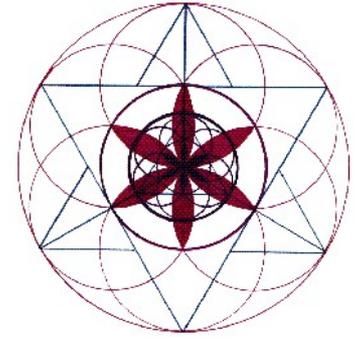


UNIT 3

GEOMETRY

WHAT'S GEOMETRY?



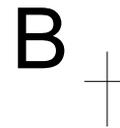
Geometry is the study of the size, shape and position of 2 dimensional shapes and 3 dimensional figures. In geometry, one explores spatial sense and geometric reasoning. Geometry is found everywhere: in art, architecture, engineering, robotics, land surveys, astronomy, sculptures, space, nature, sports, machines, cars and much more.

BASIC ELEMENTS IN GEOMETRY

The point: Points show position. We represent a point with two intersecting lines.

A point is shown by one capital letter.

A, B, C, ...

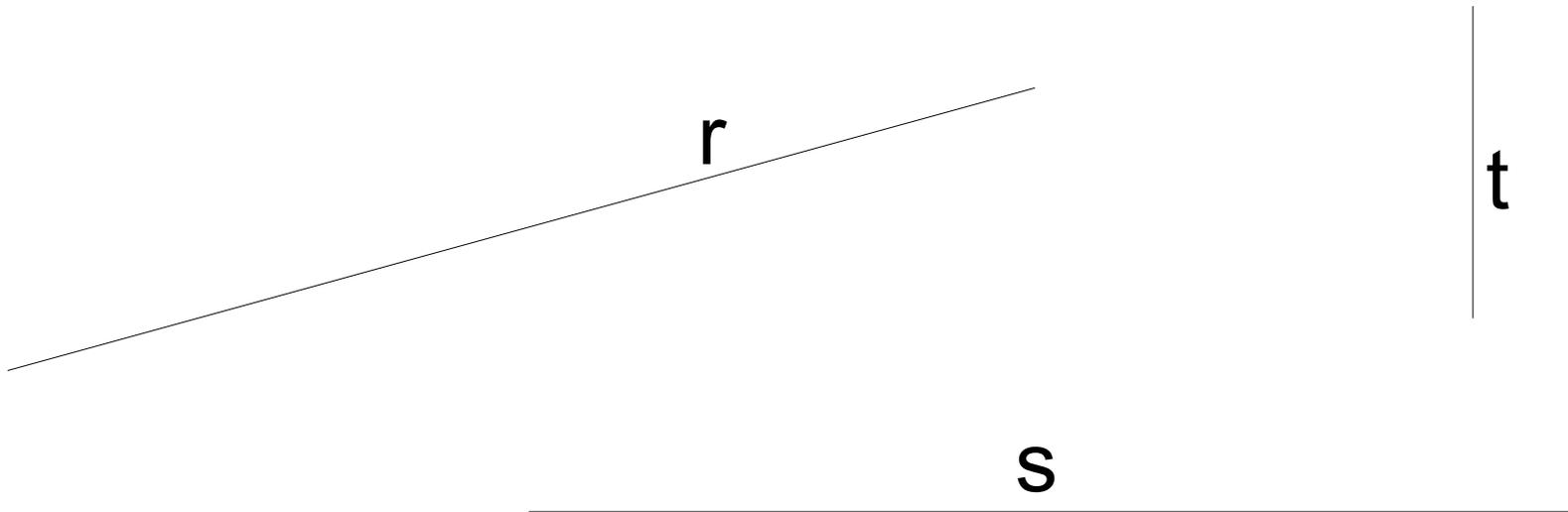


BASIC ELEMENTS IN GEOMETRY

The line: A line is infinite and straight.

A line is shown by one lowercase letter.

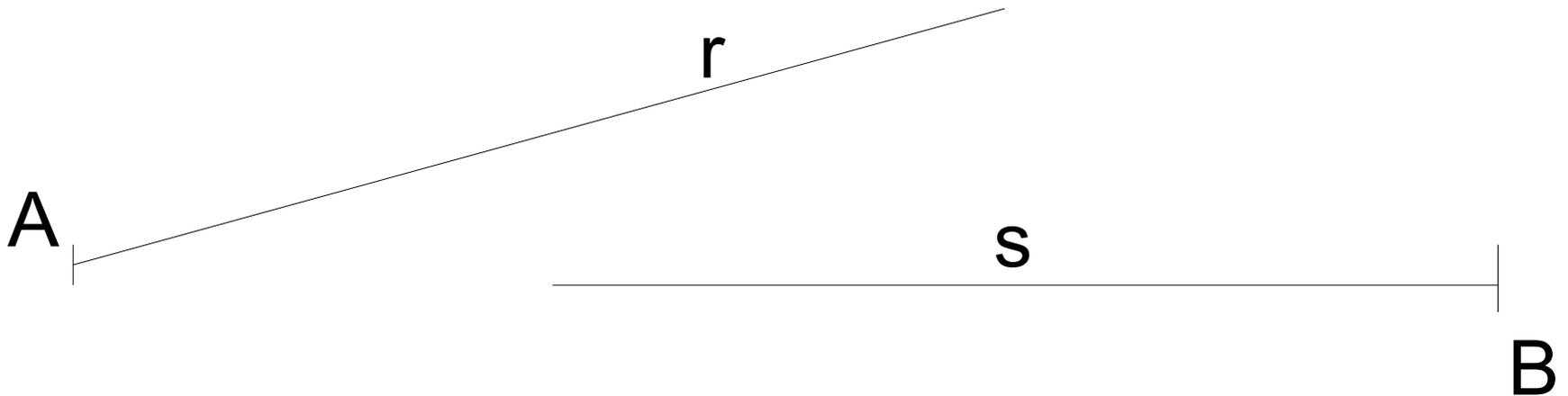
r, s, t, ...



BASIC ELEMENTS IN GEOMETRY

Half line: Half a line is a line that's limited at one end.

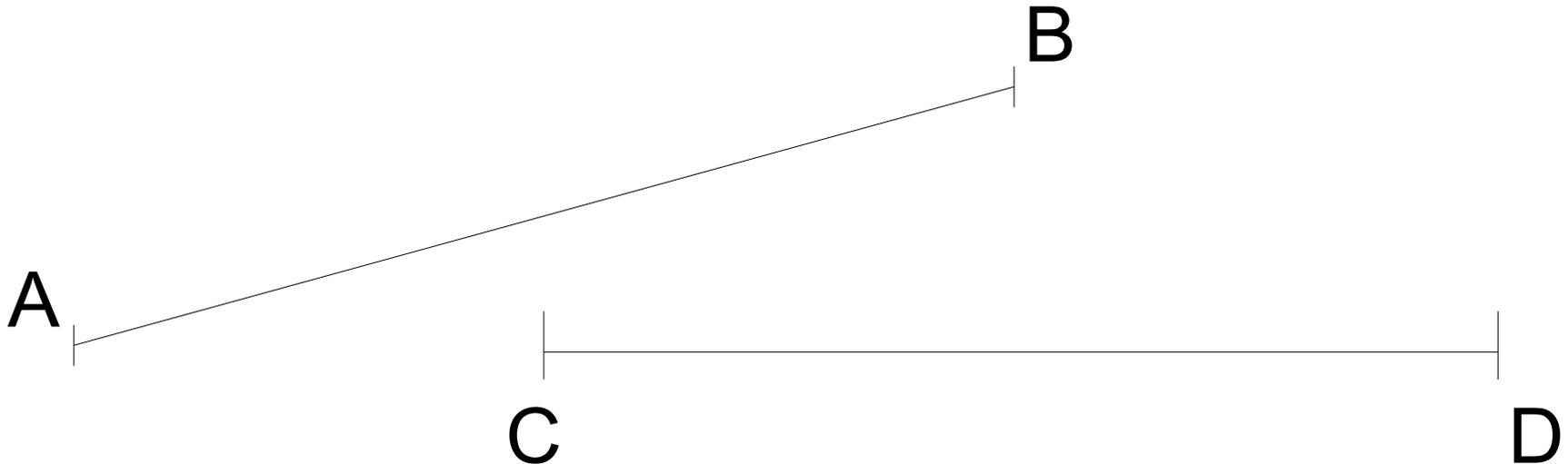
Half a line is represented by a point where it's limited and with the name of the line.



BASIC ELEMENTS IN GEOMETRY

Line segment: A line segment is the part of the straight line between two points.

