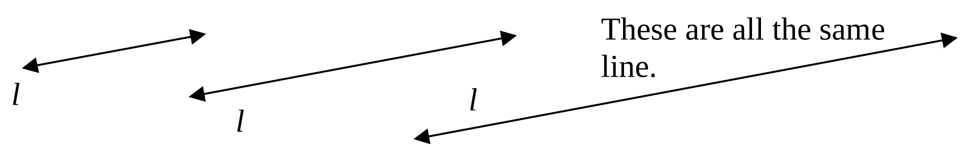
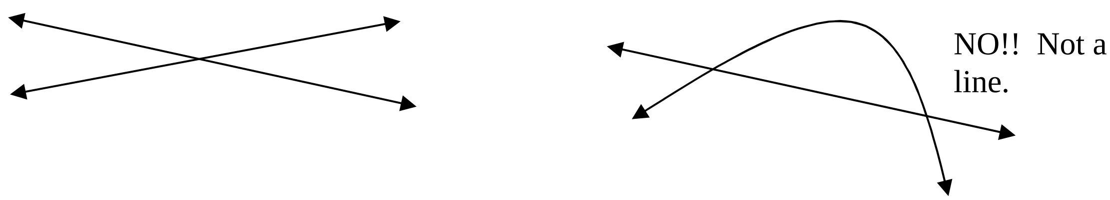
Postulates

***Postulates*, like axioms, are statements that are assumed to be true without proof. Postulates, however, apply particularly to geometry.**

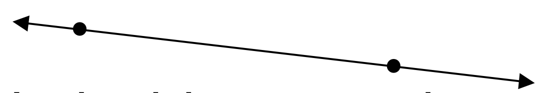
1. ***A straight line can be drawn to any required length.***



2. ***Two straight lines cannot intersect in more than one point.***



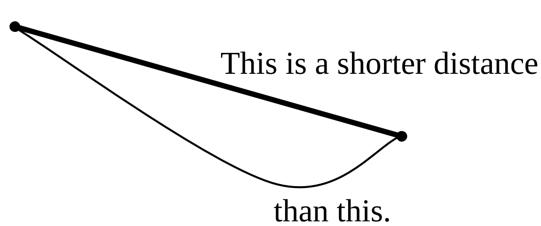
3. ***Through two given points, one and only one straight line can be drawn.***



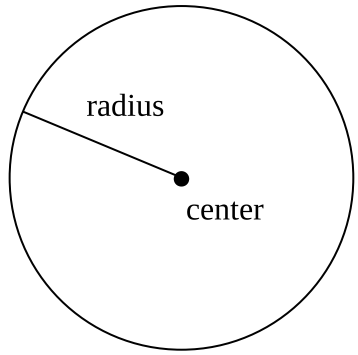
A different looking line through these two points either:

- wouldn’t be straight (breaks the geometric definition of a line)
- would be longer or shorter than the one drawn
  (This is the same line as the one drawn according to Postulate 1, above.)

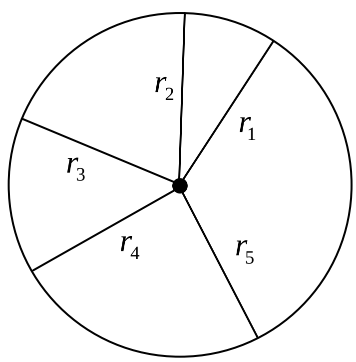
4. ***The length of the line segment connecting two points is the shortest distance between them.***



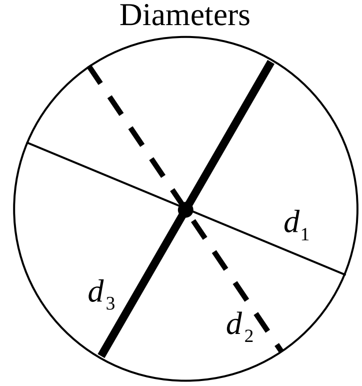
5. ***A circle may be drawn with any point as the center and with any line segment as radius.***



6. ***All radii and all diameters of the same circle or of equal circles are equal.***



$r_1 = r_2 = r_3 = r_4 = r_5$



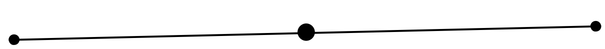
$d_1 = d_2 = d_3$

7. ***A geometric figure can be moved without changing its size or shape.***

We are allowed to slide a shape around without changing it.

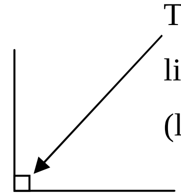
8. ***A line segment has one and only one point of bisection.***

This is just saying that a line segment only has one middle.



9. ***All right angles are equal.***

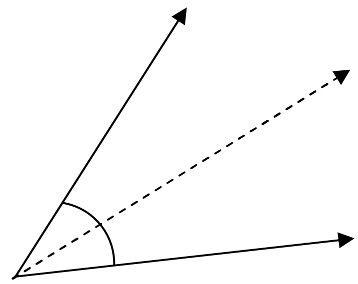
They all have a measure of $90°$.



