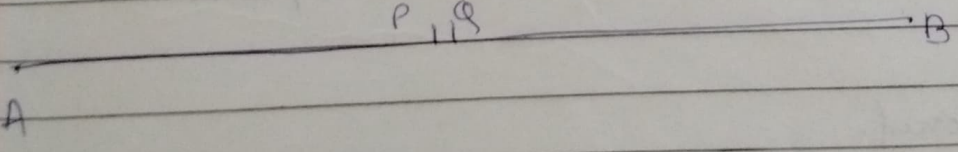
2AC = BC + AC

BC + AC = AB

∴ 2AC = AB

⇒ A = $\frac{1}{2}$ AB.

Q5) 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.



Let, AB be the line segment.

Assume that points P & Q are the two different mid points of AB.

Now,
∴ P & Q are mid points of AB.

Therefore,
AP = PB and AQ = QB,

also,
PB + AP = AB (as it coincides with line segment AB)

Similarly, QB + AQ = AB.

Now,
Adding AP to the LHS and RHS of the equation
AP = PB
we get, AP + AP = PB + AP.
⇒ 2AP = AB -(i)

Similarly,

2AQ = AB (ii)

2AP = 2AQ
⇒ AP = AQ

∴ we conclude the P & Q are same points.

∴ proved.

Q6) In fig. 5.10, If AC = BD, then prove that AB = CD

ans→ It is given, AC = BD

From the given figure, we get,

AC = AB + BC

BD = BC + CD

⇒ AB + BC = BC + CD [AC = BD, given]

AB + BC - BC = BC + CD - BC

AB = CD

∴ Hence proved.

Q7) Why is Axiom 5, in the list of Euclid's axioms, considered a 'universal ~~to~~ truth'?

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

For ex :- If we take a stick and break into pieces, if one is lost, the it is not completed.