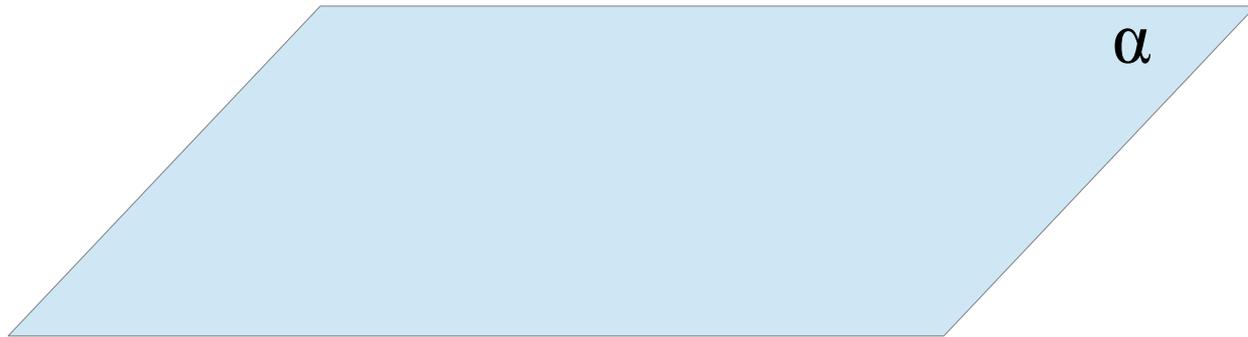
A line segment is represented by the name of the two points that limit it \overline{AB} , \overline{CD} .



BASIC ELEMENTS IN GEOMETRY

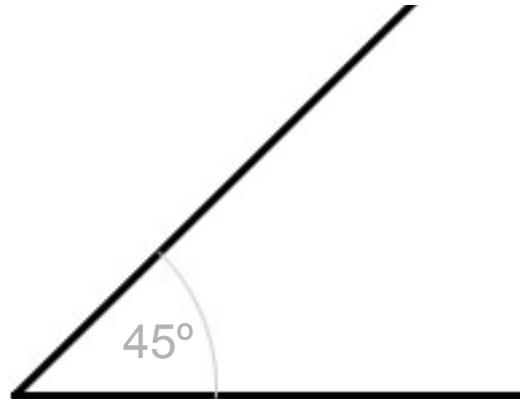
Plane: A plane is a two-dimensional group of points that goes on infinitely in all directions, made up of infinite lines.

A plane is shown by a greek letter. α , β , γ , δ , ϵ ,...



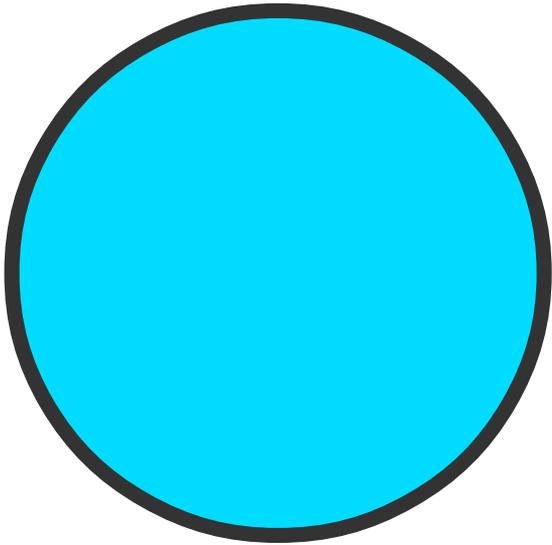
BASIC ELEMENTS IN GEOMETRY

Angle: An angle is the union of 2 lines that have the same endpoint. Angles are measured in degrees.



BASIC ELEMENTS IN GEOMETRY

CIRCLE AND CIRCUMFERENCE



- A **circle** is a shape with all points the same distance from the center.
- The **circumference** of a circle is the distance around the outside of the circle. It could be called the perimeter of the circle.

RELATIVE POSITIONS OF A STRAIGHT LINE IN SPACE

Horizontal:

s

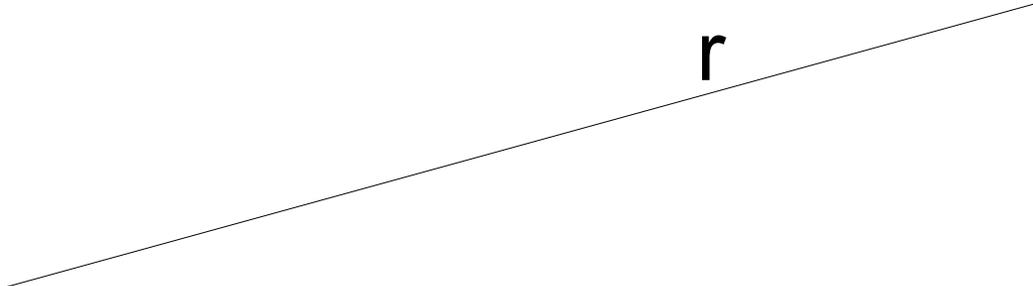


Vertical:

t

Oblique:

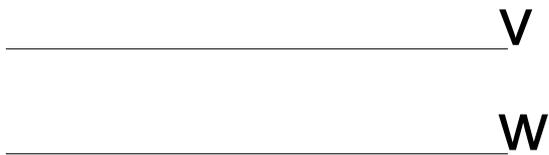
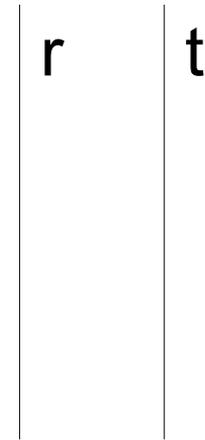
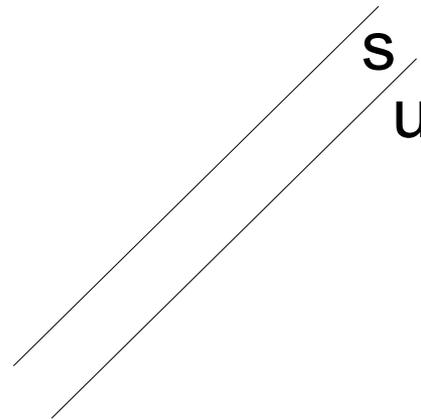
r



RELATIVE POSITIONS OF TWO LINES IN A PLANE

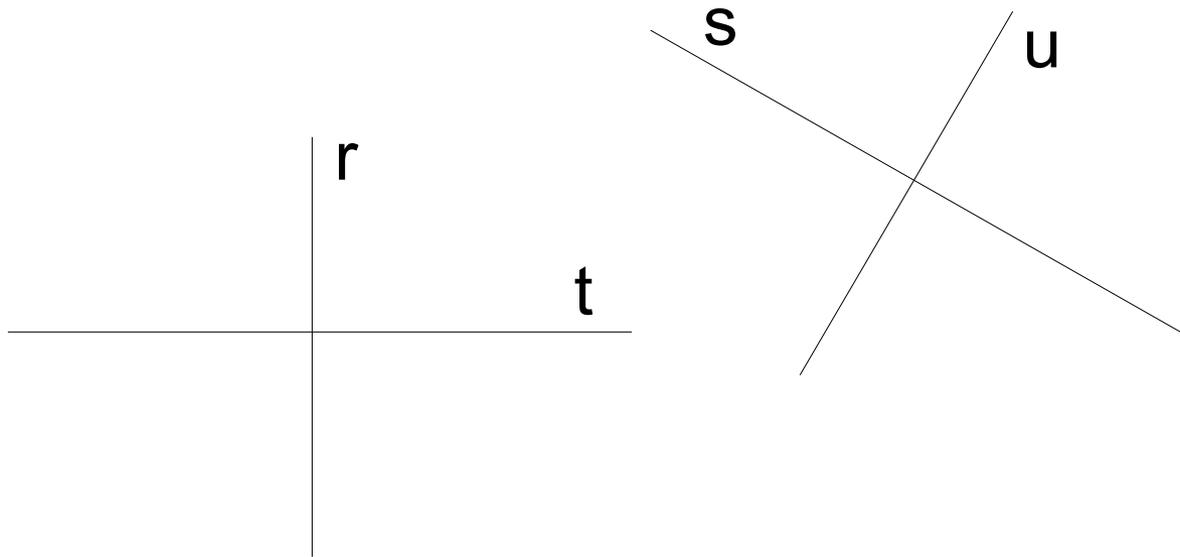
Parallel lines: two or more coplanar lines that have no points in common.