This symbol is used to denote lines that are perpendicular (lines that form a right angle).

10. ***An angle has one and only one bisector.***

This is similar to Postulate 8, in that there can only be one middle to something. The same is true for angles. For any angle, there is only one way to cut it in half.



11. ***Two lines in the same plane must either be parallel or they must intersect.***

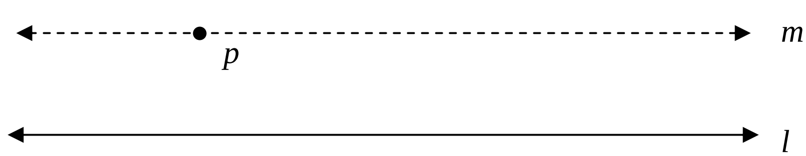
This is a fancy way to say that lines either cross or they don't. If they don't ever cross, they must be parallel.

12. ***Through a given outside point there can be one and only one parallel to a given line.***

In Euclidean geometry, start with a line, and a point that's not on the line.

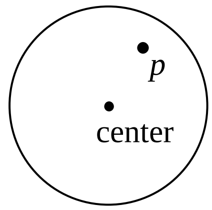
Notice that there is only one line that:

1) goes through the point, *P*
2) is parallel to the line drawn, line *l*.



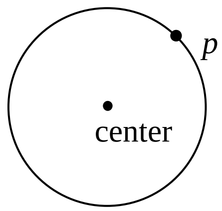
13. ***A point is within, on, or outside a circle if its distance from the center is less than, equal to, or greater than the radius, respectively.***

Case i) The distance from the center of a circle to point *p* is less than the radius.



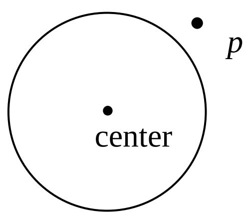
Point *p* is within the circle.

Case ii) The distance from the center of a circle to point *p* is equal to the radius of the circle.



Point *p* is on the circle.

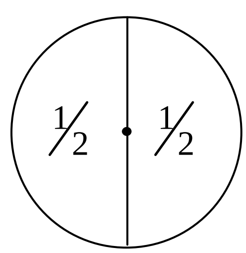
Case iii) A point's distance from the center of a circle is greater than the radius of the circle.



Point *p* is outside the circle.

14. ***A diameter of a circle bisects the circle and the surface enclosed by it; if a line bisects a circle, it is a diameter.***

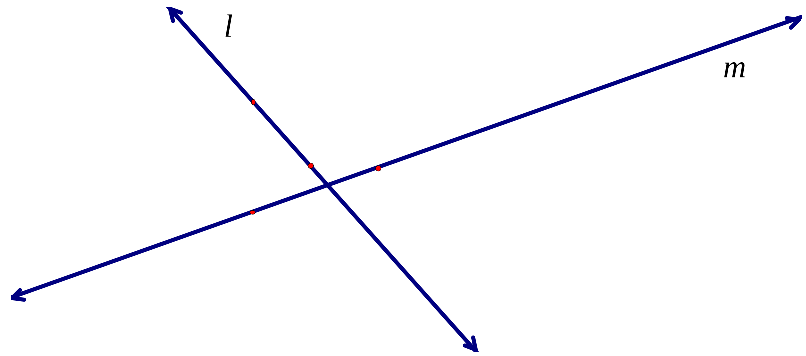
If you are given that a line is a diameter, you can conclude that the line bisects the circle. To bisect means to cut something in half. If you are given that a line bisects a circle, you can conclude that the line is the diameter.



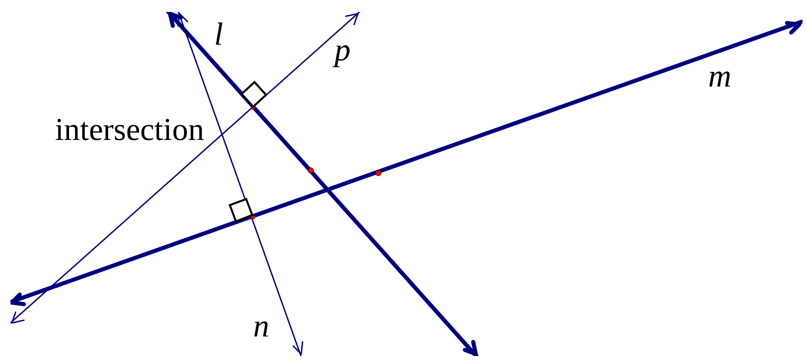
The bisector is also a line of symmetry.

