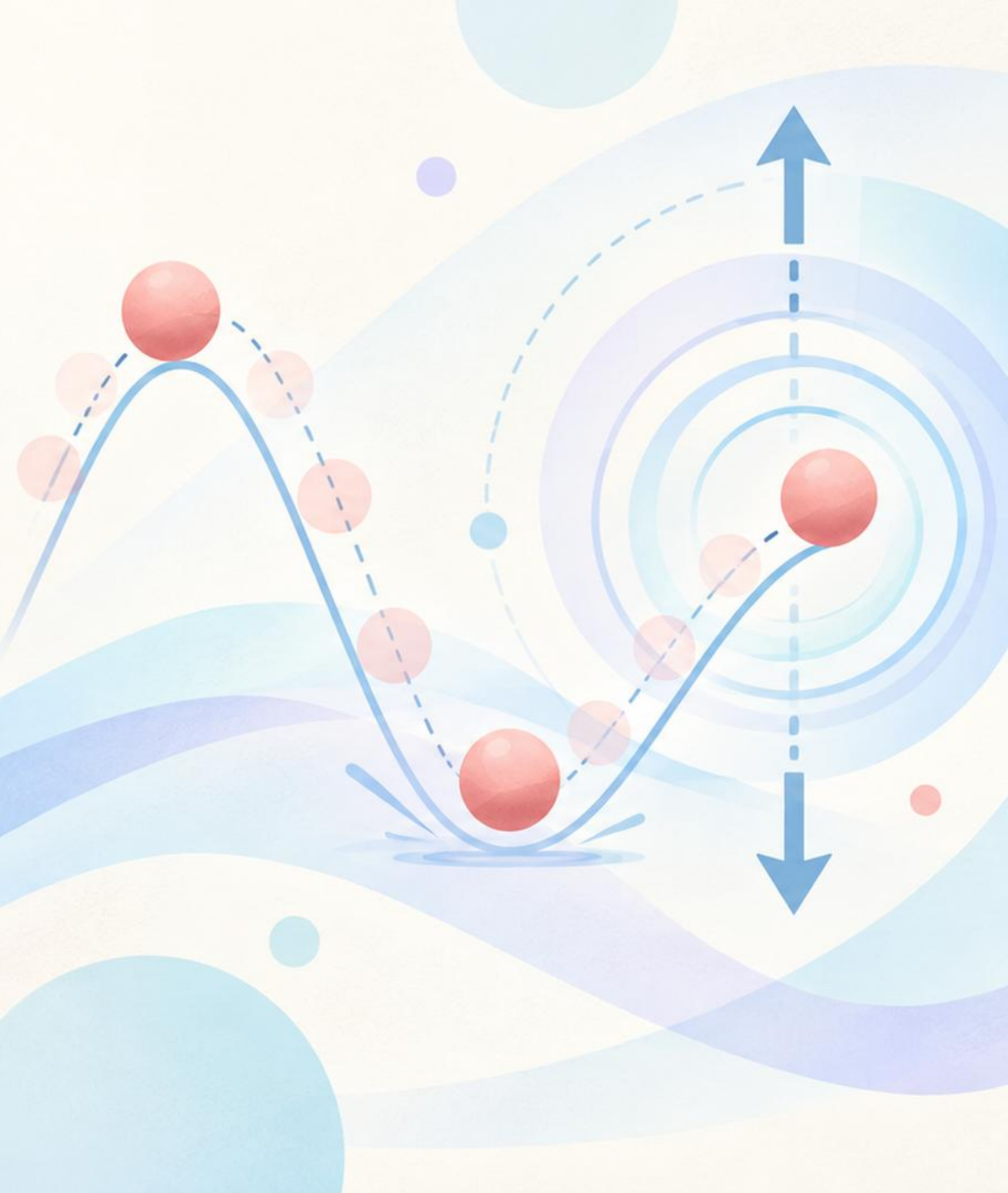


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