📘 Chapter 6: Lines and Angles

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🔹 Key Concepts & Results

🟡 **Important Definitions:**

- ✨ Complementary Angles: Two angles whose sum is 90°
- ✨ Supplementary Angles: Two angles whose sum is 180°
- ✨ Adjacent Angles: Two angles with a common arm and vertex
- ✨ Linear Pair: Adjacent angles that form a straight line (sum = 180°)
- ✨ Vertically Opposite Angles: Angles opposite to each other when two lines intersect — and always equal! ♻️

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📐 Angle Relationships

📘 **Postulates & Theorems You Must Know:**

1️⃣ If a ray stands on a line, the adjacent angles form a linear pair and are supplementary
2️⃣ Vertically opposite angles formed by two intersecting lines are equal
3️⃣ A transversal intersecting two parallel lines gives:

- ✅ Corresponding angles = equal
- ✅ Alternate interior angles = equal
- ✅ Co-interior (same side interior) angles = supplementary

4️⃣ Lines parallel to the same line are parallel to each other
5️⃣ Sum of the angles of a triangle = 180°
6️⃣ Exterior angle of a triangle = sum of two opposite interior angles

🧠 **Example:**
If ∠A = 50° and ∠B = 60°, then exterior ∠C = 110° ✅

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❓ Multiple Choice Questions (Concept-Based)

1️⃣ If two angles are in ratio 2:3 and are interior angles on same side of transversal → greater angle = 108° ✅

2️⃣ Triangle with angle sum condition:
If one angle = sum of other two → triangle is a Right triangle ✅

3️⃣ Triangle with exterior angle = 105° and two equal interior angles → each = 37.5° ✅

4️⃣ Triangle with angles in 5:3:7 ratio → obtuse triangle (one angle > 90°) ✅

5️⃣ Given one angle = 130° in a triangle, the angle between bisectors of other two = 50° ✅

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🧠 Reasoning-Based Short Questions

Q: Can a triangle have all angles < 60°?
A: ❌ No! Total must be 180°; 3 angles < 60° can't add to 180°.

Q: Can a triangle have 2 obtuse angles?
A: ❌ No! One obtuse angle is > 90°, so two such angles exceed 180°.

Q: Triangle angles 45°, 64°, 72° — Possible?
A: ✅ Yes, 45+64+72 = 181° ❌ Too much! So only one triangle can be drawn if sum = 180°.

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📝 Application-Based Examples

🧾 Q: If two adjacent angles are equal, are they right angles?
A: Yes, if adjacent + supplementary → Each must be 90°

🧾 Q: If one angle of intersecting lines is 90°, what about others?
A: All are 90°, as they're vertically opposite and supplementary ✅

🧾 Q: If two lines are ⊥ to same line → they are parallel ✅

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🔍 Geometry Diagrams & Results (Explained)

🟢 Fig 6.6 — Two lines l and m are ⊥ to the same line n
✅ So, l ∥ m

🟢 Fig 6.7 — AB, CD, and EF intersect at O. Given ∠COE = 2y, ∠AOE = 5y
→ Apply angle sum: ∠COE + ∠AOE + ∠AOD = 180°
→ Find y, then confirm values

🟢 Fig 6.12 and 6.13 — Given BA ∥ ED and BC ∥ EF
→ Prove angle equal or supplementary using parallel line properties

🟢 Fig 6.14 — Given DE ∥ QR, and bisectors are drawn
→ Use angle properties to find ∠APB

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💡 Long Answer Thinking Problems

📘 Ray Reflection with Perpendicular Mirrors (Fig 6.15)

- Use geometry of reflections and perpendicularity
- ∠1 + ∠4 = 90° and ∠2 + ∠3 = 90°
  → Total = 180°, so reflected ray ∥ incident ray ✅

📘 Triangle Angle Sum:

- ∠A + ∠B + ∠C = 180°
  (Standard theorem — proven via parallel lines and transversal)

📘 ∠BOC = 90° + ½∠A:

- When angle bisectors of B and C intersect at O
- Use triangle sum + bisector properties → proof follows step by step 📏

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🔚 Final Summary Table

Concept	Rule/Value
Vertically Opposite Angles	Always Equal
Linear Pair	Sum = 180°
Angles of Triangle	Sum = 180°
Exterior Angle of Triangle	= Sum of opposite interior angles
Alternate Interior / Corresponding Angles	Equal (for parallel lines + transversal)
Co-interior Angles	Supplementary
Lines ⊥ to same line	∥ to each other