CHAPTER TEST: LINES AND ANGLES

Mathematics | Class IX (2026/LINANG/09/002)

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

General Instructions:

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

SECTION A (8 x 1 = 8 Marks)

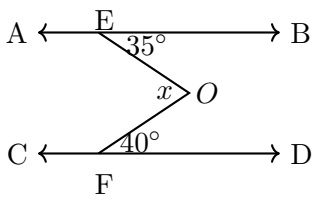
1. If an angle is 20° more than its complement, then the measure of the angle is:

   (i) 35°
   (ii) 55°
   (iii) 45°
   (iv) 70°

2. If two interior angles on the same side of a transversal intersecting two parallel lines are in the ratio $2 : 3$, then the measure of the larger angle is:

   (i) 72°
   (ii) 108°
   (iii) 120°
   (iv) 150°

3. In the following figure, if $AB \parallel CD$, $\angle AEO = 35^\circ$ and $\angle DFO = 40^\circ$ then the value of x is:



   (i) 75°
   (ii) 105°
   (iii) 285°
   (iv) 255°

4. If a transversal intersects two parallel lines, then the bisectors of the four interior angles form a:

(i) Rhombus

(ii) Square

(iii) Rectangle

(iv) Parallelogram

5. Two lines are respectively perpendicular to two parallel lines. Then these two lines are:

   (i) Perpendicular to each other

   (ii) Parallel to each other

   (iii) Intersecting at $45°$

   (iv) Coincident

6. If the supplement of an angle is three times its complement, then the angle is:

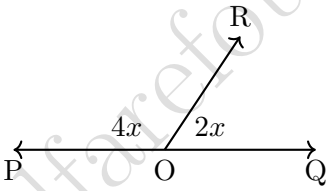
   (i) $45°$

   (ii) $30°$

   (iii) $60°$

   (iv) $90°$

7. In the figure below, POQ is a straight line. The value of x is:



   (i) $20°$

   (ii) $25°$

   (iii) $30°$

   (iv) $35°$

8. If the ratio of a linear pair of angles is $1 : 5$, the angles are:

   (i) $30°, 150°$

   (ii) $20°, 100°$

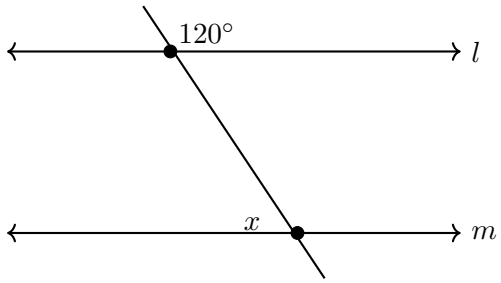
   (iii) $40°, 140°$

   (iv) $15°, 75°$

SECTION B (4 x 2 = 8 Marks)

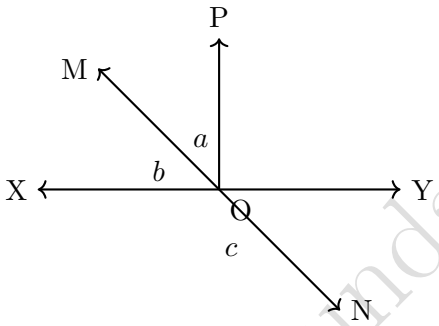
1. Prove that if two lines intersect each other, then the vertically opposite angles are equal.

2. In the figure below, find the value of x if $l \parallel m$.



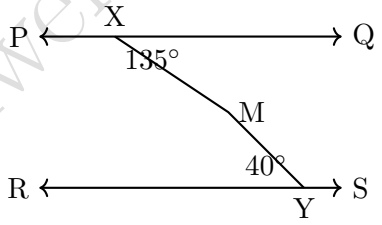
3. If an angle is 14° more than its complement, find the measure of the angle.

