Definition: A parallelogram is a quadrilateral with two pairs of parallel sides.

The opposite sides of a parallelogram are congruent.

The opposite angles of a parallelogram are congruent.

The diagonals of a parallelogram bisect each other.

Pairs of consecutive angles are supplementary.

A square is a regular parallelogram.

Parallelogram

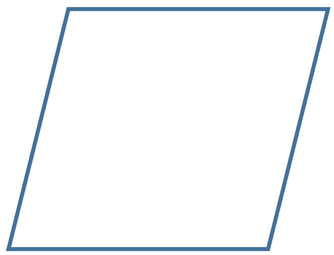
Definition: A rectangle is a parallelogram with four right angles.

Diagonals of a rectangle are congruent.

All the properties of a parallelogram apply to the rectangle.

Rectangle

Definition: A rhombus is a quadrilateral with four congruent sides.



The non-vertex angles of a kite are congruent.

The diagonals of a kite are perpendicular.

The diagonal between the vertex angles bisects the vertex angles and bisects the other diagonal.

The diagonal between the vertex angles creates two congruent triangles and is a line of symmetry for the kite.

Kite

Area of a triangle:

$$A = \frac{1}{2}bh$$
$$A = \sqrt{s(s-a)(s-b)(s-c)}$$
$$A = absinC^o$$

Area of a parallelogram: $A = bh$

Area of a square: $A = s^2$

Area of a rectangle: $A = bh$

Area of a rhombus: $A = bh \; or \; A = \frac{1}{2}d_1d_2$

Area of a kite: $A = \frac{1}{2}d_1d_2$

Area of a trapezoid: $A = \frac{1}{2}(b_1 + b_2)h$

A midsegment of a trapezoid joins the midpoints of the legs and is parallel to the bases. Its length is the average of the lengths of the bases.

An Isosceles Trapezoid is a trapezoid with congruent legs.

Isosceles trapezoids have congruent diagonals.

Isosceles trapezoids have congruent base angles on the same base.

Trapezoid

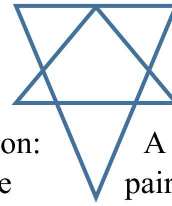
Definition: A kite is a quadrilateral with two pairs of congruent, consecutive sides. No sides are parallel in a kite.

The diagonals of a rhombus are perpendicular.

The diagonals of a rhombus bisect opposite angles and are lines of symmetry for the rhombus.

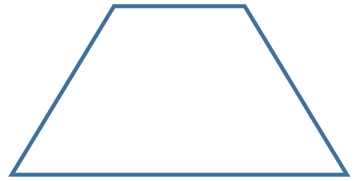
All properties of a parallelogram apply to the rhombus.

A square is an equiangular rhombus.



Rhombus

Definition: A trapezoid is a quadrilateral with one pair of parallel sides.



Base angles on the same leg of a trapezoid are supplementary.

Area of a regular polygon: $\frac{1}{2}ap$

Area of a circle: $A = \pi r^2$

Surface Area of a prism: $S.A. = 2B + pH$

Surface Area of a pyramid: $S.A. = B + \frac{1}{2}pl$

Surface Area of a cylinder:

$$S.A. = 2\pi r^2 + 2\pi rH$$

Surface Area of a cone: $S.A. = \pi r^2 + \pi rl$

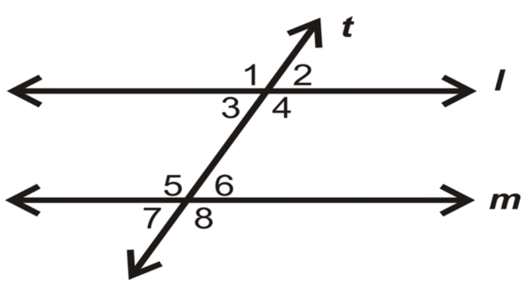
Surface Area of a sphere: $S.A. = 4\pi r^2$

Surface Area of a hemisphere:

$$S.A. = 3\pi r^2$$

Area Formulas

Definition: A circle is the set of all points in a plane that are a given distance (the radius) from a given point (the center.)



