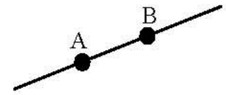
Review of Plane Geometry

Points, Lines, and Rays

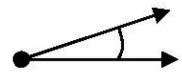
A ***point*** has no length or width. •   A ***line*** is straight with unlimited length in *two* directions but no width.



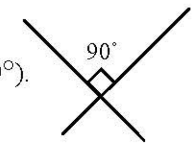
A ***ray*** has as starting point and unlimited length in *one* direction but no width.

Angles, Triangles

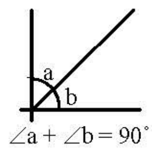
An ***angle*** is formed by two rays with the same beginning point called the ***vertex***.



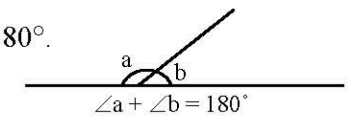
Angles are measured in degrees or radians. Two lines are ***perpendicular*** if their intersection forms a ***right angle*** ($90°$).



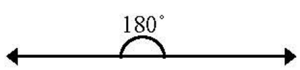
Complementary angles add to $90°$.



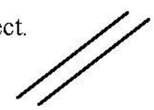
Supplementary angles add to $180°$.



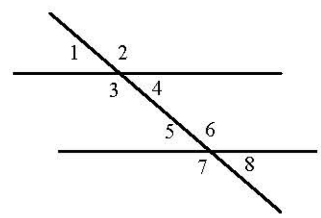
A ***straight angle*** measures $180°$.



Parallel lines do not intersect.



The opposite angles formed by a ***transverse*** line intersecting two parallel lines are called ***vertical angles***. 1 and 4 are vertical angles. So are 2 and 3, 5 and 8, and 6 and 7.
Vertical angles are ***congruent*** (have the same measure). So angle 1 = angle 4, angle 2 = angle 3, angle 6 = angle 7, and angle 5 = angle 8.

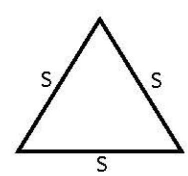


Angles 3, 4, 5, and 6 are called ***interior*** angles because they are *between* the parallel lines.
Angles 1, 2, 7, and 8 are called ***exterior*** angles because they are *outside* the parallel lines.

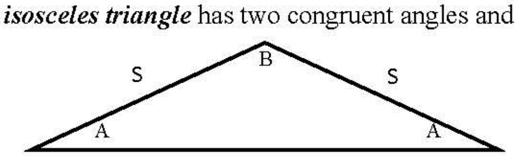
Alternate interior angles are congruent (angle 3 = angle 6 and angle 4 = angle 5).
Alternate exterior angles are congruent (angle 1 = angle 8 and angle 2 = angle 7).
Interior angles on the same side of the transversal are *supplementary*. So angle 3 + angle 5 = $180°$ = angle 4 + angle 6.

A ***triangle*** has three sides and three angles. The *sum of the angles* of a triangle is $180°$.

In an ***equilateral triangle*** all three sides are the same length and all three angles are also congruent.

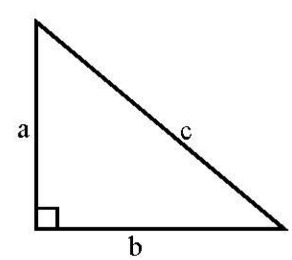


An ***isosceles triangle*** has two congruent angles and sides.

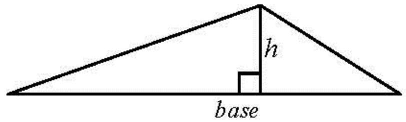


Right triangle: One of the angles is $90°$. This is indicated by a "square" in the angle.

$$\boxed{\text{Pythagorean Theorem}: a^2 + b^2 = c^2}$$

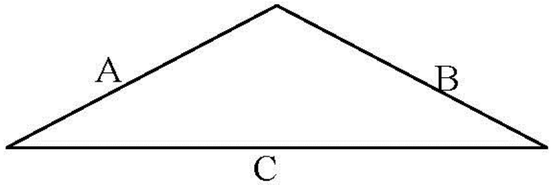


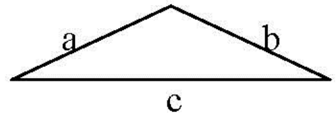
Area of a triangle is ½ base x height.



