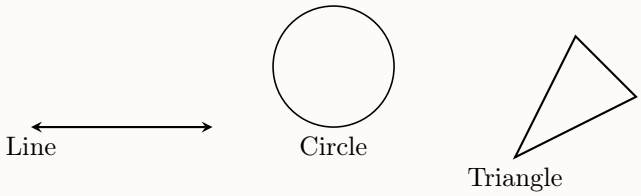
2D SHAPES

A PLANE GEOMETRY

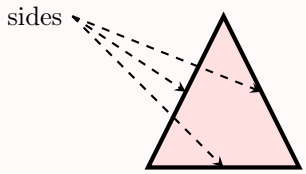
Definition Plane Geometry

Plane Geometry is the study of flat shapes that you see in pictures or on paper. These shapes include lines, circles, triangles, squares, and rectangles. We call them flat because they have length and width, but no thickness.



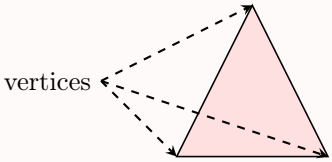
Definition Side

A **side** is a straight edge of a shape.



Definition Vertex

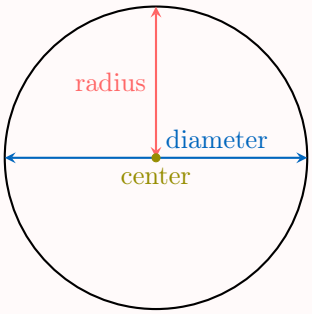
A **vertex** (more than one: *vertices*) is a point where two sides meet.



B CIRCLES

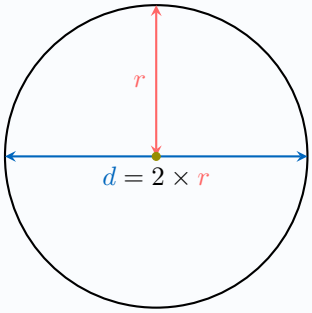
Definition Circle

A **circle** is a flat shape. Every point on the circle is the same distance from a point called the **center**.
The **radius** is a line segment from the center to a point on the circle. The radius is also the length of this segment.
The **diameter** is a line segment that goes across the circle through the center and connects two points on the circle. The diameter is also the length of this segment.

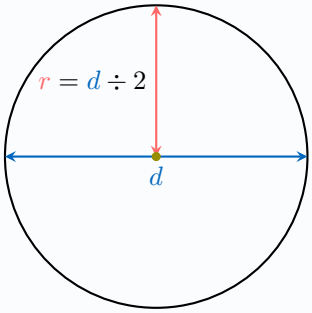


Proposition Diameter-Radius Rule

- The diameter is twice as long as the radius: $d = 2 \times r$.



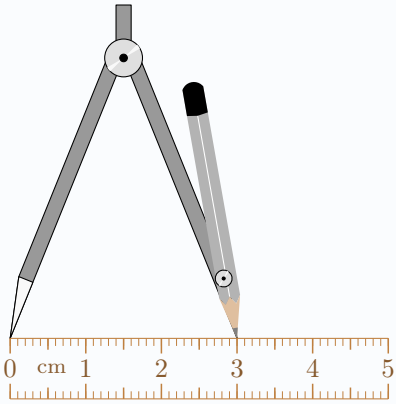
- The radius is half of the diameter: $r = d \div 2$.



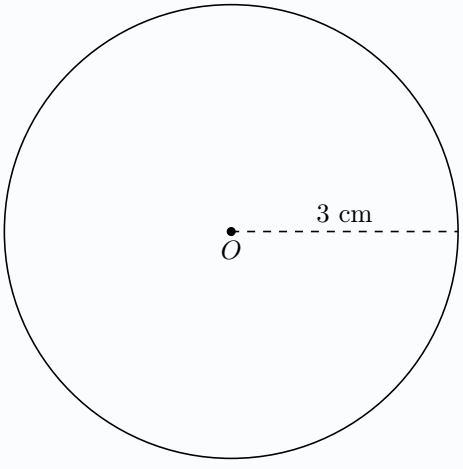
Method **Constructing a Circle**

To construct a circle with a radius of 3 cm at center O:

1. Set your compass to a radius of 3 cm. To do this, open your compass so the distance between the pencil tip and the needle is 3 cm. You can measure this distance using your ruler.



2. Place the needle of your compass on point O. Hold the compass steady and rotate the pencil around O to draw the full circle.



C POLYGONS

Definition Polygon

A **polygon** is a flat, closed shape made of straight sides that do not cross each other.

Ex: Look at the shapes below. Decide if each one is a polygon.

a)  b)  c)  d) 

Answer:

a) 
Yes, it is a polygon.

b) 
No, it has a curved side.

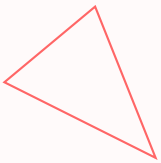
c) 
No, the sides cross.

d) 
No, it is not closed.

D TRIANGLES

Definition Triangle

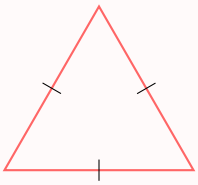
A **triangle** is a polygon with three sides (and therefore three vertices and three angles).



We can classify triangles by looking at how many of their sides are equal in length.

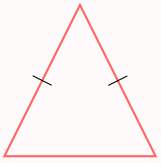
Definition Equilateral triangle

An **equilateral triangle** is a triangle in which all three sides are equal in length and all three angles are equal.



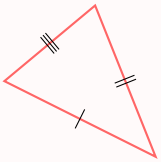
Definition Isosceles triangle

An **isosceles triangle** is a triangle in which exactly two sides are equal in length.



