Geometry 5.5 (skipping 5.4...not in standards)

Use the triangle inequality theorem to identify possible triangles
Prove triangle relationships using the triangle inequality theorem

triangle sum theorem
inequality
integer
whole number

activity: spaghetti

**Can you create a triangle?**

Use a ruler to break spaghetti to the indicated lengths.
Measure in centimeters.
Be as accurate as possible.
Can a triangle be formed?

Make a table in your notes to record your observations.

| Side 1 | Side 2 | Side 3 | Triangle? (Y/N) | Comments |
|---|---|---|---|---|
| 5 | 5 | 3 | yes | isos. |
| 8 | 12 | 5 | yes | scalene |
| 3 + | 3 | 8 | no | don't reach |
| 7 | 8 | 12 | yes | scalene |
| 2 + | 8 | 12 | no | don't reach |
| 3 | 3 | 6 | no | 2 str. lines |

How do you tell whether a triangle is possible?
Record your conjecture in sentence form.

**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.

a. 8 in., 15 in., 17 in. yes

$8+15$

$23 > 17$

Theoretically:

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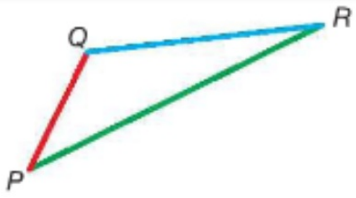
**Theorem 5.11 Triangle Inequality Theorem**

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

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

~~$QR + PR > PQ$~~

~~$PR + PQ > QR$~~




PQ + QR > PR  QP + PR > QR

Practically:

## GuidedPractice

**1A.** 15 yd, 16 yd, 30 yd

31 > 30

yes

**1B.** 2 ft, 8 ft, 11 ft

10 > 11

no

Measure and break 2 pieces of spaghetti (cm) as accurately as possible.
What is the smallest 3rd side that will still form a triangle? Explain.
What is the largest 3rd side that will still form a triangle? Explain

window

5, 6, 7, 8, 9

whole #

| Side 1 | Side 2 | Smallest? | Largest? | Explain |
|---|---|---|---|---|
| 3 | 7 | $x \geq 4$ | $x \leq 10$ | $4 < x < 10$ |
| 5 | 3 | 2 | 8 | $2 < x < 8$ |
| 10 | 2 | 8 | 12 | $8 < x < 12$ |
| 12 | 5 | 7 | 17 | $7 < x < 17$ |


lengths
3, 5 ⟶ $2 < x < 8$

which ⟶ 3, 4, 5, 6, 7

The third side has to be more than..... but less than....

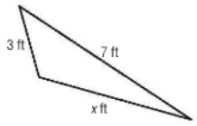
What is the range? (number line is helpful)
Which whole numbers are in it?
between

$4 < x < 10$

**Standardized Test Example 2** Find Possible Side Lengths

If the measures of two sides of a triangle are 3 feet and 7 feet, which is the *least* possible whole number measure for the third side?

A 3 ft  B 4 ft  C 5 ft  D 10 ft



$4 < x < 22$

What is the range?
What number is not in it?

**GuidedPractice**

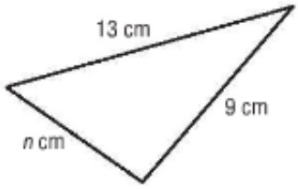
**2.** Which of the following could *not* be the value of $n$?

F ~~7~~

G ~~10~~

H ~~13~~

J 22



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

6. 4 ft, 9 ft, 15 ft no

7. 11 mm, 21 mm, 16 mm yes

8. 9.9 cm, 1.1 cm, 8.2 cm

no

9. 2.1 in., 4.2 in., 7.9 in.

no

$2.1 + 4.2 < 7.9$

Find the range for the measure of the third side of a triangle given the measures of two sides.

**12.** 4 ft, 8 ft

**13.** 5 m, 11 m

$4 < x < 12$

Only answer w. whole numbers if they specifically say!

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7-19 ~~odd~~

25-30

34-37