Representation: $r//t$

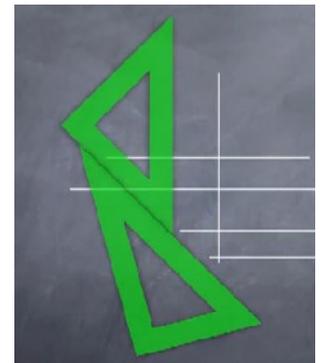


RELATIVE POSITIONS OF TWO LINES IN A PLANE

Perpendicular lines: two lines that form a 90 degree angle. Representation: $r \perp t$, $s \perp u$



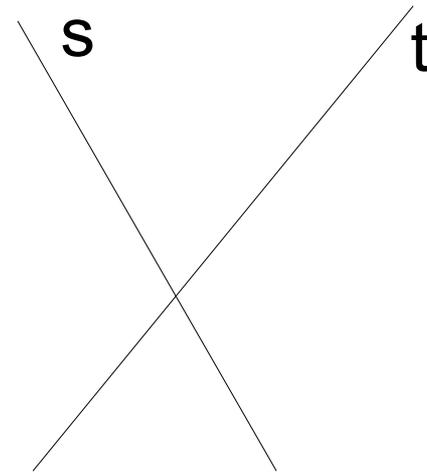
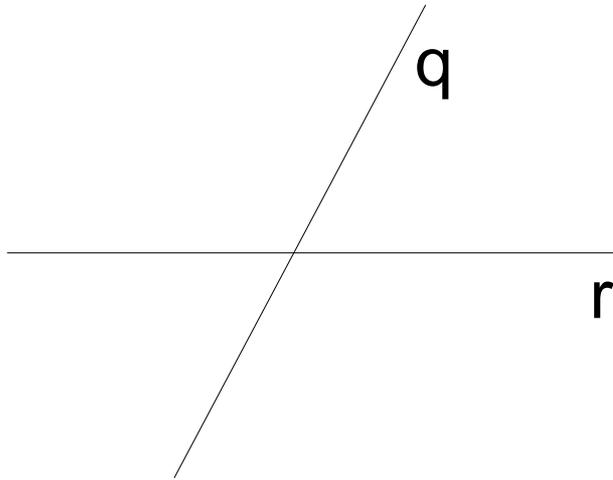
Compass procedure in our books on page 79



RELATIVE POSITIONS OF TWO LINES IN A PLANE

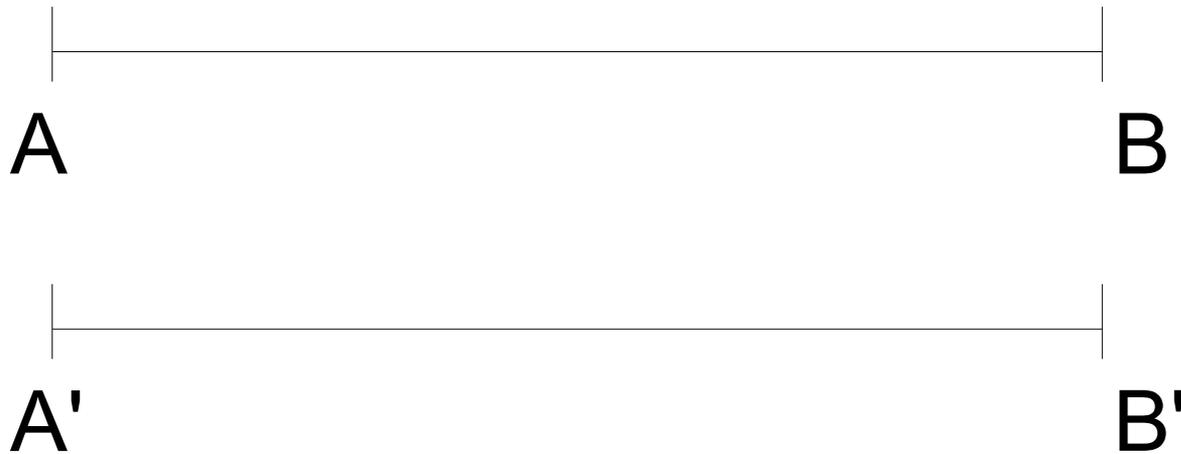
Oblique lines: Two lines that intersect with a different angle to 90° .

Representation: $q \not\perp r, s \not\perp t$



BASIC LINE DRAWING WITH SEGMENTS

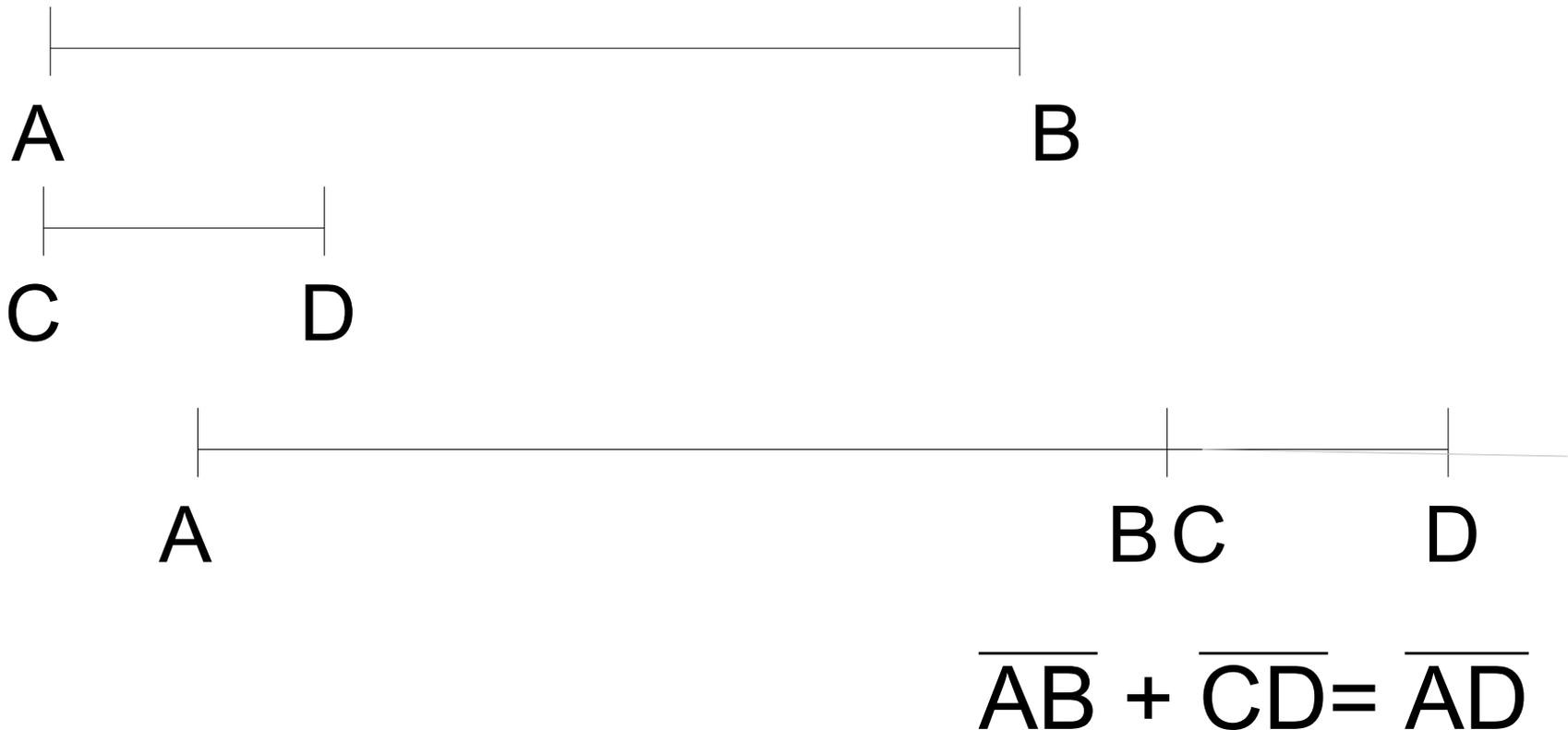
To copy a line segment: Compass procedure.



