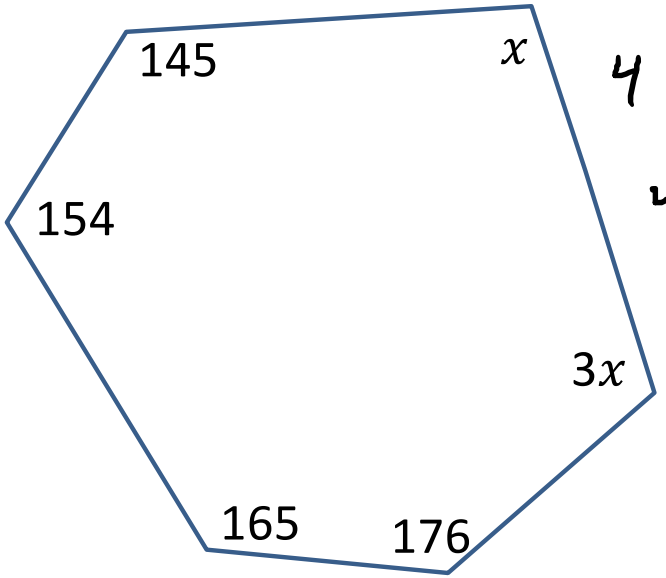
Warm Up

1. Find the sum of the angles in a polygon with 21 sides

→ 19 triangles

↘ $180(19) = 420$

2. Solve for x:



6 sides

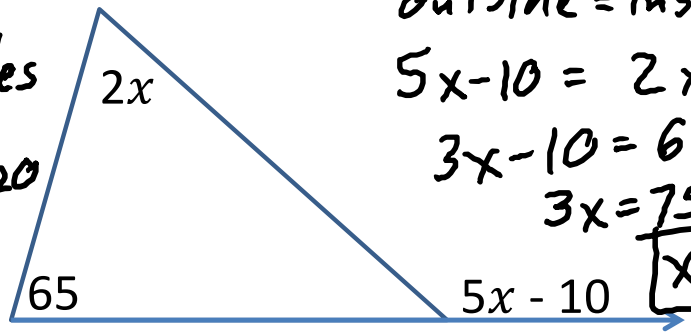
↓

4 triangles

↓

$4(180) = 720$

3. Solve for x:



outside = inside + inside

$5x - 10 = 2x + 65$

$3x - 10 = 65$

$3x = 75$

$x = 25$

$x + 3x + 176 + 165 + 154 + 145 = 720$

$4x + 640 = 720$

$4x = 80$

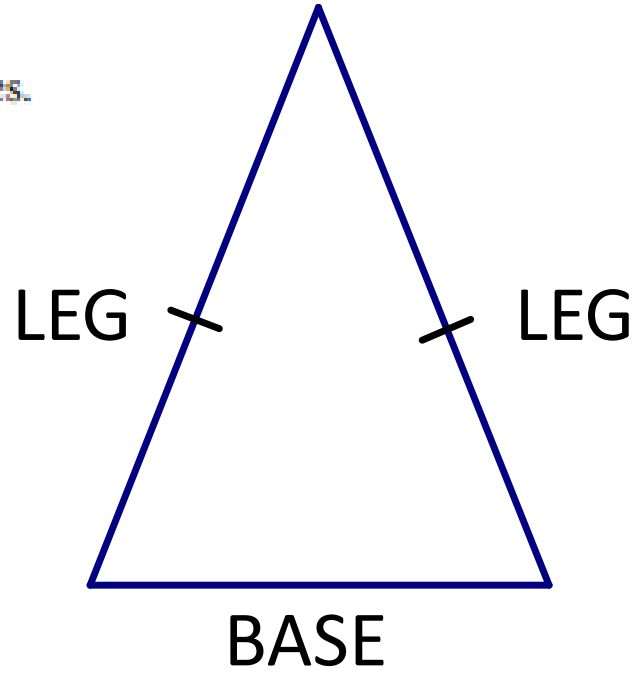
$x = 20$

7.2 Isosceles and Equilateral Triangles

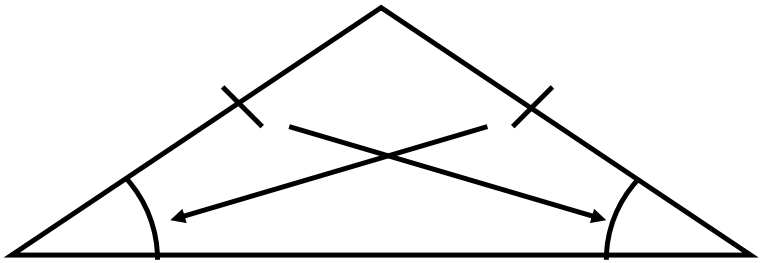
An **isosceles triangle** is a triangle with at least two congruent sides.

