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HW
11/05/2021

Exercise 5.1

1) ~~Writ~~ 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 ~~terminal~~ terminated line can be produced 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

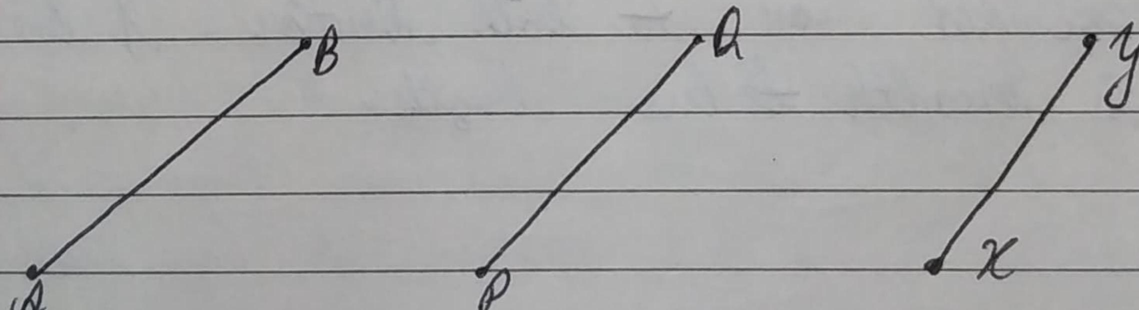

Fig. 5.9

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2) Give a defination for each of the fallowing terms. Are there other terms that need to be defined first? What are they; and have might you define them?

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

Plane :- Flat surfaces in which geometric figures can be drawn are known as plane. A place surface is a surface which lies evenly with the straight lines on itself.

Point :- A dimensionless dot which is drawn on a plane surface is known as point. A point ~~which~~ is that which has no part.

Line :- A collation of points that has only length and no breadth is known as a line. And it ~~can~~ can be extended on ~~to~~ both directions. A line is breadth-~~th~~ less length.

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i- Parallel lines :- Parallel lines are those lines which never intersect each other and 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 are said to be perpendicular to each other i.e., at an angle of 90°.

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 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~~ internal angles is right angles is called square.

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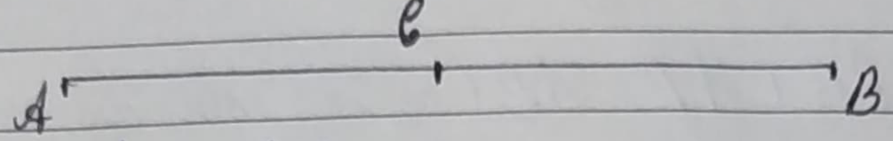
3) Consider two 'postulates' given below:
i- Given any two distinct points A and B, ~~thi~~ there exists a third point C which is between A and B.
ii- There exist at least three points that are not on the same line.
Do these postulates contain any undefined terms? Are these postulates consistent? Do they follow from Euclid's postulates? Explain.

ans) Yes, these postulates contains undefined terms. ~~the~~ 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 the top of that, there is no ~~I~~ information about whether the points are in same plane or not. And
* Yes, these postulates are consistent when we deal with these two situation:
⇒ 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 Euclid's postulates. They follow axioms,

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

ans)



Given that, AC = BC.

Now, adding AC both sides.

L.H.S + AC = R.H.S + AC

AC + AC = BC + AC

2AC = BC + AC

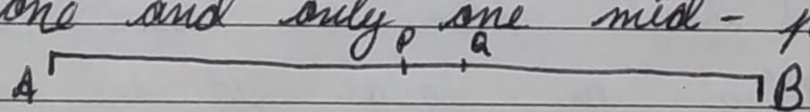
We know that BC + AC (as it ~~same~~ coincides with line segment AB)

∴ 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~~ 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 line segment 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 things are equal to one another.)

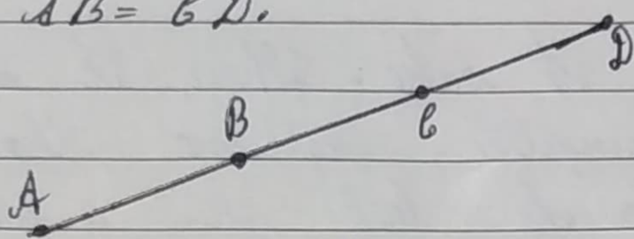
Thus, we conclude that P and Q are the same thing.

This contradicts our assumption the P and Q

are two different mid points of AB.
Thus, it is proved that every line segment has one and only one mid-point.
Hence Proved.

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

ans)



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

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

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

For example: A cake. When it ~~i~~ is whole or complete, assume that it measures 2 pounds but when a part from it is taken out ~~of~~ and measured, its weigh will be smaller than the previous measurement. So, the fifth axiom of Euclid is true for all the fifth axiom of Euclid is true for all the materials in the universe. Hence, Axiom 5, is the list of Euclid's axiom, is considered a 'universal truth'.