In ***similar triangles***, corresponding angles are congruent. Thus, similar triangles have the *same shape*, and their corresponding sides are ***proportional***.

$$\frac{A}{a}=\frac{B}{b}=\frac{C}{c}$$

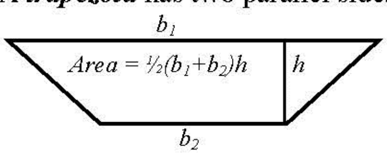




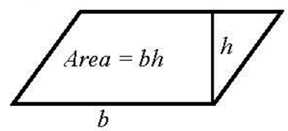
Quadrilaterals

A ***quadrilateral*** has four sides (and four angles). The four angles of a quadrilateral add up to 360°.

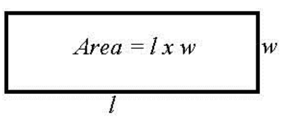
A ***trapezoid*** has two parallel sides.



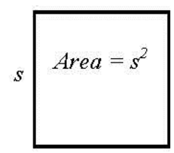
A ***parallelogram*** has two sets of parallel sides.



A ***rectangle*** is a parallelogram with each angle 90°.

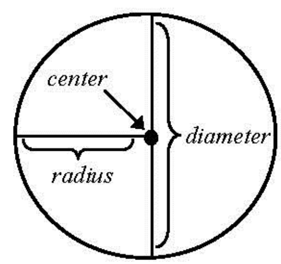


A ***square*** is a rectangle with each side the same length.



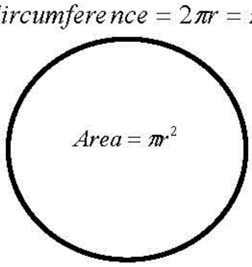
Circles

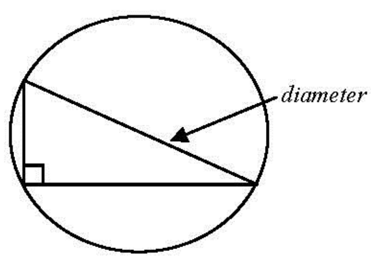
A ***circle*** is the set of all points that are the same distance from a point called the ***center***. The distance from the center to any point on the circle is the ***radius*** of the circle. The ***diameter*** is a line segment that goes through the center with endpoints on the circle. So a diameter = two radii.



The ***circumference*** is the length of the circle if it is cut once and formed into a straight line. A triangle inscribed with one side a diameter is a *right* triangle.

$$Circumference = 2\pi r = \pi d$$





Angle Measure

A circle has 360°. If a circle has *radius* = 1 and an angle is formed with the vertex of the angle at the center of the circle, the ***radian measure*** of the angle is the number of *radius* lengths in the ***arc*** the angle subtends (or cuts out) on the circle.

There are 2π radius lengths in any circle (the circumference = 2π x radius), so for a circle of radius = 1, the circumference is 2π radians. Radians are abbreviated as ***rad***.

$$90° = \frac{\pi}{2}\,rad \qquad 180° = \pi\ rad \qquad 270° = \frac{3\pi}{2}\,rad \qquad 360° = 2\pi\ rad$$

$1\ rad = \dfrac{180°}{\pi}$	To convert radians to degrees, multiply by $\dfrac{180°}{\pi}$
$1° = \dfrac{\pi}{180°}\,rad$	To convert degrees to radians, multiply by $\dfrac{\pi}{180°}$

Example: $1\ rad = \dfrac{180°}{\pi} \approx 57.3°$

Example: $90° = 90° \cdot \dfrac{\pi}{180°}\,rad = \dfrac{\pi}{2}\,rad$