15. ***Two lines, each perpendicular to one of two intersecting lines, must intersect.***

This postulate says that if we have two intersecting lines, *l* and *m*



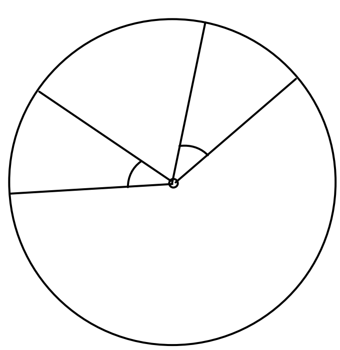
and we draw perpendicular lines to lines *l* and *m*, then they will cross as well.



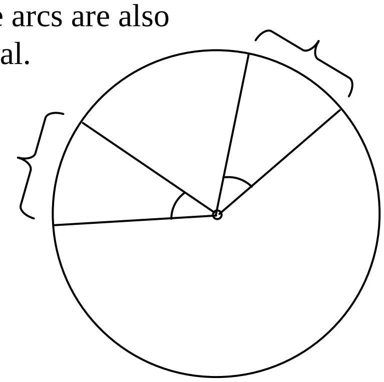
16. ***In the same circle, or in equal circles, equal central angles have equal arcs. The converse is also true.***

a. In the same circle

If two central angles are equal,

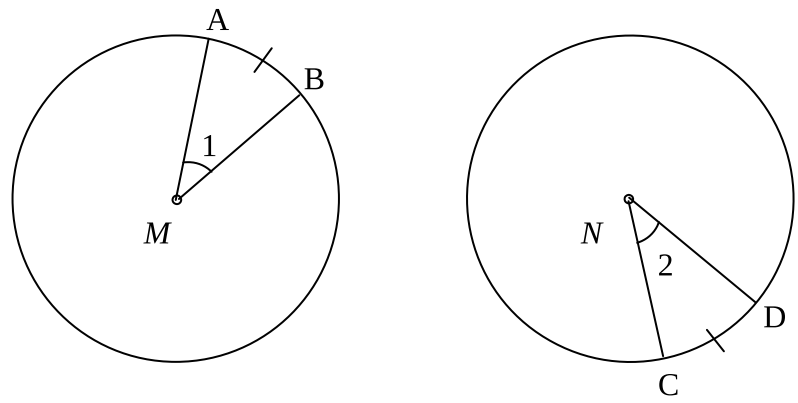


The arcs are also equal.



b. In equal circles, equal central angles have equal arcs.

Given equal circles *M* and *N* with equal central angles, $m\angle 1 = m\angle 2$. Thus, we know the arcs are equal as well $(m\widehat{AB} = m\widehat{CD})$



c. In the same circle, equal arcs have equal central angles. (converse of a.)

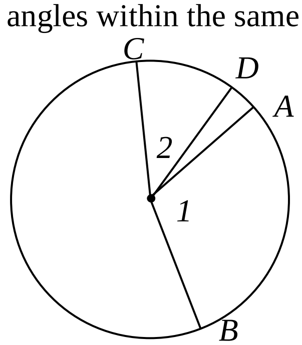
This simply means that if you are given equal arcs within one circle, you may conclude that the central angles are equal as well.

d. In equal circles, equal arcs have equal central angles. (converse of b.)

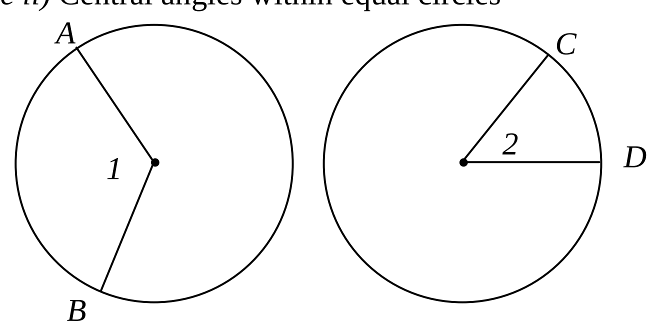
This is the same as part c., except that you will be given that the arcs for two different circles are equal.

17. ***In the same circle, or in equal circles, the greater of two unequal central angles has the greater arc. The converse is also true.***

Case i) Central angles within the same circle



Case ii) Central angles within equal circles



In both cases,

If you are given $m\angle 1 > m\angle 2$,

then you conclude

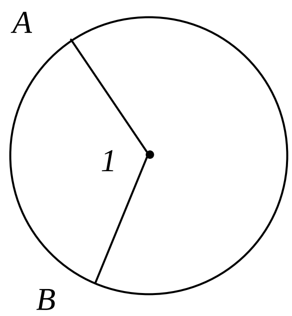
$m\widehat{AB} > m\widehat{CD}$

The other way around (the converse) works as well:

If you are given

$m\widehat{AB} > m\widehat{CD}$, then you conclude $m\angle 1 > m\angle 2$.

18. ***A central angle has the same measure as its arc.***



$$m\overset{\frown}{AB} = m\angle 1$$

19. ***Any theorem which has been proven true regarding a regular polygon, and which does not depend on the number of sides of the polygon, is equally true for the circle.***

NOTES

End of Postulates