CHAPTER-5

INTRODUCTION TO EUCLID'S GEOMETRY

KEY POINTS

- **Introduction :** Euclidean geometry, which is taught today is named after Euclid - he is known as "the father of geometry". Euclid also studied and contributed in other areas of mathematics, including number theory and astronomy.
- **Axiom or Postulates** : Axiom or Postulates are the assumptions which are obvious universal truths. They are not proved.
- **Theorems :** Theorems are statements which are proved using definitions, axioms, previously proved statements and deductive reasoning.

SOME OF EUCLID'S AXIOMS

1. Things which are equal to the same thing are equal to one another.
2. If equals are added to equals the whole 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.

EUCLID'S POSTULATES AND DEFINITIONS

- **Postulates 1 :** A straight line may be drawn from any one point to any other points.
- **Postulate 2 :** A terminated line can be produced indefinitely.
- **Postulate 3 :** A circle can be drawn with any centre and any radius.
- **Postulate 4 :** All right angles are equal to one-another.
- **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 two straight lines if produced indefinitely, meet on that side on which the sum of angles is less than two right angles.

DEFINITIONS

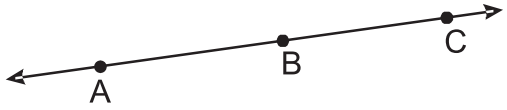
1. A Point is that which has no part.
2. A line is breadth less length.
3. The ends of a line are points.
4. A straight line is a line which lies evenly with the points on it self.
5. A surface is that which contain length and breadth only.
6. The edges of a surface are lines.
7. A plane surface is a surface which lies evenly with the straight lines on it self.
8. Two distinct lines can not have more than one point in common.

Part – A

1. Write the number of dimensions, that a surface contain.
2. A proof is required for _____ (Postulate, Axioms, Theorem).
3. The number of line segments determined by three collinear points is _____ (Two, three, only one).
4. Euclid stated that if Equals are subtracted from Equal then the remainders are equal in the form of _____ (an axiom, a definition, a postulate).
5. In given figure AD = BC then AC and BD are equal or not?

6. How many lines can pass through a single point ?
7. State Euclid's first postulate.
8. Write Euclid's fifth postulate.
9. If a + b = 15 and a + b + c = 15 + c

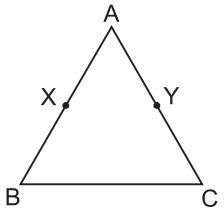
   which axiom of Euclid does the statement illustrate?
10. If A, B and C are three points on a line and B is between A and C then prove that AC – BC = AB.



Part – B

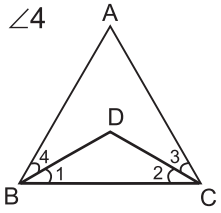
11. If x + y = 10 and x = z then show that z + y = 10
12. In given figure AX = AY, AB = AC

    Show that : BX = CY



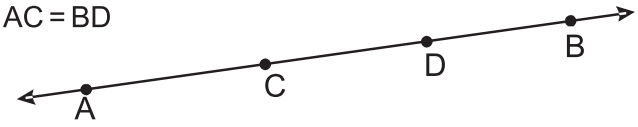
13. In given figure ∠ABC = ∠ACB and ∠3 = ∠4

    Show that ∠1 = ∠2



14. In the given figure of AD = CB

then prove that AC = BD



15. Solve the equation x – 10 = 15, State which axiom do you use here.

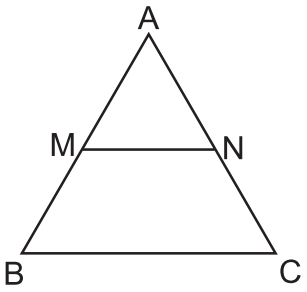
16. If a point C lies between two points A and B such that AC = BC then prove that

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

17. In the given figure

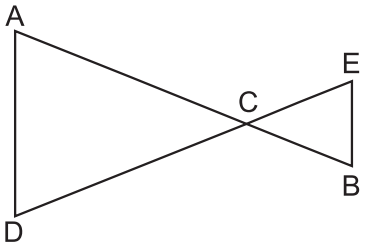
$$AM = \frac{1}{2} AB$$

$$AN = \frac{1}{2} AC$$



show that AB = AC

18. In the given figure AC = DC, CB = CE
then show that AB = DE



19. Prove that every line segment has one and only one mid point.

20. State true or false

(a) only one line can pass through a single point.