The congruent sides are called the **legs** of the triangle.

The side opposite the vertex angle is the **base**.

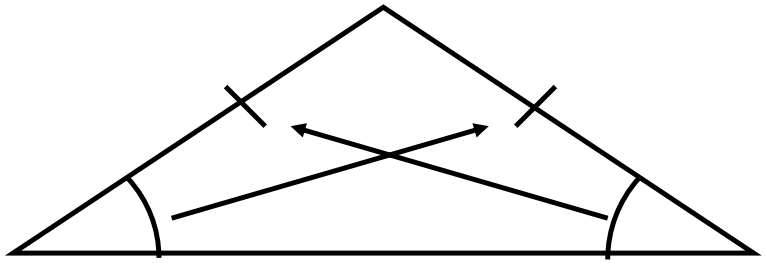


Isosceles Triangle Theorem: In an isosceles triangle, the angles across from the congruent sides are congruent.

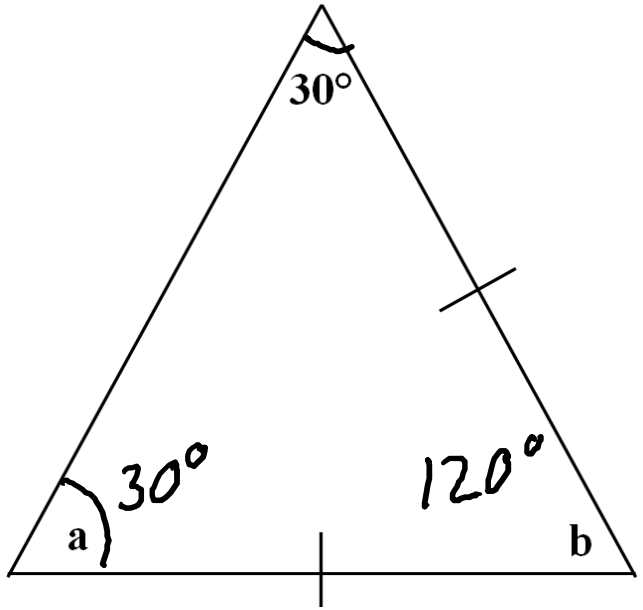


Converse of the Isosceles Triangle Theorem:

If two angles in a triangle are congruent, then the sides opposite the angles are also congruent.



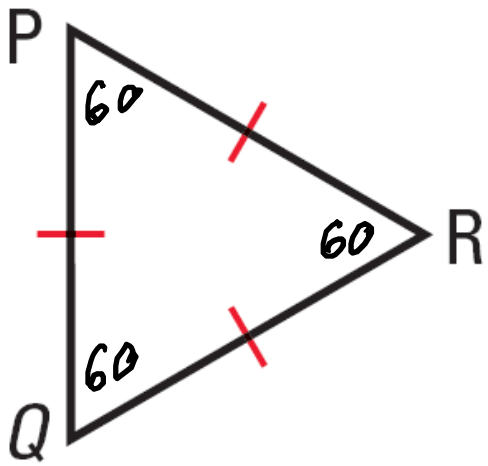
Ex. Find the missing angles.



$30 + 30 + b = 180$

$b = 120$

Ex. Find the missing angles.