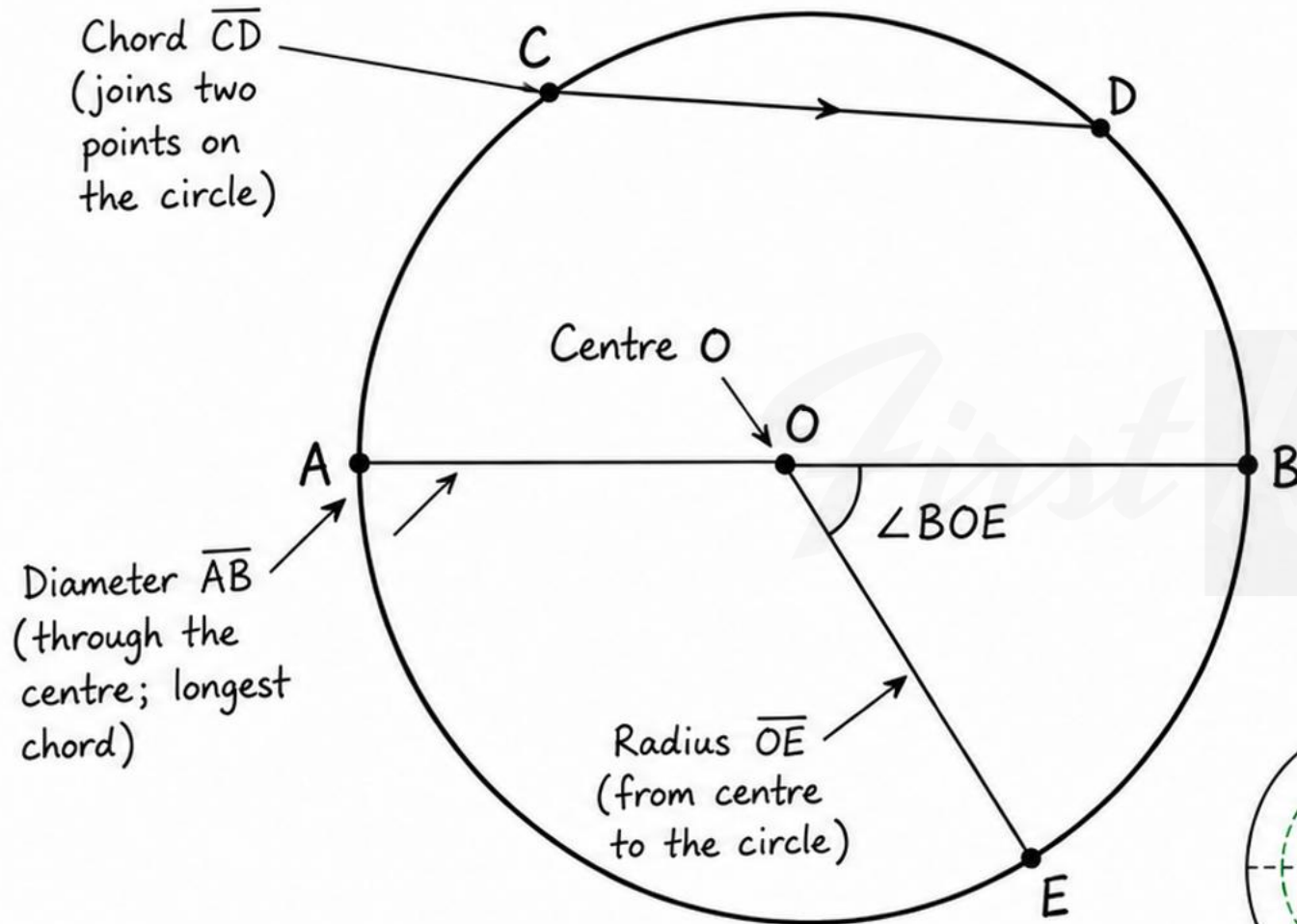
CHAPTER 5