$$\overline{AB} = \overline{A'B'}$$

BASIC LINE DRAWING WITH SEGMENTS

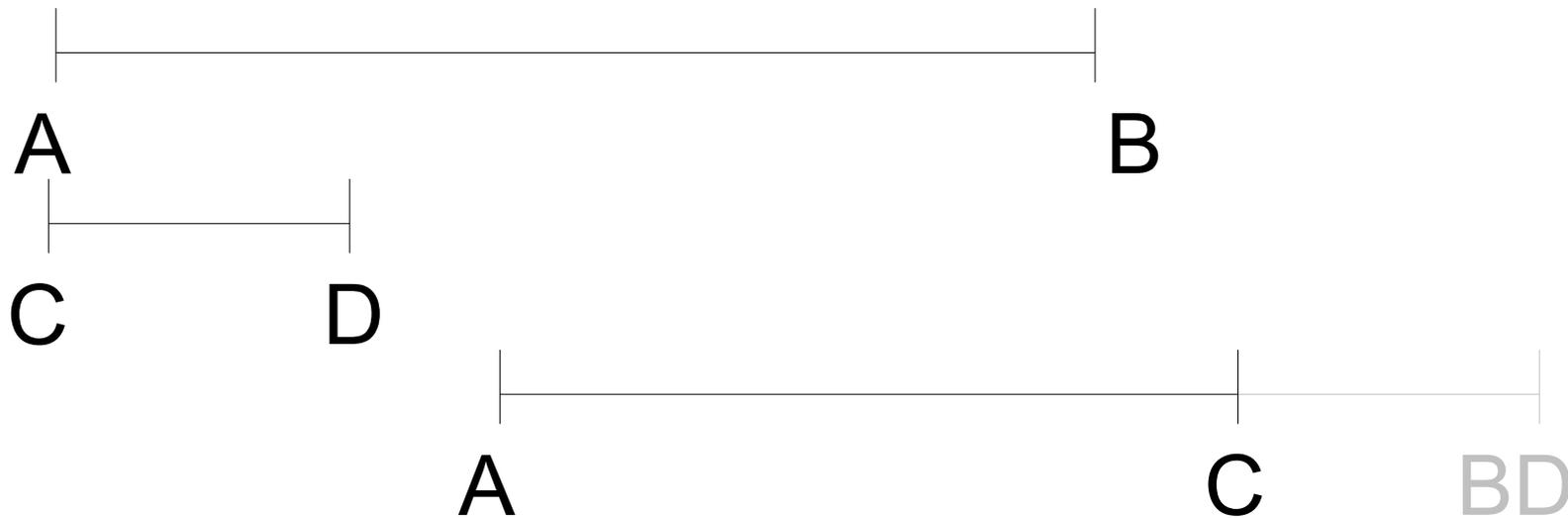
To add two line segments: Compass procedure.



BASIC LINE DRAWING WITH SEGMENTS

To subtract one line segment to another:

Compass procedure.

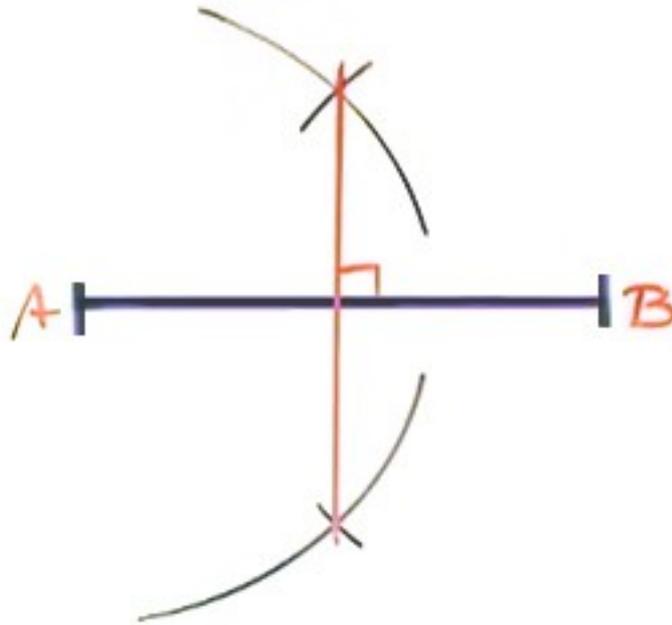


$$\overline{AB} - \overline{CD} = \overline{AC}$$

BASIC LINE DRAWING WITH SEGMENTS

Segment bisector: The segment bisector is the perpendicular line which passes through the midpoint of a segment.

How to draw it:



In our books on page 79 (mediatriz)

BASIC LINE DRAWING WITH SEGMENTS

To divide a line segment into “n” equal parts:

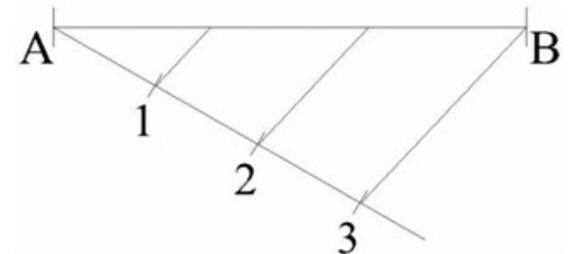
Step 1: Draw half a line at any angle from endpoint A.

Step 2: Draw three arcs of equal size on the sloping line. Label the arcs.

Step 3: Draw a line from the last arc (3) to the endpoint B.

Step 4: Draw parallel lines from the other arcs.

Line \overline{AB} is now divided exactly into three equal parts.

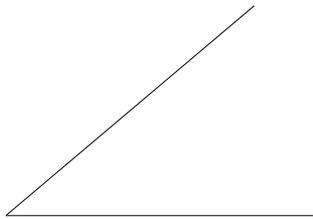


In our books on page 81
(división de un segmento en partes iguales).

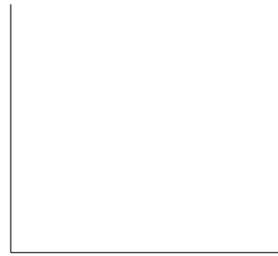
ANGLES

types of angles

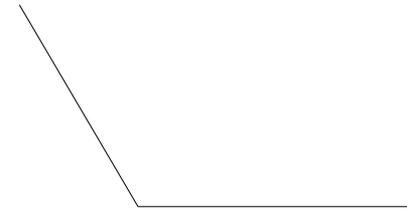
ACUTE ANGLE: $< 90^\circ$



RIGHT ANGLE: $= 90^\circ$



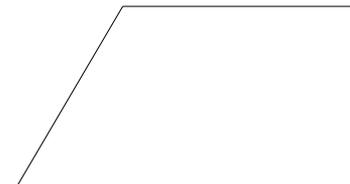
OBTUSE ANGLE: $> 90^\circ < 180^\circ$



STRAIGHT ANGLE: $= 180^\circ$



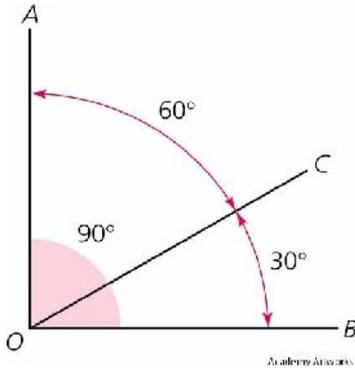
REFLEX ANGLE: $> 180^\circ < 360^\circ$



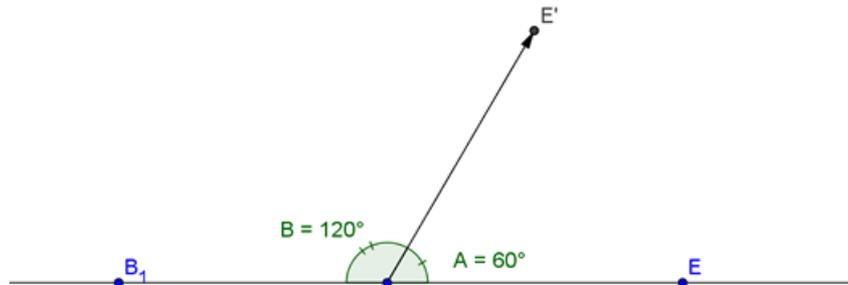
ANGLES

pairs of angles

COMPLEMENTARY ANGLES: Two angles adding up to 90° are called complementary angles.



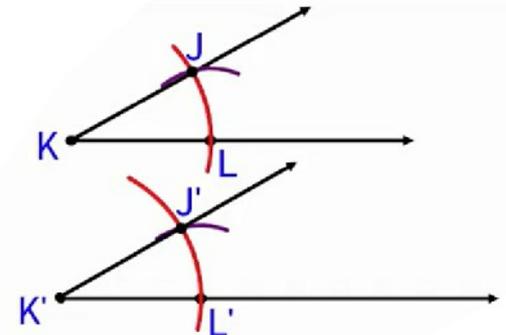
SUPPLEMENTARY ANGLES: Two angles adding up to 180° are called supplementary angles.