$\frac{180}{3} = 60$

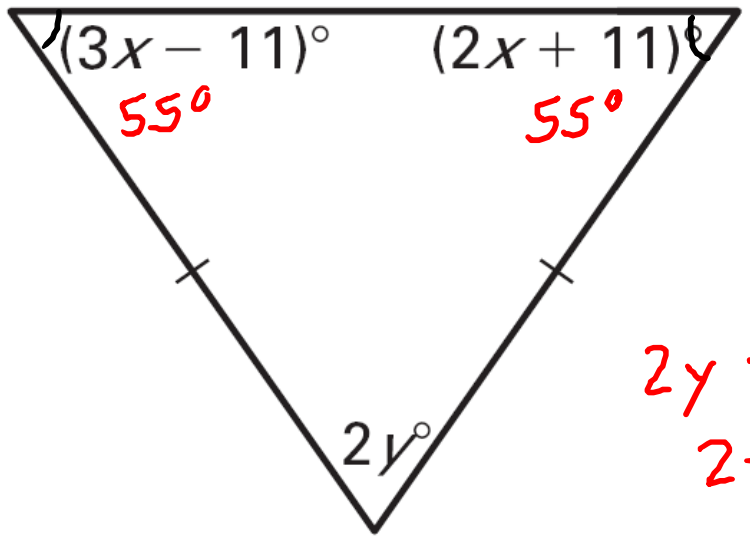
An **equilateral triangle** is a triangle with three congruent sides.

An **equiangular triangle** is a triangle with three congruent angles.

Equilateral Triangle Theorem

If a triangle is equilateral, then it is equiangular.

Ex. Solve for x and y.



$3x - 11 = 2x + 11$

$-2x \quad -2x$

$x - 11 = 11$

$+11 \quad +11$

$x = 22$

$2(22) + 11 = 55$

$2y + 55 + 55 = 180$

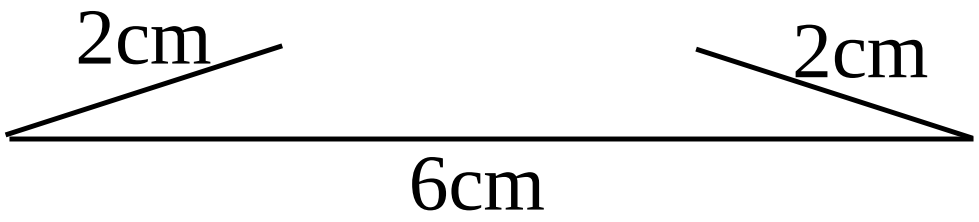
$2y + 110 = 180$

$2y = 70$

$y = 35$

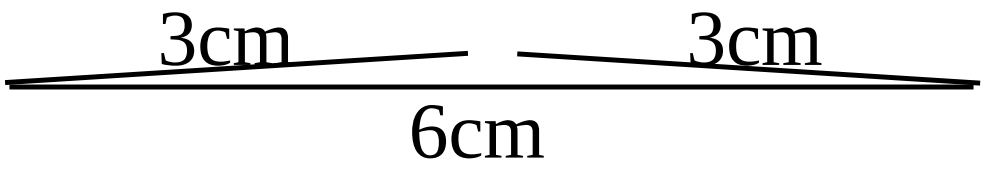
7.3 Triangle Inequalities

Try to draw a triangle with sides 2 cm, 2 cm, and 6 cm.



Too short!

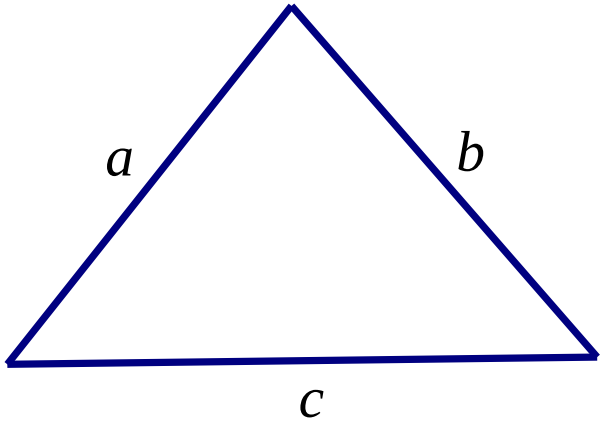
What if I tried 3, 3, and 6cm?



Still doesn’t work!

Thm. Triangle Inequality

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



$$a + b > c$$
$$a + c > b$$
$$b + c > a$$

*add the 2 small sides and make sure that the total is bigger than the 3rd side.