I'm Up and Down, and Round and Round

CHAPTER NOTES

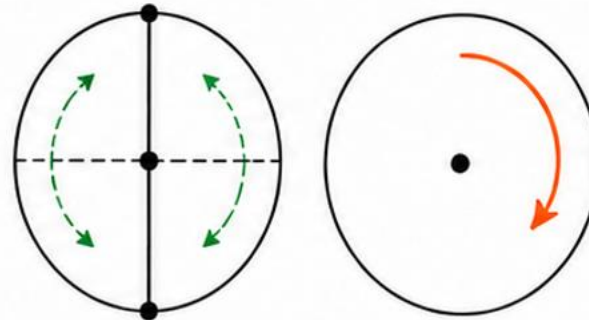


CIRCLE PARTS AND SYMMETRY



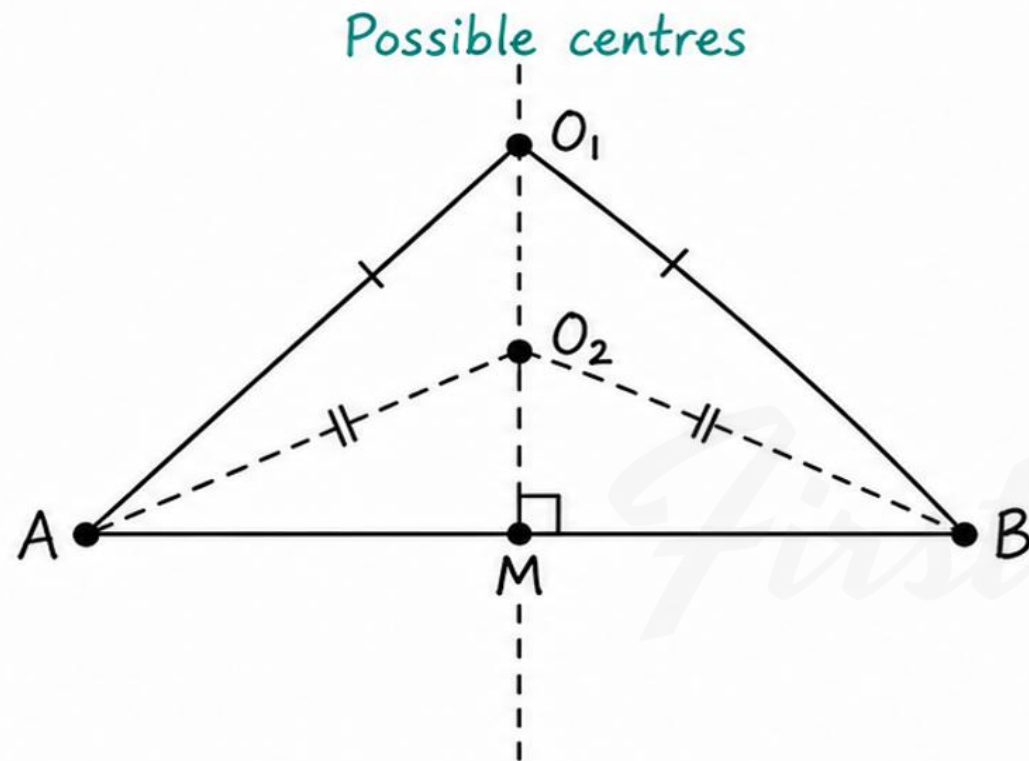
- A circle is the set of points in a plane at the same distance from a fixed point.
- The fixed point is the centre; the fixed distance is the radius.
- A chord joins two points of the circle.
- A diameter is a chord through the centre and is the longest chord.
- A central angle has its vertex at the centre.

$$OA = OB = r \quad \text{diameter} = 2r$$



- A circle has reflection symmetry about every diameter.
- Rotation about its centre through any angle leaves it unchanged.
- The circle is the boundary, not the filled-in region.

CIRCLES THROUGH TWO POINTS



$$O_1A = O_1B; \quad O_2A = O_2B.$$

- Minimum radius = $\frac{AB}{2}$, when $O = M$.
- This smallest circle has the segment as a diameter.
- There is no upper limit to the radius. Centres farther from the midpoint give larger circles.