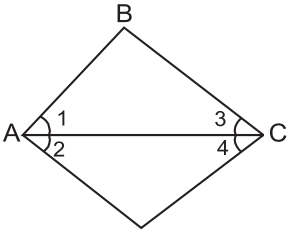
(b) There are infinitely many number of lines which passes through the two distinct point.

(c) Euclid belongs to Greece.

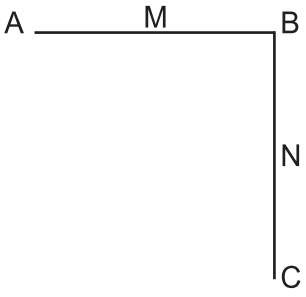
Part – C

21. In the given figure $\angle 1 = \angle 2$ and $\angle 2 = \angle 3$

then show that $\angle 1 = \angle 3$

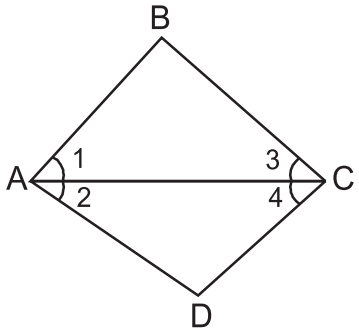


22. In the give figure AB = BC, M is the mid point of AB and N is the mid point of BC. Show that AM = NC



23. In the given figure $\angle 1 = \angle 3$ and $\angle 2 = \angle 4$

then show that $\angle BAD = \angle BCD$



24. An equilateral triangle is a polygon made up of three line segments out of which two line segments are equal to the third one and all the angles are 60° each.

Can you justify that all sides and all angles are equal in equilateral triangle?

25. RAM and Shyam are two students of Class IX. They give equal donation to a blind school in the month of March. In April each student double their donation.

(a) compare their donation in April.

(b) which mathematical concept have been covered in this question?

26. Monika and Vasu have the same weight if they both gain weight by 2kg. How will their new weights be compared?

(a) What mathematical concept have been covered in this question?

CHAPTER-5

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ANSWERS

1.	Two	2.	Theorem	3.	Only One
4.	Axiom	5.	Equal	6.	Infinite
9.	Second axiom	15.	Second Axiom		
20.	(a) false	(b)	false	(c)	true

25. (a) Donation amount is same in April

(b) Euclid's axiom

26. (a) Euclid's axiom

PRACTICE TEST

Introduction To Euclid's Geometry

Choose the correct option:

1. Through two points :
   (a) A unique line can be drawn
   (b) No line can be drawn
   (c) More than one line can be drawn
2. Through a fixed point :
   (a) A unique line can be drawn
   (b) No line can be drawn
   (c) More than one line can be drawn
3. Number of line segments required to form a closed figure :
   (a) 2 (b) 3 (c) 4
4. Two lines having a common point is called :
   (a) Parallel lines (b) Intersecting lines
   (c) Coincident lines
5. Euclid arranged all known work in the field of mathematics in his treatise called :
   (a) Elements (b) Axioms (c) Postulets
6. The thing which are double the same thing are :
   (a) Halves of the same thing (b) Double of the same thing
   (c) Equals
7. Axioms are assumed :
   (a) Universal truth specific of geometry
   (b) Universal truths in all branches of mathematics
   (c) Definitions
8. A mathematics statement whose truth has been logically established is called :
   (a) An Axiom (b) A Postualtes
   (c) A Theorem