Euclid's Geometry

Geo (earth) — metrin (measurement)

Euclid's ← Maths → Element — 13 chapters (books)

outer boundary — Surface

Which can't be proved ↪ Axioms ↑ Universal Truth

Postulates → axioms ↓ specifically for geometry

(1) Things which are equal to the same thing are equal to one another.
(2) If equals are added to equals, the wholes are equal.
(3) If equals are subtracted from equals, the remainders are equal.
(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 things are equal to one another.
(7) Things which are halves of the same things are equal to one another.

AB = BC, BC = CA, AB = CA

Dorer = Dorr, Dorr = Square

10 = 10, 10 + 1 = 10 + 1

10 = 10, 10 − 1 = 10 − 1

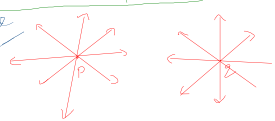
NCERT science book-9

$\frac{10Rs}{2} = \frac{10Rs}{2}$, 5Rs = 5Rs

10 Rs = 10 Rs, 2 × 10 = 2 × 10, 20 = 20

Euclid's Five postulates

Postulate 1



P ——— Q

Postulate 2

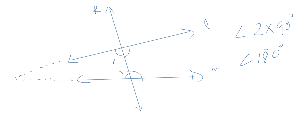
A ——— B

line segment — Terminated line

Postulate 3

Postulate 4

Postulate 5 : *If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the two straight lines, if produced indefinitely, meet on that side on which the sum of angles is less than two right angles.*



$\angle 2 \times 90^\circ$, $\angle 180^\circ$

A point is that which has no part.

Something which occupies area

(i) parallel lines – Two lines x & y in a plane are said to be parallel, if they have no point in common.

(ii) Perpendicular lines :– Two lines x and y in a plane are said to be perpendicular lines if they intersect each other at right angles.

360°

⊥ is less of a revolution makes angle 90° & that angle is called right angle

(iii) line segment – A straight path b/w two points A and B is called line segment AB

A ——— B

(iv) Radius — line joining the center of a circle to any point on the circle is called radius of the circle.

→ A circle is a collection of all points which are equidistant from fixed point & that fixed point is known as center of circle. & distance b/w that fixed point & any point on the circle is called radius.

Square :- Square is a rectangle with all sides equal.

rectangle is parallelogram whose opposite sides are equal & each angle 90°.

Some Undefine terms

– "A point is that which has no part."

Point – A point is represented by a fine dot made by a sharp pencil on a sheet of paper. ↑ Not a defn, its an example

Plane – Surface of a smooth wall or the surface of a paper etc are close example of plane.

Line – If we fold a piece of paper, the crease in paper represent a geometrical line, the edge of a ruler etc.

3)
(i) A ——C—— B
(ii) .C A ——— B

Ans (i) points, line
(ii) Yes, as one situation is contradicting other situation. they follow Axiom 5.)

4) A ——C—— B

Given :- AC = BC
To prove AC = $\frac{1}{2}$AB

Proof :- According to Axiom 5, whole is greater than the part.

AB = AC + BC
AB = AC + AC (Given AC = BC)
AB = 2AC
$AC = \frac{1}{2}AB$

5) A ——C—D—— B

Given :- C is a midpoint

Proof:
let D is a midpoint of AB

$AD = \frac{1}{2}AB$ –(i)
Given $AC = \frac{1}{2}AB$ (ii)

Subtract (ii) from (i)
AD − AC = 0
AD = AC

This is possible only when point D lies on point C. ∴ C is only mid point.

6)

A —B—C— D

Given :- AC = BD
To prove AB = CD

According [illegible]

Proof :- AC = BD (given)
Subtract BC from both sides.
AC − BC = BD − BC
AB = CD

Axiom 5 – "Whole is greater than its part".

Why universal Truth? because we can't prove it only can understand by example.

A —B—C— D

Theorem – Two distinct lines can't have more than one point in common.

Given : line l & line m

To prove : line l & line m can not have more than one point in common.

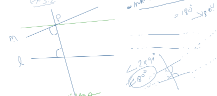
Proof : let line l cut line m into two point ↑ but it contradict the axiom that there is a unique line between two point.

So, our supposition is wrong ∴ l & m have only one point in common.

To prove universal truth, Method of contradiction is used.

Ex-5.2

1)



interior angles < 180°, = 180°, > 180°

< 2 × 90°, < 180°

Euclid's 5 postulate ~~rewritten~~

Parallel axiom – If l is a line and P is a point not on line l, there is one and only one line which passes through P and is parallel to l.

2) Yes, if interior angle sum < 180° or 180° then lines are not ∥, but if it is equal to 180° lines are parallel.