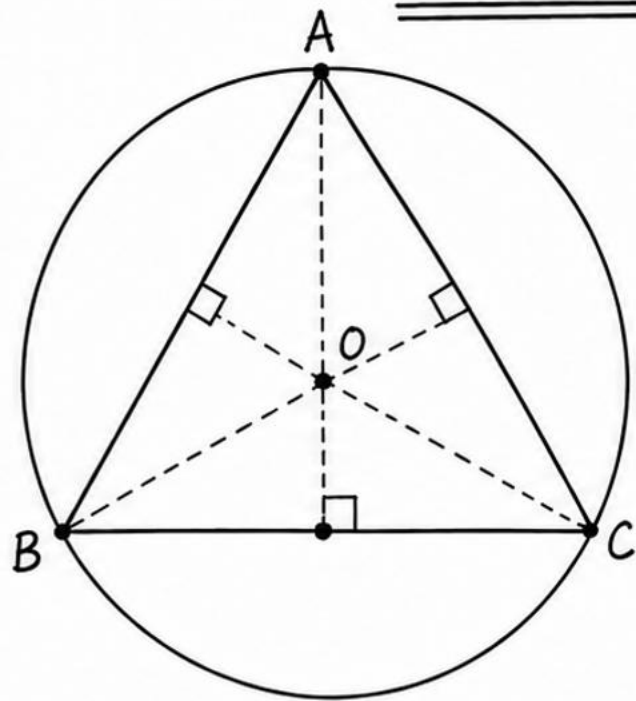
Infinitely many circles pass through two distinct points. Their centres lie on the perpendicular bisector of the segment joining the points.

- A circle through the two points has equal radii to them, so its centre is equidistant from the endpoints.

$$OA = OB.$$

- Conversely, every point on their perpendicular bisector is equidistant from them and can be used as a centre.

THREE POINTS AND CIRCUMCIRCLES



Exactly one circle passes through three non-collinear points.

Construction:

1. Join the three points to form a triangle.
2. Draw perpendicular bisectors of two sides.
3. Their intersection is the centre.
4. Draw a circle through any vertex.

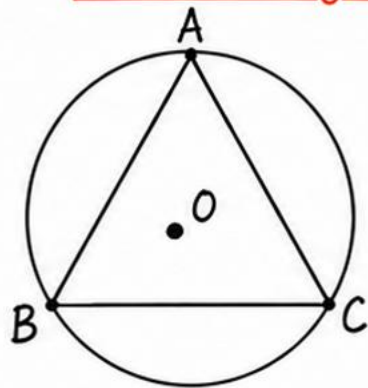
$$OA = OB \text{ and } OA = OC, \\ \text{so } OA = OB = OC.$$

A circumcircle passes through all three vertices of a triangle. Its centre is the circumcentre.

The triangle is inscribed in the circle; the circle is circumscribed about it.

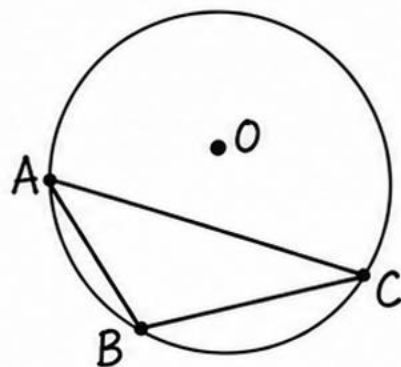
Three distinct collinear points cannot lie on one circle.

Acute Triangle



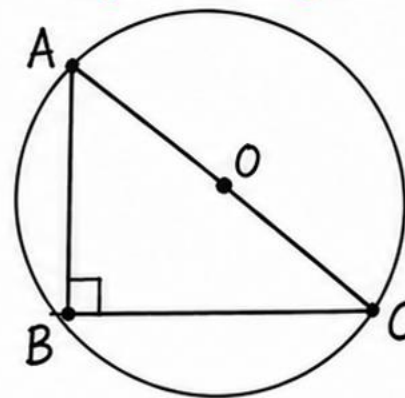
Centre inside the triangle.

