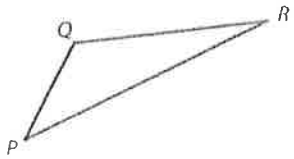
LESSON 5-5 The Triangle Inequality

Target: I will be able to use the triangle inequality Theorem to identify possible triangles.

Theorem 5.11 Triangle Inequality Theorem

The sum of the lengths of any two sides of a triangle must be greater than the length of the third side.

Examples $PQ + QR > PR$
$QR + PR > PQ$
$PR + PQ > QR$



Example 1 Identify Possible Triangles Given Side Lengths

Is it possible to form a triangle with the given side lengths? If not, explain why not.

1A. 15 yd, 16 yd, 30 yd

the sum of the shorter 2 sides must be greater than the longest side

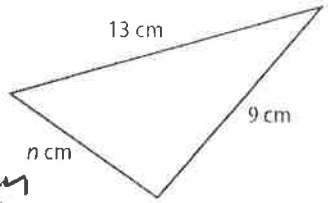
$15+16 = 31 > 30$, so yes

1B. 2 ft, 8 ft, 11 ft

$2+8 = 10 \neq 11$, so no

Guided Practice

2. Which of the following could *not* be the value of n?



F 7 **H** 13

G 10 **J** 22

the 3rd side must be greater than their difference, but less than their sum.

$13-9=4$ $13+9=22$, $4<n<22$, must be less than 22, cannot be equal to.

3. If the measures of two sides of a triangle are 9 yards and 17 yards, then the measure of the third side must be greater than ____. their difference

$17-9=8$ greater than 8.

4. Find the range for the measure of the third side of a triangle if two sides measure 9 and 19.

greater than their difference: $19-9=10$.
less than their sum: $9+19=28$

$10 < 3^{rd}$ side < 28

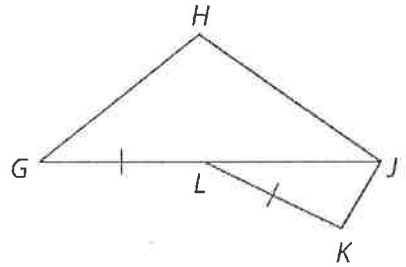
5. If the measures of two sides of a triangle are 12 yards and 8 yards, what is the least possible measure of the third side if the measure is an integer? must be greater than their difference, 12 - 8 = 4, but can't be equal to 4, so least possible is 5.

GuidedPractice

3. Write a two-column proof.

Given: $GL = LK$

Prove: $JH + GH > JK$



statements	reasons
1. $GL = LK$	1. Given
2. $JH + GH > GJ$	2. △ Inequal. Thm.
3. $GJ = GL + LJ$	3. Seg. Add. Post.
4. $JH + GH > GL + LJ$	4. Subst.
5. $JH + GH > LK + LJ$	5. Subst.
6. $LK + LJ > JK$	6. △ Inequal. Thm.
7. $JH + GH > JK$	7. Transitive