BASIC LINE DRAWING WITH ANGLES

To copy an angle:

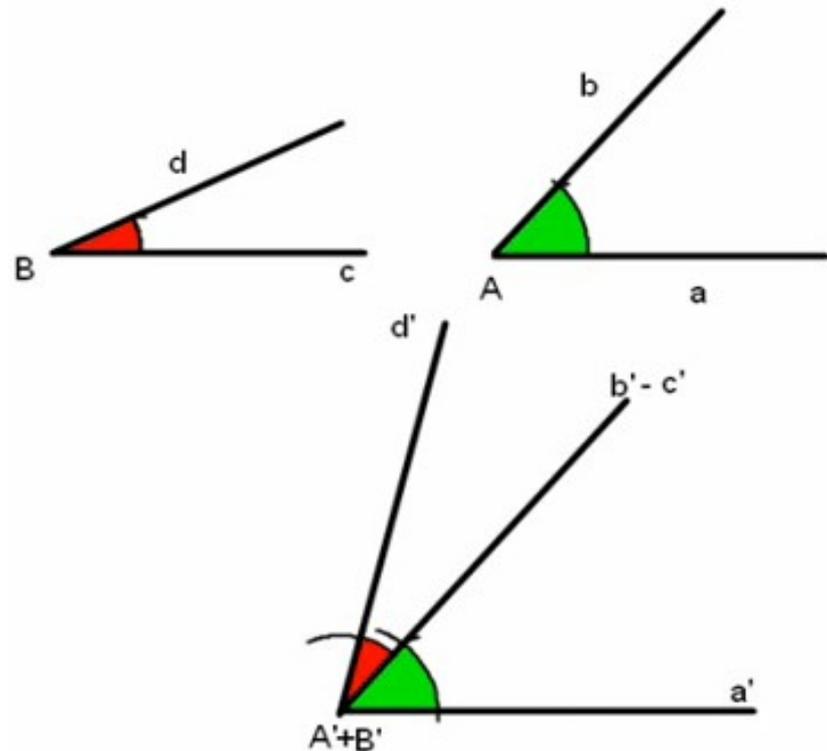
1. Create a line longer than the rays in the angle.
2. Place the compass point at the vertex and the pencil on a point of the angle. Create an arc that touches both sides of the angle.
3. Without changing the compass measure, create a similar arc on the line you drew.
4. With the compass, measure the size of the 1st arc between the two rays. Without changing the measure, place the compass' point where your line touches it's arc.
5. Create an arc that crosses your line's first arc.
6. Join the vertex of your line with the intersection point you created.



BASIC LINE DRAWING WITH ANGLES

To add two angles:

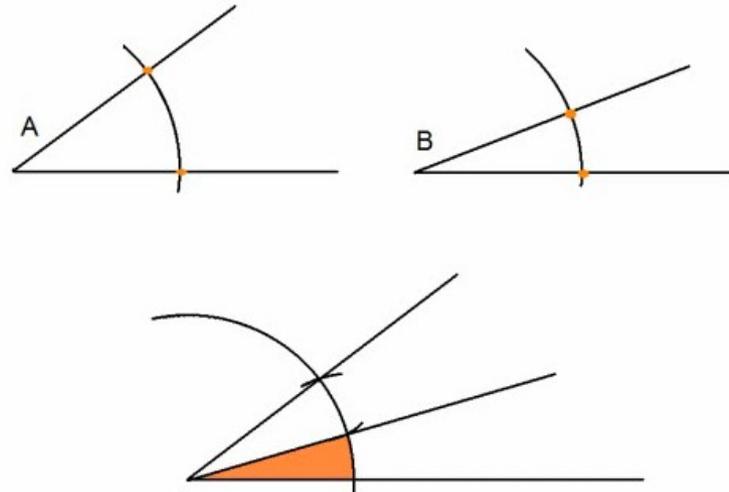
1. Copy the first angle as we have studied.
2. Copy the second angle making sure one of the sides of both angles is common and the second angle is drawn above the first one.



BASIC LINE DRAWING WITH ANGLES

To subtract two angles:

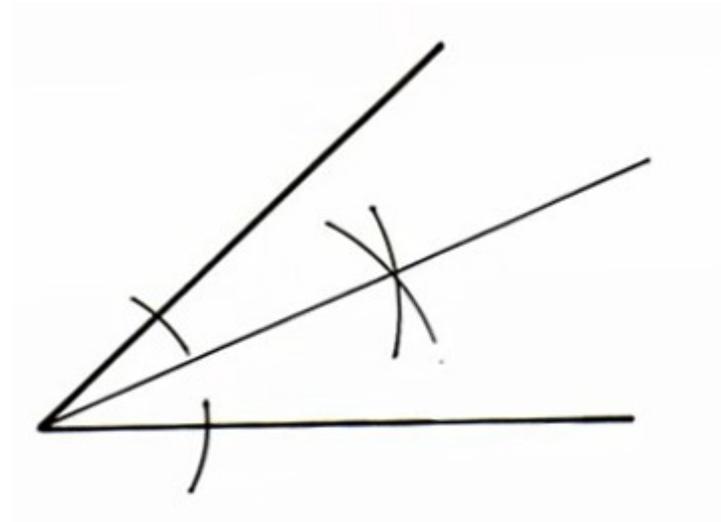
1. Copy the first angle as we have studied.
2. Copy the second angle making sure one of the sides of both angles is common and the smallest of the angles is in the biggest of them.



BASIC LINE DRAWING WITH SEGMENTS

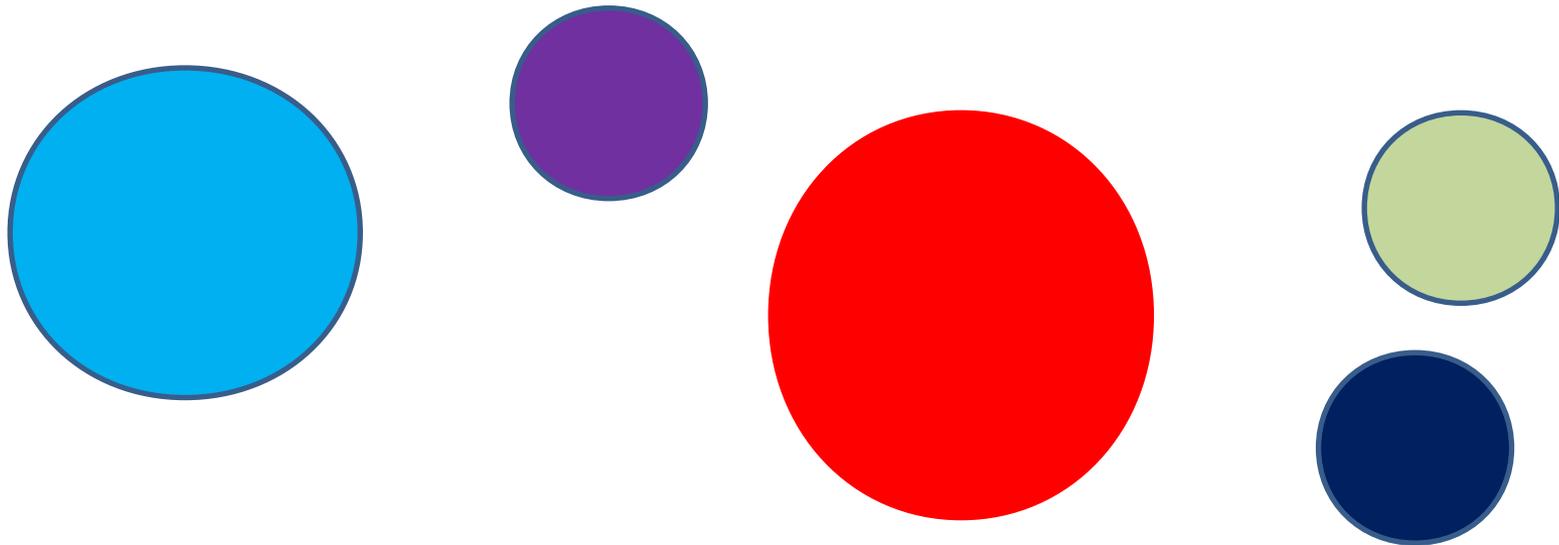
Angle bisector: a ray that is in the interior of an angle and forms two equal angles with the sides of that angle.

How to draw it:



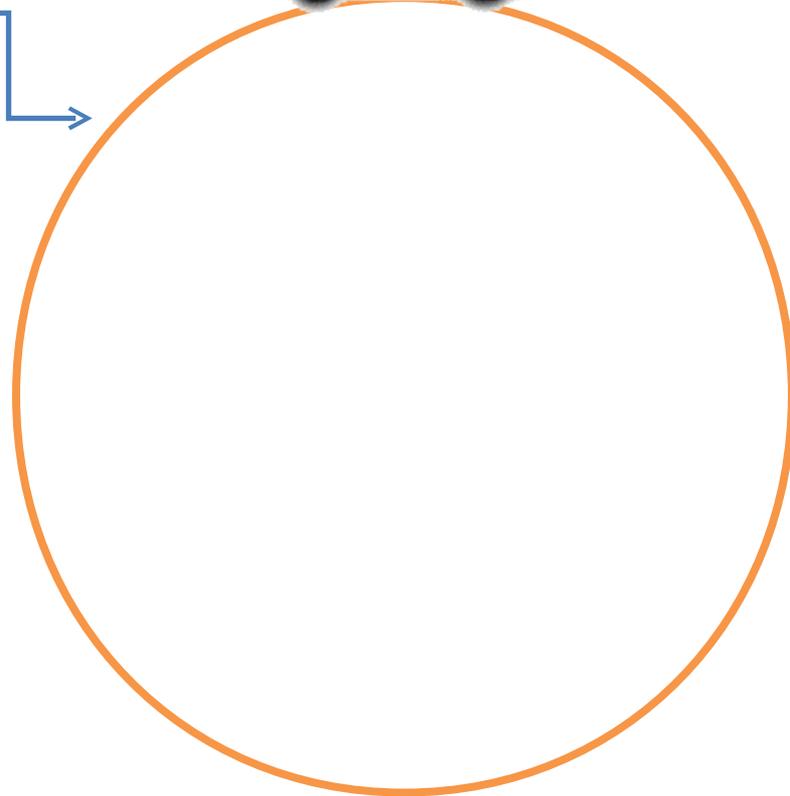
In our books on page 79 (bisectriz)