Obtuse Triangle



Centre outside the triangle.

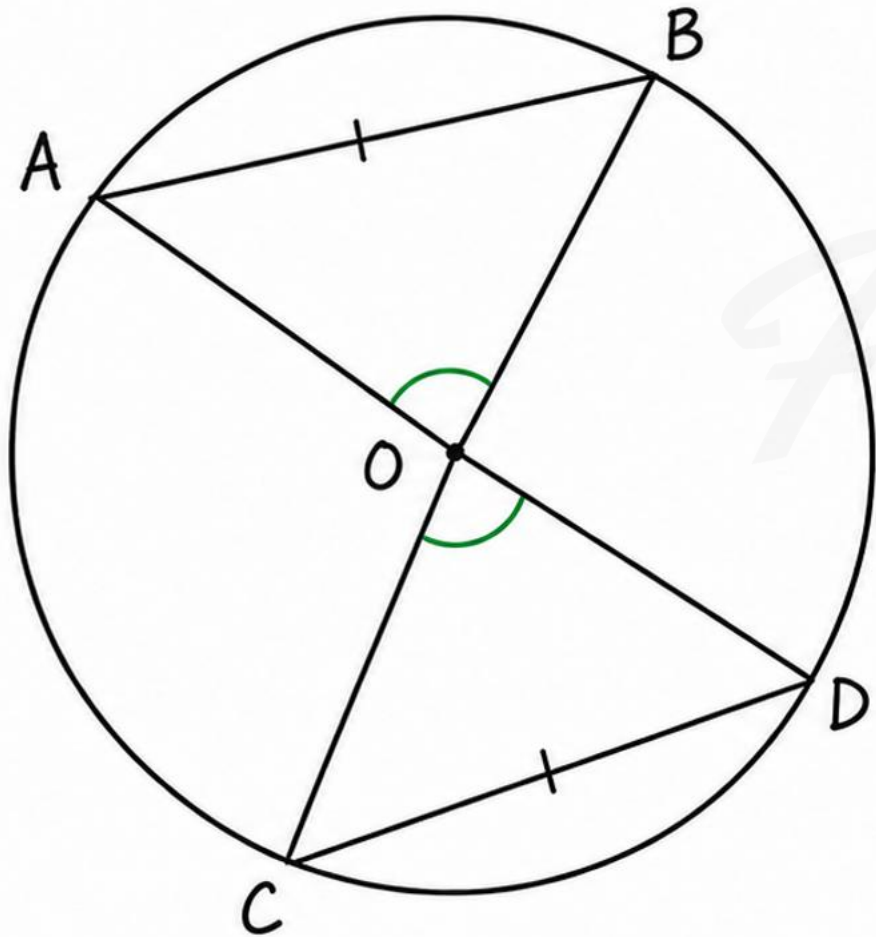
Right Triangle



Centre at the midpoint of the hypotenuse.

EQUAL CHORDS AND CENTRAL ANGLES

These results hold in the same circle or in congruent circles.



Equal chords $\rightarrow$ equal central angles

$$AB = CD$$

$$OA = OC, OB = OD \text{ (radii)}$$

$$\triangle OAB \cong \triangle OCD \text{ (SSS)}$$

$$\angle AOB = \angle COD$$

Compare the triangles formed by joining the chord endpoints to the centre.

Equal central angles $\rightarrow$ equal chords

$$\angle AOB = \angle COD$$

$$OA = OC, OB = OD$$

$$\triangle OAB \cong \triangle OCD \text{ (SAS)}$$

$$AB = CD$$

The second statement is the converse of the first.

Use the smaller central angles consistently, not a reflex angle.

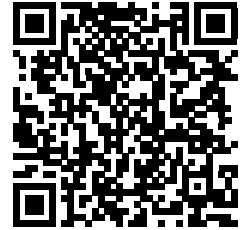


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