Common Reasons used in Triangle Proofs

Alternate Interior Angles Theorem: Two alternate interior angles are congruent if and only if they are formed by a set of parallel lines and a transversal (See Diagram 1)

Corresponding Angles Postulate: Two corresponding angles are congruent if and only if they are formed by a set of parallel lines and a transversal (See Diagram 2)

Same Side Interior Angles Theorem: Two same side interior angles are supplementary if and only if they are formed by a set of parallel lines and a transversal (See Diagram 3)

These theorems can be used to prove congruent or supplementary angles, but also can be used to prove lines are parallel if a pair of congruent angles is known

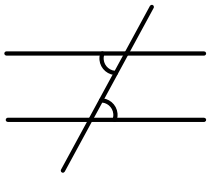
Diagram 1: 

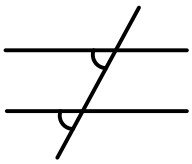
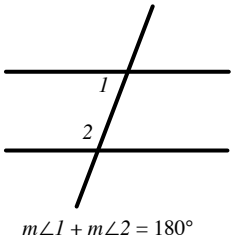
Diagram 2: 

Diagram 3: 

Vertical Angles Theorem: Two angles are congruent if they are vertical angles (See Diagram 3)

Linear Pair Postulate: Two angles are supplementary if they are adjacent and form a straight line (See Diagram 4)

Reflexive Property: An angle or side is always congruent to itself (See Diagram 5). *Used when an angle or side is shared by two triangles*

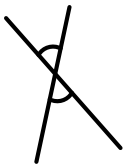
Diagram 3: 

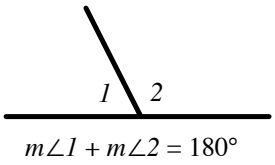
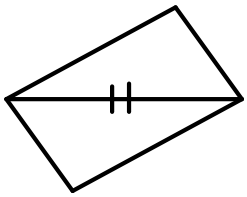
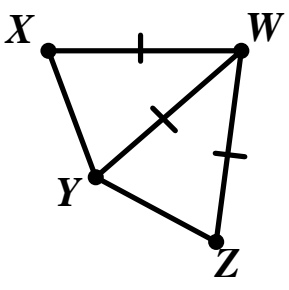
Diagram 4: 

Diagram 5: 

Substitution Property: If two sides or angles are congruent, one can be replaced by the other when make a new statement

Transitive Property: If two sides or angles are congruent to the same side or angle, then they are congruent to each other

$\overline{WX} \cong \overline{WY}$, and $\overline{WY} \cong \overline{WZ}$,
so then $\overline{WX} \cong \overline{WZ}$

Diagram 6: 

Definition of Midpoint: A midpoint divides a segment into two congruent smaller segments (See Diagram 7)

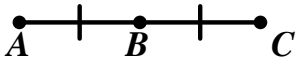
Definition of Perpendicular: An angle formed by perpendicular lines measures 90 degrees (See Diagram 8)

Definition of Perpendicular Bisector: Angles formed by the bisector measure 90 degrees and the segment bisected is divided into two congruent smaller segments (See Diagram 9)

Definition of Angle Bisector: An angle bisected by a segment, line, or ray is divided into two congruent smaller angles (See Diagram 10)

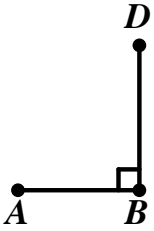
These are commonly used in various proofs

Diagram 7:



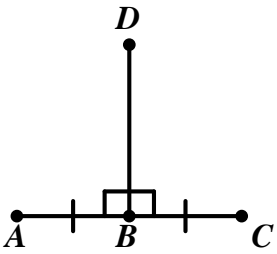
B is the midpoint of $\overline{AC}$

Diagram 8:



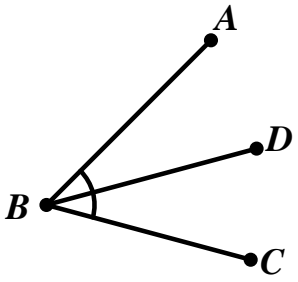
$\overline{DB} \perp \overline{AB}$

Diagram 9:



$\overline{DB}$ is the perpendicular bisector of $\overline{AC}$

Diagram 10:



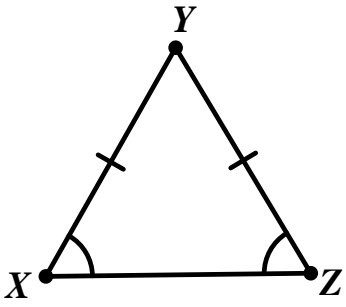
$\overline{BD}$ bisects $\angle ABC$

Definition of Isosceles Triangle: A triangle with two sides that are congruent to each other

Base Angle Theorem: If a triangle is isosceles, then it has two angles that are opposite the congruent sides in which are also congruent

These two are often used together in a proof that involves an isosceles triangle

Diagram 11:



$\triangle XYZ$ is an isosceles triangle