PARTS OF A CIRCLE



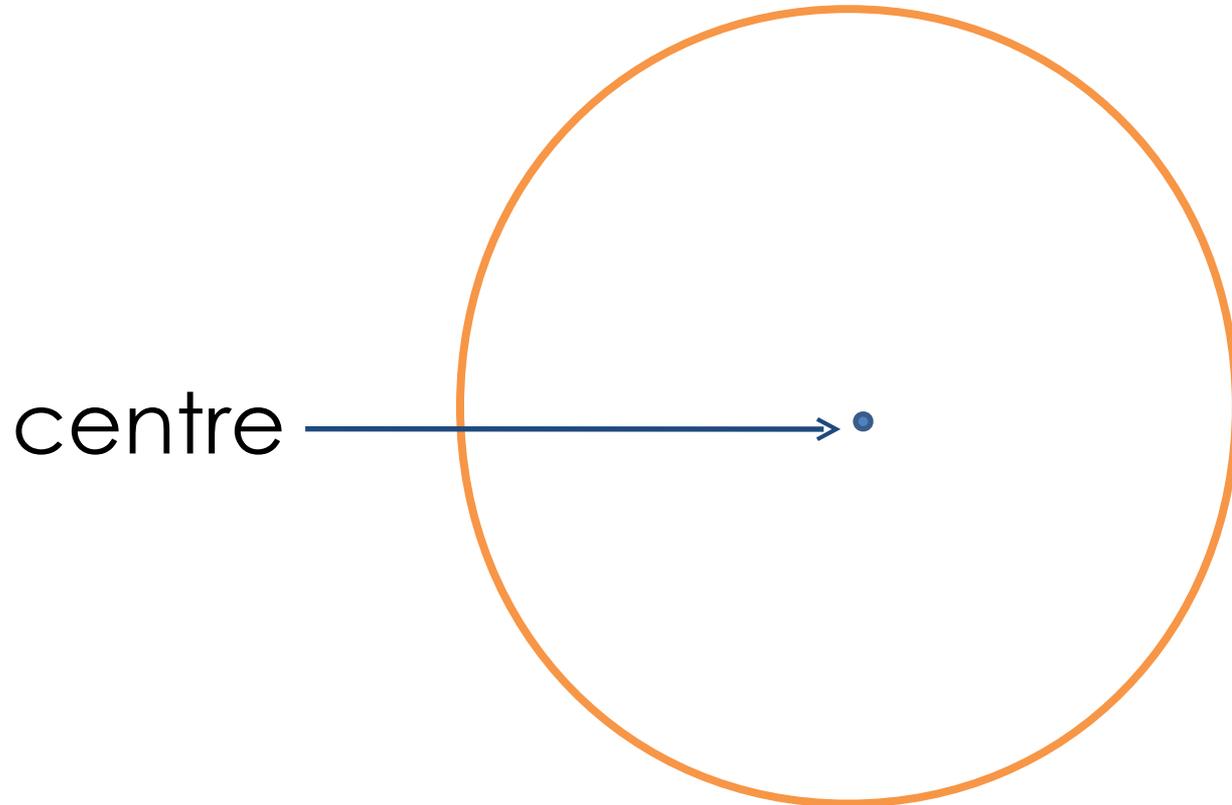
The outside of the circle is called

circumference

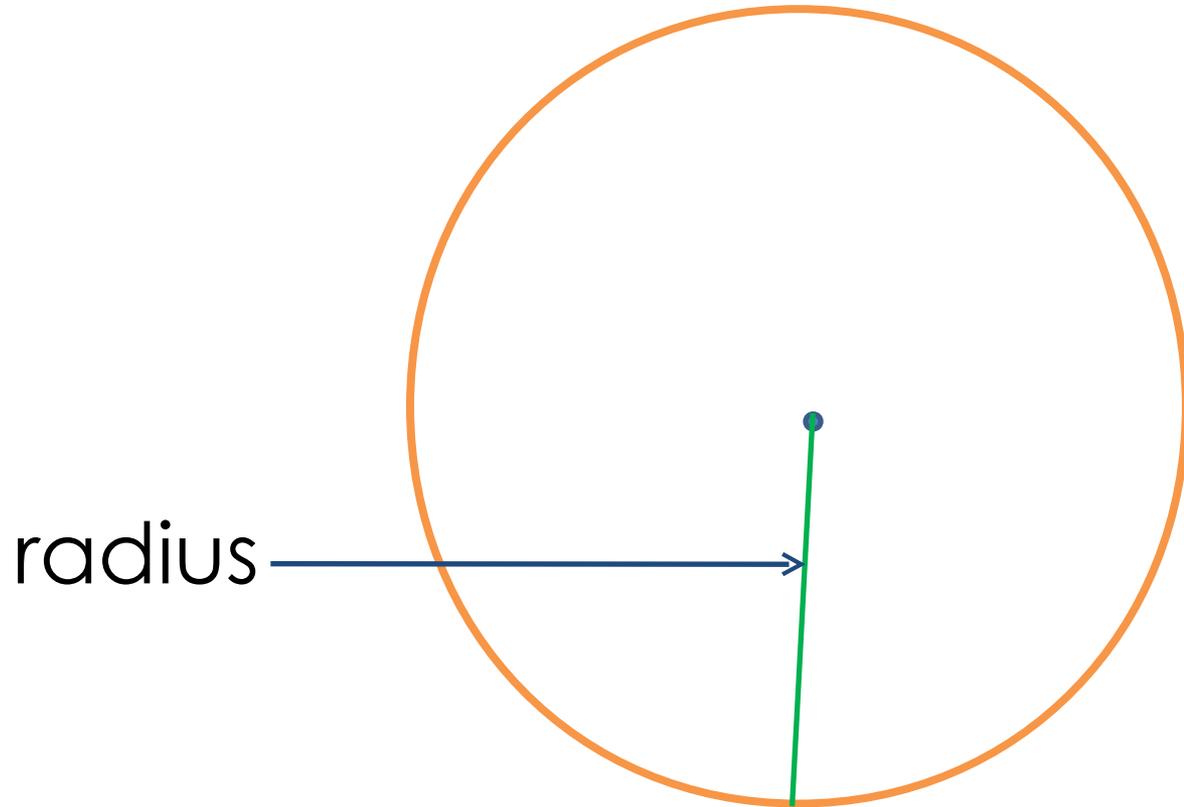


The circumference is the **distance** around the circle.

