RAM Math Circle - Chennai

Synopsis for January 25 2026

Junior Batch

We started the session by briefly discussing what is meant by a **line** and a **point**, and then made the following definitions and observations.

- An infinite number of straight lines can be drawn through a given point.
- **Uniqueness of a line:** Two distinct points determine a unique straight line.
- **Segment** $\overline{AB}$: points A, B and all points between them. Length $|AB|$.
- **Segment addition property:** If point C lies between points A and B, then

$$|AB| = |AC| + |CB|.$$

- Three or more points are said to be **collinear** if they lie on the same straight line.
- **in-betweeneness:** If A, B, C are collinear, exactly one lies between the other two.
- **Ray** $\overrightarrow{AB}$: starts at A, passes through B, continues indefinitely.
- **Supplementary rays**: two rays with common origin that point in opposite directions on the same line.
- An infinite number of rays can be drawn from a given point.

- **Angle** $\angle AOB$: formed by two rays $\overrightarrow{OA}, \overrightarrow{OB}$ with common vertex O.
- **Classification of Angles**

Type of Angle	**Measure**	**Quadrant(s)**
Zero angle	0°	On positive x-axis (no quadrant)
Acute angle	$0^\circ < \theta < 90^\circ$	First quadrant
Right angle	90°	On positive y-axis (boundary)
Obtuse angle	$90^\circ < \theta < 180^\circ$	Second quadrant
Straight angle	180°	On negative x-axis (boundary)
Reflex angle	$180^\circ < \theta < 360^\circ$	Third and Fourth quadrants
Complete angle	360°	All quadrants

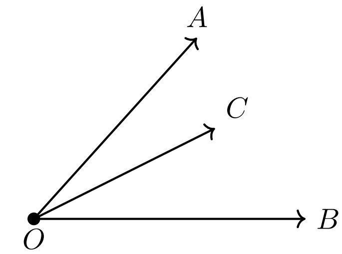
- **Sign convention:** Angles measured in the counterclockwise direction are taken as positive, while angles measured in the clockwise direction are taken as negative. A full revolution measures 360° and a half revolution measures 180°.
- Angles are added modulo 360°.

$$2026^\circ \equiv 2026^\circ \pmod{360^\circ}$$

Since $2026 = 360 \times 5 + 226$, we have $2026^\circ = 226^\circ$.

- Two angles are said to be *adjacent angles* if they have a common vertex, a common side,and lie on opposite sides of the common side.
- Adjacent angles can be added *only when* one angle lies between the arms of the other.

  Example (Addable Adjacent Angles)



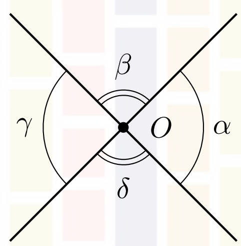
  Here, ray $\overrightarrow{OC}$ lies between rays $\overrightarrow{OA}$ and $\overrightarrow{OB}$. Hence,

$$\angle AOB = \angle AOC + \angle COB.$$

- **Linear pair (straight-on):** If a straight line stands on another straight line, the two adjacent angles formed sum to 180°.

- **Theorem:** If two straight lines intersect, then the vertically opposite angles formed are equal.

  Proof. Let two straight lines intersect at a point O, forming four angles α, β, γ, and δ in order around O.



  Angles α and β form a supplementary pair, so $\alpha + \beta = 180°$. Also, angles β and γ form a supplementary pair, hence $\beta + \gamma = 180°$. Therefore, $\alpha = \gamma$. Similarly, $\beta = \delta$. Hence, vertically opposite angles are equal. ■

- We also discussed the difference between theorems and axioms; however, we will revisit this topic in upcoming sessions.
- We also worked through several simpler problems throughout the session, which are not recorded here, to help students understand the definitions and subtle details.
- **Exercises:**
  1. Two straight lines PQ and RS intersect each other at point O. If

$$\angle POR : \angle ROQ = 5 : 7,$$

     find the all possible measures of angles formed at the point of intersection.
  2. Ray OS stands on the straight line POQ. Rays OR and OT are the angle bisectors of $\angle POS$ and $\angle SOQ$ respectively. If $\angle POS = x°$, find $\angle ROT$.

Senior Batch

Today we started working with polynomials. We discussed polynomial multiplication and polynomial division. This was new to some students so we proceeded slowly and with a number of examples that students took the lead in solving. We explored the similarities between integer division and polynomial division and framed the division algorithm for polynomials. With some nudging, students came up with the idea that the degree of the polynomial had to play a role in the constraint here. In the end they could frame the statement by themselves.

After the break we worked on the Miura fold (or the *map fold*). We discussed why the regular way of folding in half and continuing that way was not the best way of folding a map. For about 40 minutes, students worked with their paper, focusing on correctness, precision (edge-to-edge, corner-to-corner) and sharp creases. Everyone was amazed at the results, The way the folded piece of paper opens up and folds right back by pulling and pushing along one direction was fascinating. We discussed applications of the Miura fold in engineering and how it is being used to compress and pack solar panels into a small package to be carried in space.