CHAPTER TEST: INTRODUCTION TO EUCLID'S GEOMETRY
Mathematics | Class IX (2026/EUCLID/09/003)

Time: 1.5 Hours **Max. Marks: 40**

General Instructions:

1. All questions are compulsory.
2. Section A: 8 MCQs (1 mark each).
3. Section B: 4 Very Short Answer questions (2 marks each).
4. Section C: 3 Short Answer questions (3 marks each).
5. Section D: 2 Long Answer questions (5 marks each).
6. Section E: 1 Case Study (5 marks total).

Section A (Multiple Choice Questions)

1. The statement "A straight line may be drawn from any one point to any other point" is:
   (a) Euclid's Axiom 1
   (b) Euclid's Postulate 1
   (c) Euclid's Definition 1
   (d) Playfair's Axiom
2. If a quantity B is a part of quantity A, then A can be written as the sum of B and some third quantity C. This illustrates that:
   (a) $C > A$
   (b) $A > B$
   (c) $B > A$
   (d) $A = C$
3. Two distinct intersecting lines cannot be parallel to the same line. This is a/an:
   (a) Postulate
   (b) Axiom
   (c) Equivalent version of the 5th Postulate
   (d) Definition
4. How many lines can pass through a single point?
   (a) Only one
   (b) Exactly two
   (c) Infinite
   (d) None
5. According to Euclid, the ends of a line are:

(a) Lines
(b) Surfaces
(c) Points
(d) Breadthless

6. "The whole is greater than the part" is considered a universal truth because:
   (a) It can be proven for circles only
   (b) It is true for all types of magnitudes
   (c) Euclid said so
   (d) It only applies to integers

7. If $AB = PQ$ and $PQ = XY$, then $AB = XY$. This is an application of:
   (a) Axiom 1
   (b) Axiom 3
   (c) Postulate 2
   (d) Postulate 4

8. In ancient India, the shapes of altars used for household rituals were:
   (a) Squares and Circles
   (b) Triangles and Rectangles
   (c) Trapeziums and Pyramids
   (d) None of the above

Section B (Very Short Answer Questions)

1. Given two points P and Q, how many line segments can you draw passing through them? State the relevant Euclidean principle. (2)

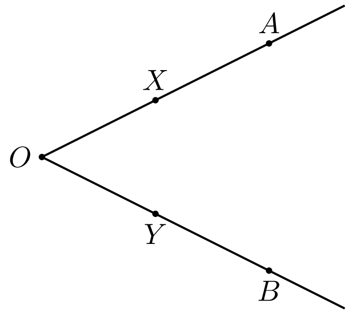
2. If $x + y = 15$ and $z = y$, prove that $x + z = 15$. Mention the axiom used. (2)

3. State the 4th Postulate of Euclid. Why is it significant for comparing geometric figures? (2)

4. "A line segment can be extended indefinitely to form a line." Which postulate is this? Draw a diagram representing a terminated line. (2)

Section C (Short Answer Questions)

1. In the figure, if $OX = OY$ and $OA = OB$, prove that $AX = BY$. Justify each step using Euclid's axioms.



(3)

2. Prove that every line segment has one and only one midpoint. (Use Euclid's axiom: Things which coincide with one another are equal). (3)

3. Discuss the "consistency" of Euclid's postulates. Can a system of axioms be inconsistent? What would happen to the geometry if it were? (3)

Section D (Long Answer Questions)

1. Prove that "An equilateral triangle can be constructed on any given line segment."
   (a) Draw a line segment AB.
   (b) Use Postulate 3 to draw two circles.
   (c) Identify the intersection point C.
   (d) Use Axiom 1 to prove $AC = BC = AB$.

   (5)

2. Examine the relationship between Euclid's 5th Postulate and the existence of parallel lines. (i) Draw two lines l and m intersected by a transversal n. (ii) If the sum of interior angles on one side is exactly 180°, what does Euclid's 5th postulate imply about the intersection of l and m? (iii) How does this lead to the definition of parallel lines? (5)

Section E (Case Study Based Question)

Case Study: The Logic of Ancient City Planning
Archeological surveys of the Indus Valley Civilization reveal a remarkable understanding of geometry. The streets of Mohenjo-Daro were laid out in a grid pattern, intersecting at right angles. This precision suggests that the planners used concepts similar to what Euclid later formalized. For instance, to ensure two main roads were parallel, they likely ensured that a third road crossing them (a transversal) created equal angles. According to Euclid's 5th postulate, if the sum of interior angles on the same side of a transversal is exactly two right angles (180°), the lines will never meet, no matter how far they are extended. This allowed for the creation of perfectly rectangular city blocks. Furthermore, they understood that if the area of two granaries was equal to a standard central storehouse, then the two granaries were equal in capacity to each other—a direct application of Euclid's first common notion.

Based on the above information, answer the following questions:

1. If two city blocks A and B have the same area as block C, which axiom proves $A = B$?
   (a) Axiom 1
   (b) Axiom 5
   (c) Axiom 7
   (d) Postulate 4

2. The streets intersecting at "right angles" relates to which postulate stating all right angles are equal?

(a) Postulate 1
(b) Postulate 2
(c) Postulate 4
(d) Postulate 5

3. A perfectly rectangular city block is a "Plane Surface." According to Euclid, a plane surface is one which:

(a) Lies evenly with the straight lines on itself.
(b) Has only length and no breadth.
(c) Has three dimensions.
(d) Is a point extended in space.

4. If a road is extended indefinitely, it satisfies which Euclidean principle?

(a) Postulate 2
(b) Axiom 3
(c) Definition 1
(d) Postulate 3

5. If the interior angles on one side of a transversal sum to 170°, the roads will:

(a) Remain parallel
(b) Eventually intersect on that side
(c) Intersect on the opposite side
(d) Turn into points