4. Lines XY and MN intersect at O. If $\angle POY = 90°$ and $a : b = 2 : 3$, find c.



SECTION C (3 x 3 = 9 Marks)

1. In the figure, $PQ \parallel RS$, $\angle MXQ = 135°$ and $\angle MYR = 40°$, find $\angle XMY$.

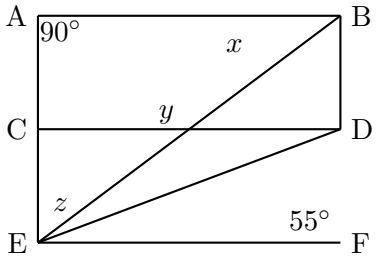


2. Side QR of $\triangle PQR$ is produced to a point S. If the bisectors of $\angle PQR$ and $\angle PRS$ meet at point T, then prove that $\angle QTR = \frac{1}{2}\angle QPR$.

3. If a transversal intersects two lines such that the bisectors of a pair of alternate interior angles are parallel, then prove that the two lines are parallel.

SECTION D (2 x 5 = 10 Marks)

1. In the figure, $AB \parallel CD$ and $CD \parallel EF$. Also $EA \perp AB$. If $\angle BEF = 55°$, find the values of x, y and z.



2. Prove that:

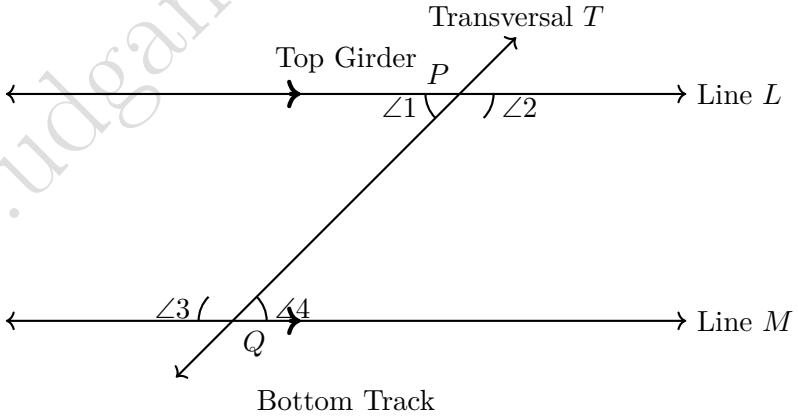
   (a) The sum of the angles of a triangle is 180°.

   (b) If a side of a triangle is produced, then the exterior angle so formed is equal to the sum of the two interior opposite angles.

SECTION E (5 x 1 = 5 Marks)

Case Study

Civil engineers utilize the geometric properties of lines and angles to ensure the stability of massive structures like railway bridges. Consider a modern truss bridge where the top girder line L and the bottom track line M are engineered to be perfectly parallel to maintain uniform load distribution. A diagonal support beam, acting as a transversal T, intersects these parallel lines to form a series of crucial angles. To prevent structural failure, the interior angles formed by these intersections must meet specific mathematical requirements. During a safety inspection, a technician measures the inclination of the diagonal beam to ensure the alternate interior angles and corresponding angles are consistent with the original blueprints. Precise calculation of these angular relationships allows for the detection of any structural shifting, guaranteeing the safety of thousands of daily commuters.



Multiple Choice Questions

1. If the measure of $\angle 2$ in the bridge truss is 75°, what is the measure of the alternate interior angle $\angle 4$?

   (a) 105°

   (b) 75°

(c) 180°

(d) 15°

2. In the diagram, if Line $L \parallel$ Line M, which of the following statements regarding $\angle 2$ and $\angle 3$ is always true?

   (a) They are vertically opposite angles.

   (b) They are complementary angles.

   (c) They are co-interior angles whose sum is 180°.

   (d) They are corresponding angles and are equal.

3. If the diagonal beam is adjusted such that $\angle 1 = (3x + 10)^\circ$ and $\angle 2 = (2x + 20)^\circ$, find the value of x assuming they form a linear pair.

   (a) 30

   (b) 20

   (c) 150

   (d) 10

4. Suppose a second diagonal beam is added parallel to the first transversal. The lines parallel to the same line are:

   (a) Perpendicular to each other.

   (b) Parallel to each other.

   (c) Intersecting at 90°.

   (d) None of the above.

5. If the measure of $\angle 3$ is decreased by 10° to increase the bridge's slope, what must happen to its corresponding angle to maintain the parallel property of the girders?

   (a) It must increase by 10°.

   (b) It must remain unchanged.

   (c) It must decrease by 10°.

   (d) It must become 90°.