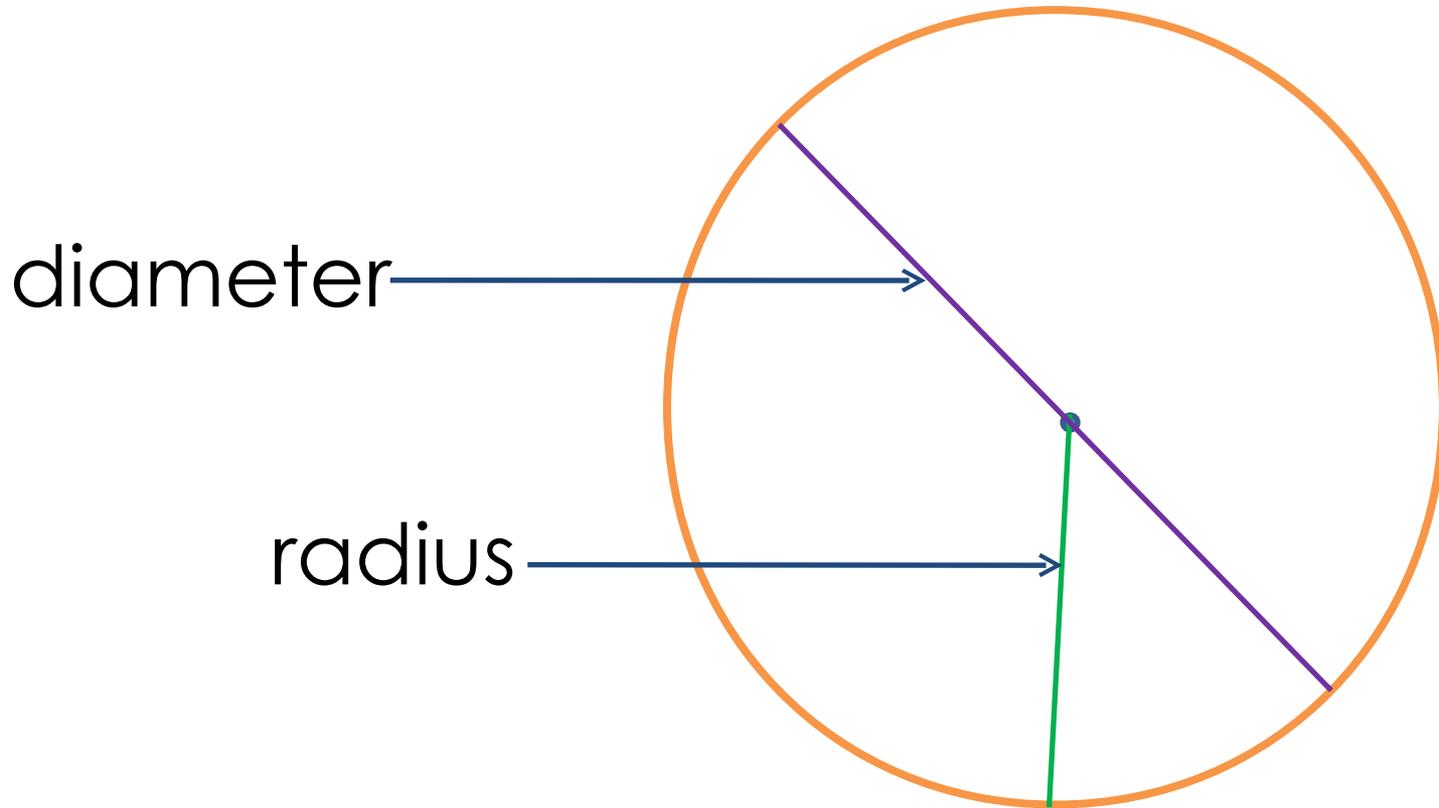
The midpoint of a circle is



The line drawn from the centre to the circumference is ...



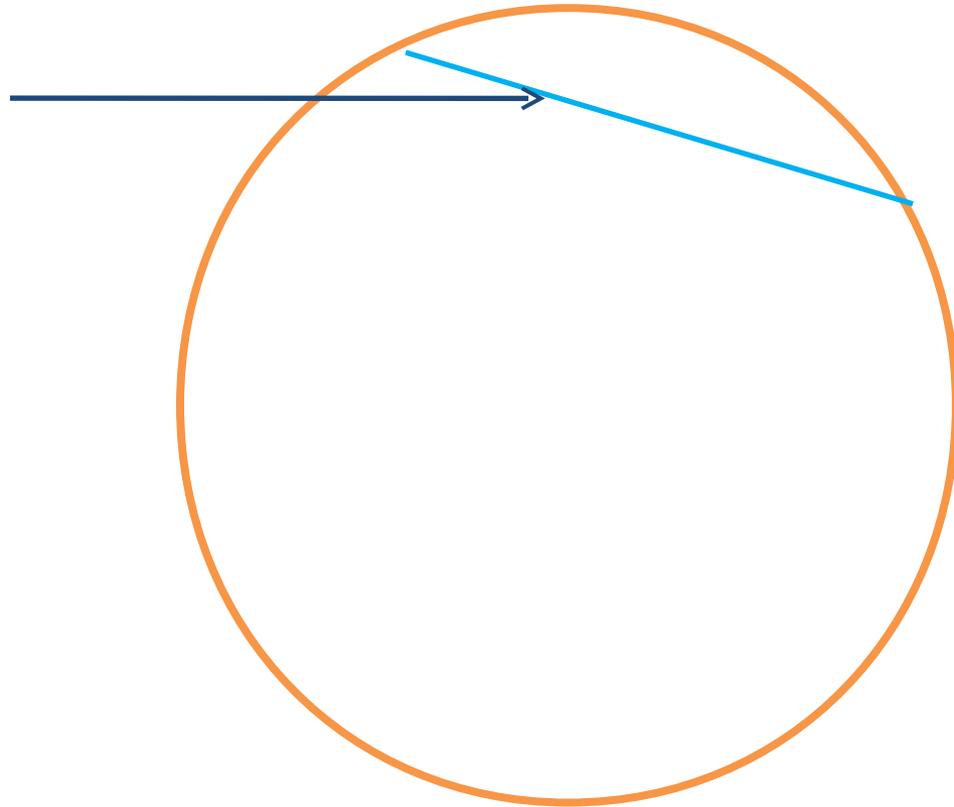
The line drawn from one circumference through the centre to another circumference is ...



The diameter cuts the circle in half!

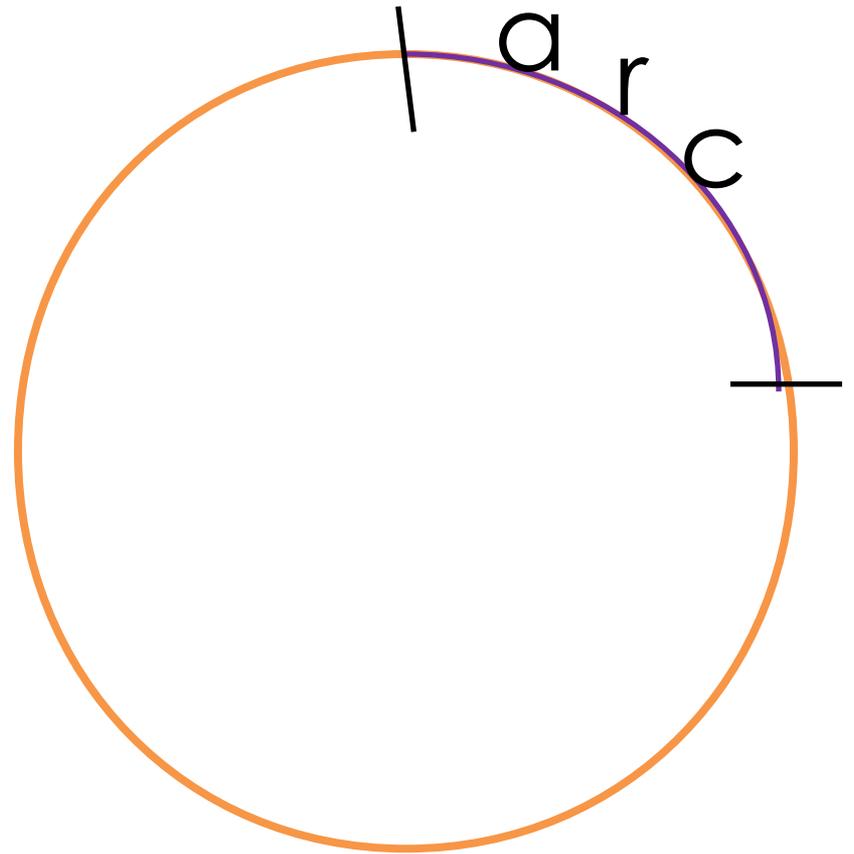
A line that connects one point on the edge of the circle with another point on the circle is called