Ex. Is it possible to construct a triangle with the given side lengths?

a. 3, 4, 5 $3+4 \stackrel{?}{>} 5$ yes

b. 1, 4, 6 $1+4 \stackrel{?}{>} 6$ no

c. 2.2, 2.6, 4.8 $2.2+2.6 \stackrel{?}{>} 4.8$ no

Determine if a triangle can be formed with the given side lengths. Explain your reasoning.

6. 12 units, 4 units, 17 units

$12 + 4 \overset{?}{>} 17$

no

7. 24 cm, 8 cm, 30 cm

$24 + 8 \overset{?}{>} 30$

yes

Ex. If two sides of a triangle have the following measures, between what two numbers must the 3rd side lie?

a. 3 ft, 8 ft

$8-3=5$

$8+3=11$

Third side is between 5 and 11.

b. 12 in, 6 in

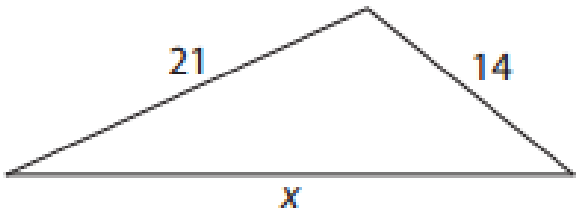
$12-6=6$ $\quad 12+6=18$ between 6 and 18

Trick!

Subtract the two sides to find the lowest and add to find the highest.

Find the range of values for x using the Triangle Inequality Theorem.

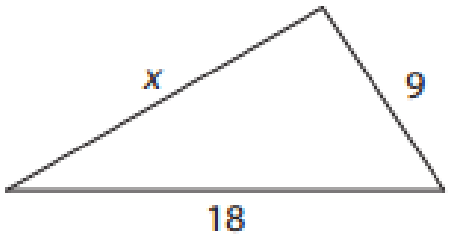
9.



$21 - 14 = 7$ $\quad 21 + 14 = 35$

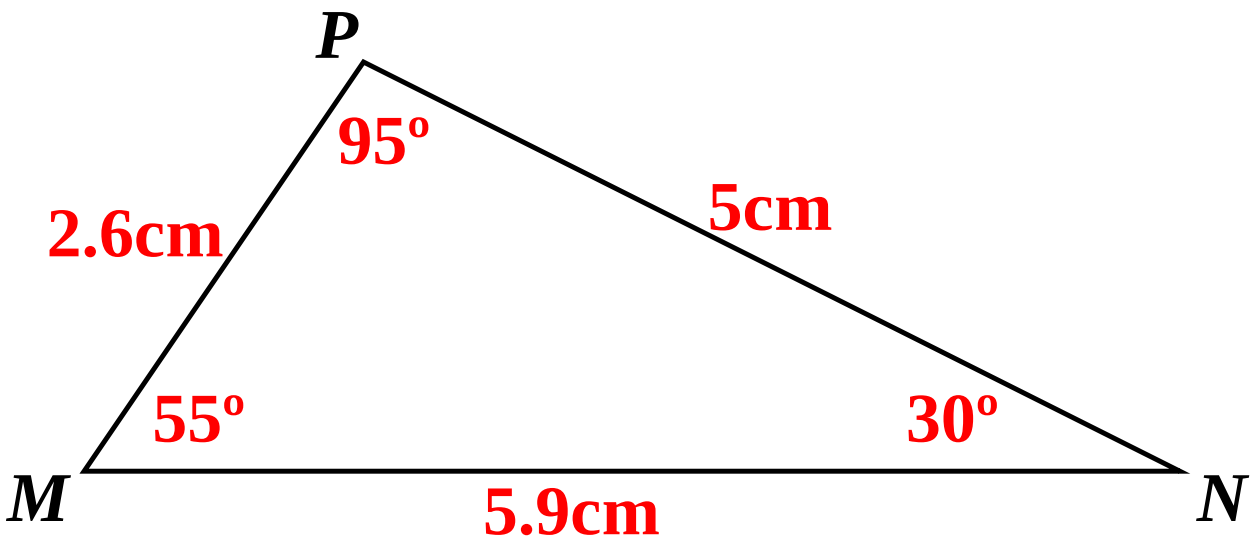
between 7 and 35

10.