Corresponding Angles: $\angle 1, \angle 5; \angle 3, \angle 7;$
$\angle 2, \angle 6;\ \angle 4, \angle 8$

Alternate Interior Angles: $\angle 3, \angle 6; \angle 4, \angle 5$

Alternate Exterior Angles: $\angle 1, \angle 8; \angle 2, \angle 7$

Same-side Interior Angles: $\angle 3, \angle 5; \angle 4, \angle 5$

Same-side Exterior Angles: $\angle 1, \angle 7; \angle 2, \angle 8$

Special Pairs of Angles

Volume of a prism: $V = BH$

Volume of a cylinder: $V = \pi r^2 H$

Volume of a pyramid: $V = \frac{1}{3}BH$

Volume of a cone: $V = \frac{1}{3}\pi r^2 H$

The midsegment of a triangle is a segment that joins the midpoints of two sides of a triangle. It is parallel to the third side and is half the length of the third side.

The median of a triangle is a segment that joins a vertex to the midpoint of the opposite side.

The altitude of a triangle is a segment that connects a vertex perpendicularly to the opposite side of the triangle (or to the line that contains the opposite side of the triangle.)

Triangle Inequality 1: The longest side of a triangle is opposite the largest angle, and the shortest side is opposite the smallest angle.
Triangle Inequality 2: The sum of the lengths of any two sides of a triangle is larger than the length of the third side.
Exterior Angle of a Triangle Theorem: The measure of the exterior angle = sum of the measures of the remote interior angles.

Triangle

Definition: Vertical angles are formed by two intersecting lines and share only a vertex. $\angle 1$ and $\angle 2$ are vertical angles.
All pairs of vertical angles are congruent.

Definition: A linear pair of angles are adjacent angles whose unshared sides form a line. $\angle 3$ and $\angle 4$ are a linear pair.
All linear pairs are supplementary.

Concentric circles have the same center.

A central angle has the same measure as its intercepted arc.

An inscribed angle's measure is half the measure of its intercepted arc.

Circumference of a circle: $C = 2\pi r \; or \; \pi d$

Arc Length = $\frac{a}{360} 2\pi r \; (if\; using\; degrees) \; or$
$= \theta r$ (if using radians)

Sector Area = $\frac{a}{360}\pi r^2 \; (if\; using\; degrees\; or$
$= \frac{\theta r}{2} \; if\; using\; radians)$

Circle

By number of congruent sides:

Scalene: No congruent sides
Isosceles: At least two congruent sides
Equilateral: All three sides are congruent

By types of angles:

Acute: Has three acute angles
Right: Has one right angle and two acute angles
Obtuse: Has one obtuse angle and two acute angles.
Equiangular: All angles are congruent (60°)

Volume of a sphere: $V = \frac{4}{3}\pi r^3$

Volume of a hemisphere: $V = \frac{2}{3}\pi r^3$

Sum of Interior Angles of a Polygon

$$S_I = (n-2)180$$

where n = # of sides of the polygon

The measure of an individual angle of an equiangular polygon is

$$I = \frac{(n-2)180}{n} = 180 - \frac{360}{n}$$

Points of Concurrency

Orthocenter--Intersection of altitudes of the triangle (or lines that contain the altitudes)

Circumcenter--Intersection of perpendicular bisectors of sides of a triangle
--Equidistant from vertices of the triangle
--Center of circumscribed circle

Incenter--Intersection of angle bisectors of a triangle--Equidistant from the sides of a triangle
--Center of inscribed circle

Centroid--Intersection of medians of a triangle --Center of balance for the triangle
--Splits the median in a 2:1 ratio

Euler Segment--Contains the orthocenter, centroid, and circumcenter of any triangle.

Volume

Interior Angles of a Polygon

Sum of exterior angles of a polygon

$$S_E = 360$$

for all polygons.

The measure of an individual exterior angle of an equiangular polygon is

$$E = \frac{360}{n} = 180 - I$$

Exterior Angles of a Polygon