chord

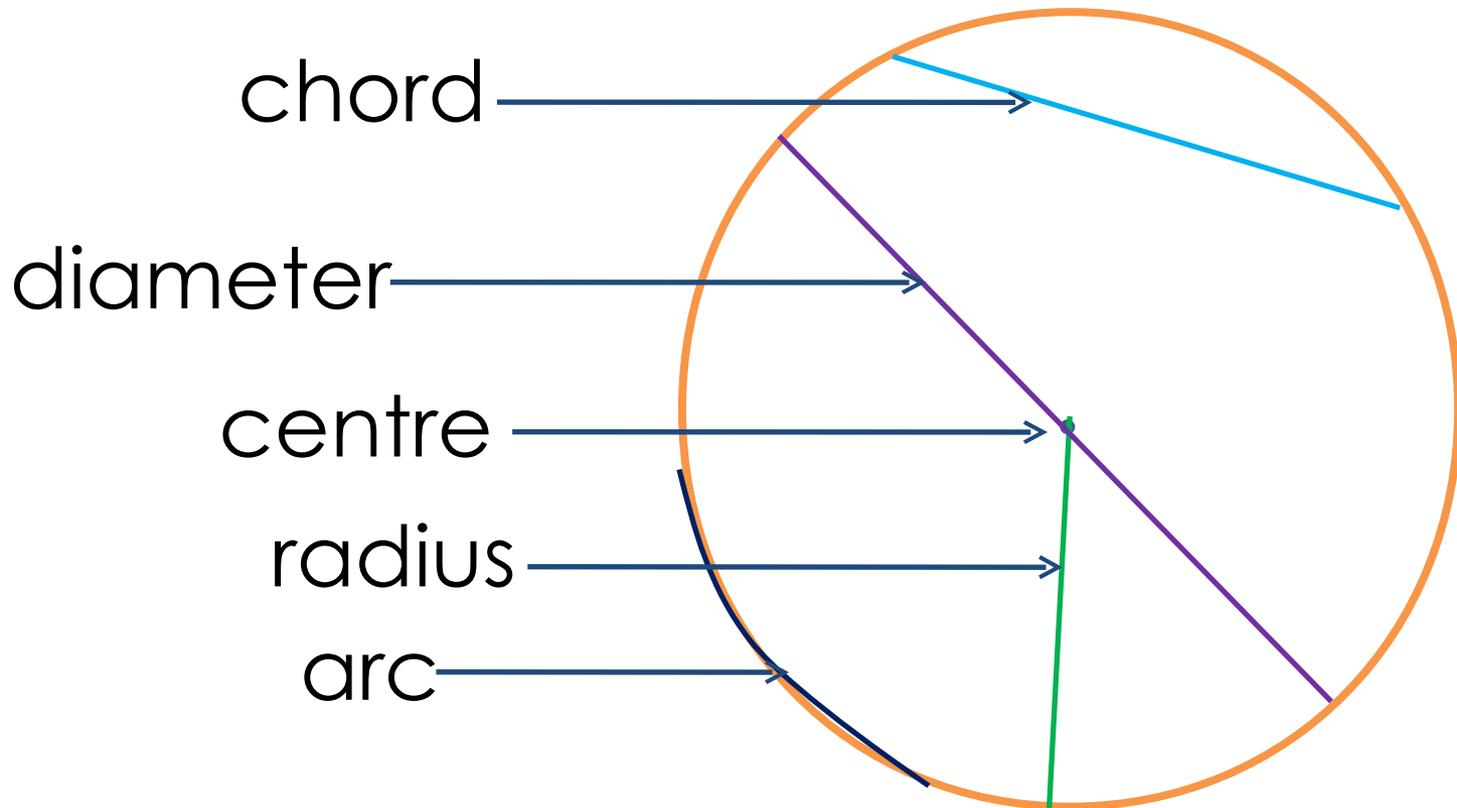


The chord that passes through the centre of the circle is the diameter.

A **segment** of the circumference of the circle is called an ...



Parts of the Circle

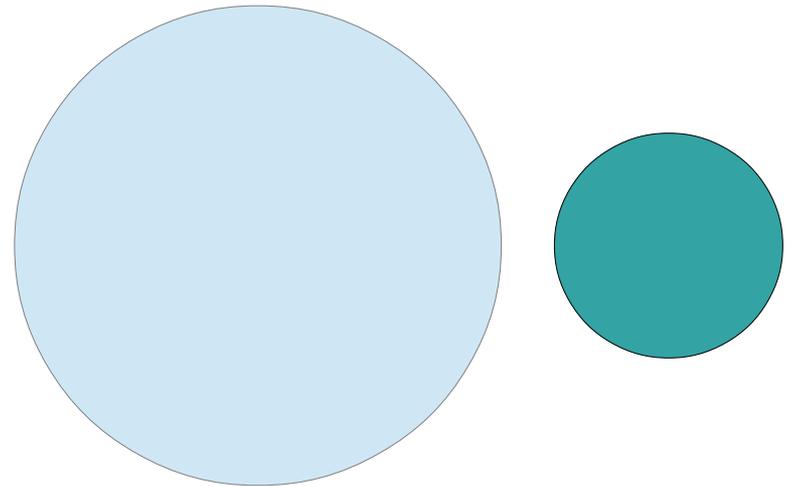
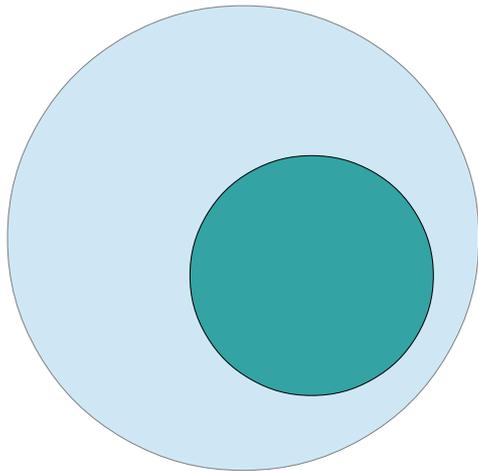


RELATIONSHIP BETWEEN CIRCUMFERENCES

Interior

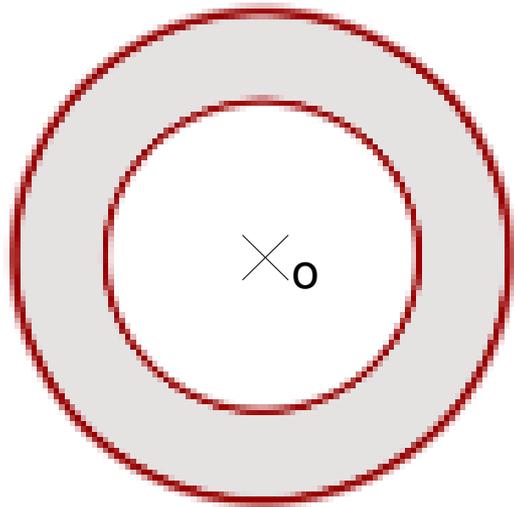
and

exterior



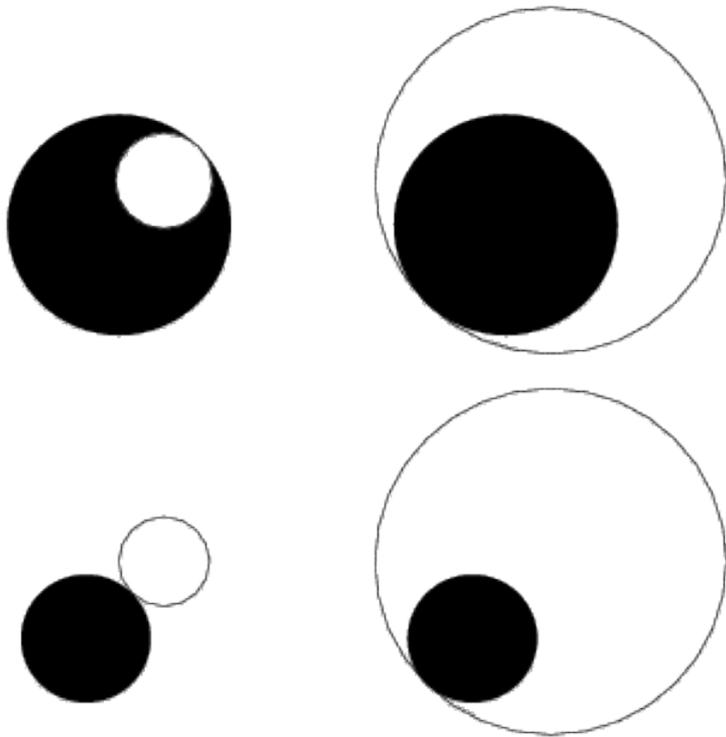
circles.

RELATIONSHIP BETWEEN CIRCUMFERENCES



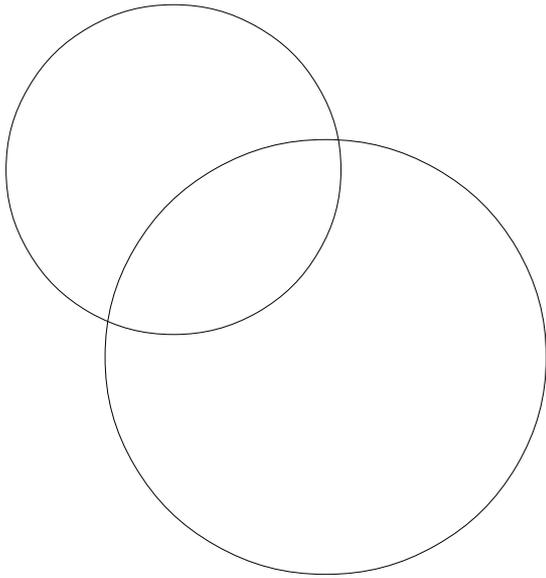
Two circles are **concentric** if they have the same center.

RELATIONSHIP BETWEEN CIRCUMFERENCES



Tangent circles (also known as **kissing circles**) are circles in a common plane that intersect in a single point. There are two types of tangency: **internal** and **external**.

RELATIONSHIP BETWEEN CIRCUMFERENCES



Secant circles are circles in a common plane that intersect in two points.

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