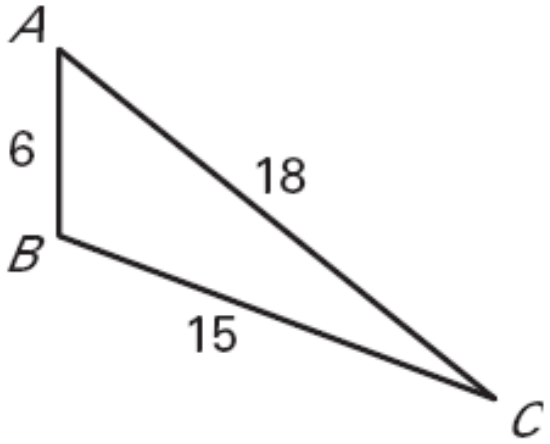
$18 - 9 = 9$ $\quad 18 + 9 = 27$

between 9 and 27


P
95º
2.6cm
5cm
55º
30º
M
5.9cm
N

Thm. The longest side of a triangle is across from the largest angle.

Ex. List the sides and angles in order from smallest to largest.



Sides:

$\overline{AB}$

$\overline{BC}$

$\overline{AC}$

Angles:

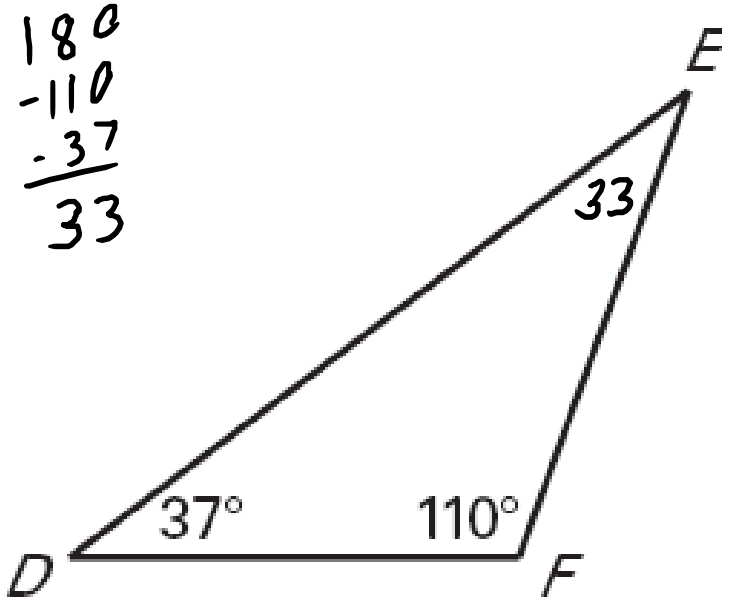
$\angle C$

$\angle A$

$\angle B$

Ex. List the sides and angles in order from smallest to largest.

180
-110
-37
33

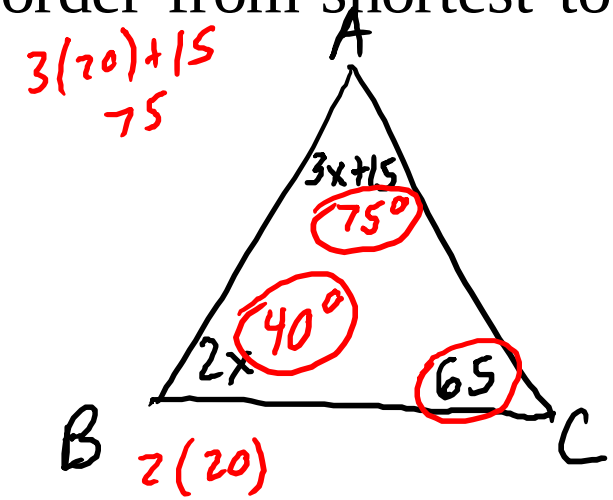


Sides: $\overline{DF}$, $\overline{EF}$, $\overline{DE}$

Angles: $\angle E$, $\angle D$, $\angle F$

Ex. In ΔABC, $m\angle A = 3x + 15$, $m\angle B = 2x$, and $m\angle C = 65$.

Find x and the measure of each angle, and then list the sides in order from shortest to longest.



$3x+15 + 2x + 65 = 180$

$5x + 80 = 180$

$5x = 100$

$x = 20$

$\overline{AC}$, $\overline{BA}$, $\overline{BC}$