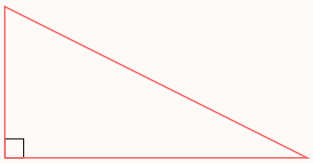
Definition Scalene triangle

A **scalene triangle** is a triangle in which all three sides have different lengths (no sides are equal).



Definition **Right-angled triangle**

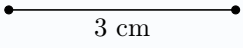
A **right-angled triangle** is a triangle with one right angle (an angle of 90°).



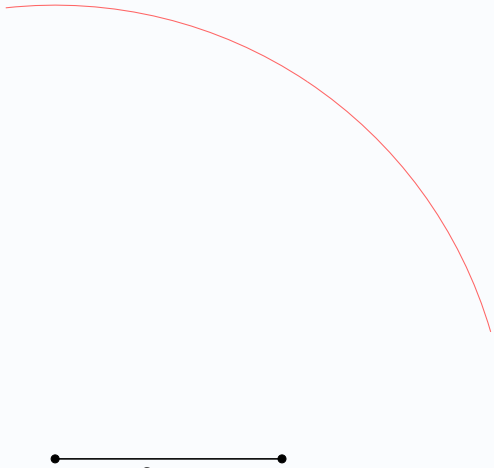
Method **Constructing a triangle with a ruler and compass**

To construct a triangle ABC with $AB = 3$ cm, $AC = 6$ cm, and $BC = 5$ cm:

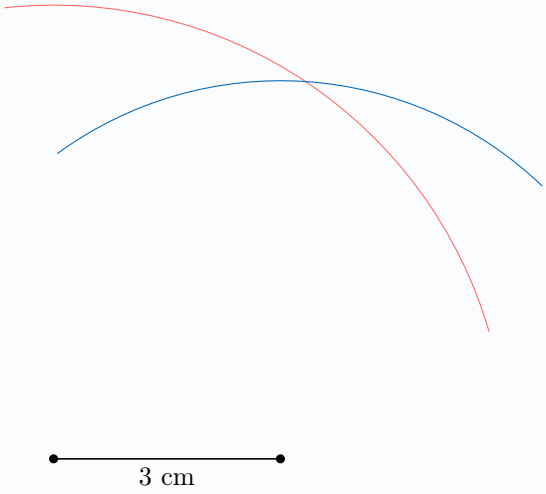
1. Draw the segment $\overline{AB}$ of length 3 cm using your ruler.



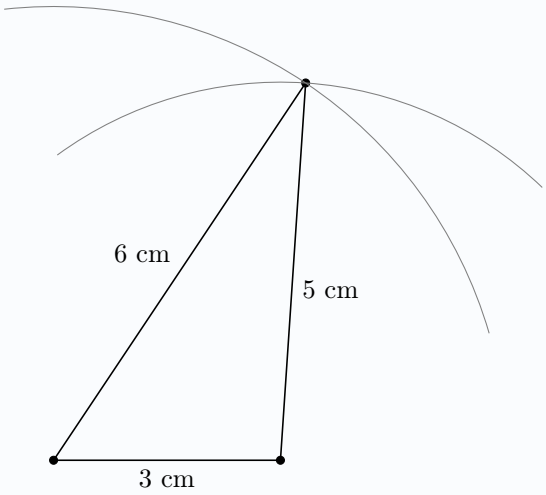
2. Using your compass, draw an arc with center A and radius 6 cm.



3. Using your compass again, draw an arc with center B and radius 5 cm.



4. Mark the point C at the intersection of the two arcs, then draw the segments $\overline{AC}$ and $\overline{BC}$ using your ruler.



E QUADRILATERALS

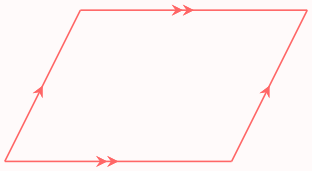
Definition Quadrilateral

A **quadrilateral** is a polygon with four sides (and therefore four vertices and four angles).

Some quadrilaterals have special names, based on their side lengths, their angles, and whether opposite sides are parallel.

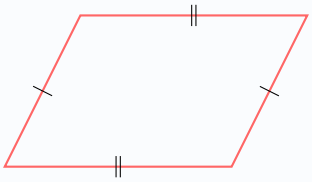
Definition Parallelogram

A **parallelogram** is a quadrilateral in which both pairs of opposite sides are parallel.



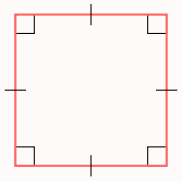
Proposition Property of a parallelogram

In a parallelogram, the opposite sides are equal in length.



Definition Square

A **square** is a quadrilateral with four right angles and four equal sides.

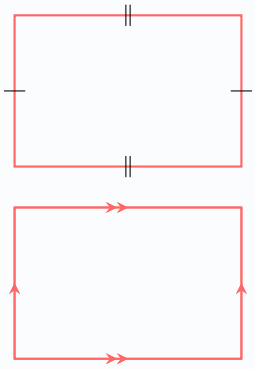


Definition Rectangle

A **rectangle** is a quadrilateral with four right angles (each angle is 90°).

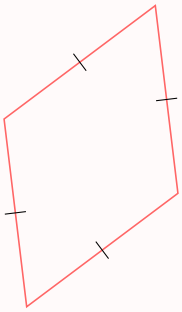
Proposition **Properties of a rectangle**

In a rectangle, the opposite sides are equal in length and parallel.



Definition **Rhombus**

A **rhombus** is a quadrilateral with four equal sides.



Proposition **Property of a rhombus**

In a rhombus, the opposite sides are parallel.