Ms. Phillips

**GEOMETRY**

**Definitions-Properties-Postulates-Theorems**

# Definitions

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| Collinear set of points: | A set of points all of which lie on the same line. |
| Non-collinear set of points: | A set of 3 or more points that do not all lie on the same line. |
| Line segment: | A set of points consisting of two points on a line (the endpoints) and all the points between. |
| Midsegment of a triangle | A segment having endpoints that are the midpoints of two sides of a triangle. |
| *Midpoint of a segment: | The point of that line segment that divides the segment into 2 congruent segments. |
| *Bisector of a segment: | Any line that intersects the segment at its midpoint. |
| Ray: | Part of line that consists of a point on the line, called the endpoint, and all the points on one side of the endpoint. |
| Opposite rays: | Two rays of the same line with a common endpoint and no other point in common. |
| Angle: | A set of points that is the union of 2 rays having the same endpoint. |
| Straight angle: | An angle that is the union of opposite rays. Its measure is 180 degrees. |
| *Right angle: | An angle whose measure is 90 degrees. |
| Acute angle: | An angle whose measure is less than 90 degrees. |
| Obtuse angle: | An angle whose measure is greater than 90 degrees but less that 180 degrees. |
| *Congruent: | Equal measures |
| Angle bisector: | A ray whose endpoint is the vertex of the angle, and that divides the angle into 2 congruent angles. |
| Adjacent angles: | 2 angles that have a common vertex and a common side but no interior points in common |
| Vertical angles: | 2 angles in which the sides of one angle are opposite rays to the sides of the other. |
| *Complementary angles | 2 angles whose measures sum to 90 degrees. |
| *Supplementary angles | 2 angles whose measures sum to 180 degrees. |
| *Linear Pair | 2 adjacent angles whose sum is a straight angle |
| *Perpendicular lines: | 2 lines that intersect to form right angles |
| *Perpendicular bisector: | A line, segment or ray that is perpendicular to a line segment and bisects the line segment |
| Types of triangles: | |
| *Scalene triangle | A triangle that has no congruent sides |
| *Isosceles triangle | A triangle that has 2 congruent sides |
| *Equilateral triangle | A triangle that has 3 congruent sides |
| *Acute triangle | A triangle that has 3 acute angles |
| *Equiangular | A triangle that has 3 congruent angles |
| *Right triangle | A triangle that has a right angle |
| *Obtuse triangle | A triangle that has an obtuse angle |
| *Altitude of a triangle: | A line segment drawn from any vertex of the triangle that is perpendicular to and ending in the line that contains the opposite side. |
| *Median of a triangle: | A line segment drawn from any vertex of the triangle to the midpoint of the opposite side. |

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# Properties and Postulates (accepted as true without proof)

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| *Addition Property: | If $a = b$, then $a + c = b + c$<br>*You can add the same amount to both sides of an equation* |
| *Subtraction Property: | If $a = b$, then $a - c = b - c$<br>*You can subtract the same amount from both sides of an equation* |
| *Multiplication Property: | If $a = b$, then $a \cdot c = b \cdot c$<br>*You can multiply both sides of an equation by the same amount* |
| *Division Property: | If $a = b$, then $a \div c = b \div c$ or $\frac{a}{c} = \frac{b}{c}$, $(c \neq 0)$<br>*You can divide both sides of an equation by the same amount as long as the amount is not zero (can't divide by zero…its against the law!)* |
| *Substitution Property: | If $a = b$, then $b$ can replace $a$ in any expression |
| Distributive Property: | $a(b + c) = ab + ac$ |
| *Partition Postulate: | *A whole is equal to the sum of its parts.* |
| *Reflexive Property: | $\overline{AB} \cong \overline{AB}$<br>*Any object is congruent to itself* |
| Symmetric Property: | If $\angle A \cong \angle B$ then $\angle B \cong \angle A$<br>*A congruence can be expressed in either order* |
| *Transitive Property: | If $\angle A \cong \angle B$ and $\angle B \cong \angle C$ then $\angle A \cong \angle C$<br>*If quantities are $\cong$ to the same quantity, then they are $\cong$ to each other.* |
| *Postulate of Contradiction | If two statements are contradictory, and one is based on an assumption, then the assumption must be false. |
| *Postulate of Elimination | If one of a series of propositions must be true, and you have can prove all but one false, then the remaining proposition must be true. |

# Angle Theorems (Statements whose truth has been proven)

*Right angles are congruent.

*Vertical angles are congruent.

Complements of the same angle are congruent.

Congruent supplements are right angles.

If 2 angles are congruent, then their complements are congruent.

If 2 angles are supplements of the same angle, then they are congruent.

If 2 angles are congruent, then their supplements are congruent.

If 2 angles form a linear pair, then they are supplementary.

If 2 parallel lines are cut by a transversal, the corresponding angles are congruent (and conversely).

If 2 parallel lines are cut by a transversal, the alternate interior angles are congruent (and conversely).

If 2 parallel lines are cut by a transversal, the same side interior angles are supplementary (and conversely).

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## Triangle Theorems:

*The sum of the measures of the angles of a triangle is 180 degrees.

The largest side of a triangle lies opposite the largest angle (and conversely).

The sum of the measures of any two sides of a triangle is greater than the measure of the 3rd side.

*If a triangle is isosceles, then the base angles are congruent (and conversely).

The midsegment of a triangle is parallel to one side of a triangle and it equal to half its length.

If a triangle is a right triangle, then the acute angles are complementary.

If a triangle is a right triangle, then the sum of the squares of the legs equals the square of the hypotenuse.

## Parallelogram Theorems:

A diagonal divides a parallelogram into 2 congruent triangles

Opposite sides of a parallelogram are congruent

Opposite angles of a parallelogram are congruent

Consecutive angles of a parallelogram are supplementary

Diagonals of a parallelogram bisect each other

## Misc/New Theorems:

All radii in a given circle are congruent.

The sum of the interior angles of an *n*-sided polygon is $(n-2)180$.

The sum of the exterior angles of a polygon is 360.