Triangle Inequality Theorem

The sum of the lengths of any two sides of a triangle is greater than the length of the third side. (If I add two sides together it should be greater than the third side).

1) Can 2, 5, & 6 be the lengths of the sides of a triangle?

2) Can 4, 5, & 12 be the lengths of the sides of a triangle?

4. Find the “possible” lengths of the third side of the following triangle

Add the numbers to get the largest possible length.

Subtract the numbers to get the smallest possible length.

5. Find the possible values of the 3rd side

6. Two sides of a triangle have the measures 35 and 12. Find the range of possible measures for the third side of the triangle.

7. A triangle has one side of length 6 and another side of length 15. Find the range of possible measures for the third side of the triangle.

8. A triangle has one side of length 12 inches and another side of length 20 inches. Find the range of possible measure for the third side of the triangle.
Side Inequality Theorem

The longest side is across from the largest angle.

The shortest side is across from the smallest angle.

Examples: List the sides from shortest to longest for each diagram.

1) 2) 3) 4)

The largest angle is across from the longest side.

The smallest angle is across from the shortest side.

Other way around! List the angles from smallest to largest for each diagram.

5) 6) 7) 8)
MidSegment Relationships in Triangles

A **midsegment** of a triangle is a segment that joins the midpoints of two sides of the triangle. Every triangle has three midsegments, which forms the midsegment triangle.

**Triangle Midsegment Theorem:** A midsegment of a triangle is parallel to a side of the triangle, and its length is half the length of that side.

The Midsegment is:
- Parallel to one side of the triangle
- Is half the length of the parallel side
- Connects to the midpoints

Midsegments:

Midsegment Triangle:

**Practice:**

A. Solve for $x$:

B. Solve for $x$:

C. Solve for $x$ and find $DE$

D. Given $CD = 14$, $GF = 8$, and $GC = 5$,

Find the perimeter of $\triangle BCD$.

E. Find the measure of the following:

- $\overline{JL}$
- $\overline{PM}$
Triangle Proportionality Theorem

If a line parallel to one side of a triangle passes through the other two sides, then it divides the other two sides proportionally.

Triangle Proportionality Theorem Converse: If a line divides two sides of a triangle proportionally, then it is parallel to the third side.

Guided Practice and Classwork:
Find the value of ‘x’ in each picture.

Ex. 4: Find the value of x if GK || HJ.

Ex. 5. Solve for x

Show that the given lines are parallel (The Converse of this theorem)