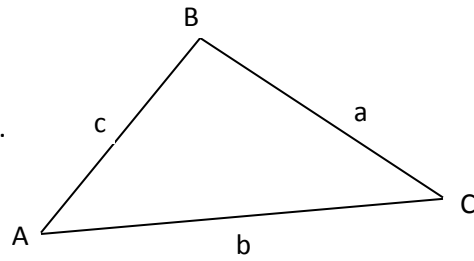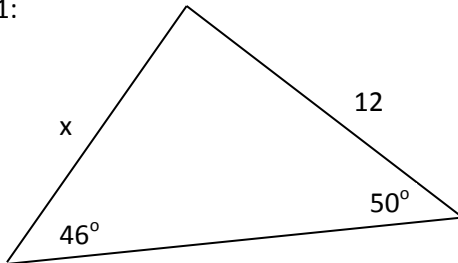Doing trig for triangles that are NOT right triangles.
Given the triangle where little letters are for sides and
Capital letters are for angles, these two equations are true.
The Law of Sines:

$$\frac{sinA}{a} = \frac{sinB}{b} = \frac{sinC}{c} \quad \text{or} \quad \frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC}$$

Ex 1:

To find x:

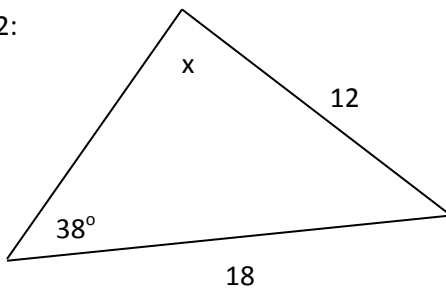1. Label the sides and angles.

2. Look at what you've got.

   x = c , 12 = a , 46 = A , 50 = C

3. Write the equation: $\frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC}$ → $\frac{12}{sin46°} = \frac{x}{sin50°}$

4. Solve the equation.

$12 \cdot sin50° = x \cdot sin46°$ → $\frac{12 \cdot sin50°}{sin46°} = \frac{x \cdot sin46°}{sin46°}$ → $x = \frac{12 sin50°}{sin46°} = \frac{12(0.766)}{(0.719)} = 12.78$

Ex 2:

1. Label the sides and angles.

2. Look at what you've got.

   18 = b , 12 = a , x = B , 38 = A

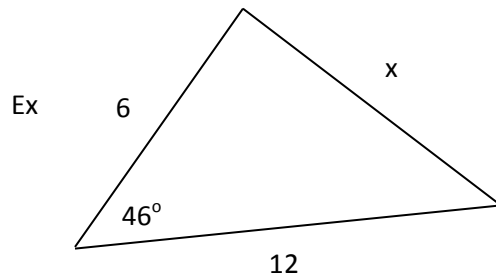3. Write the equation: $\frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC}$ → $\frac{12}{sin38°} = \frac{18}{sinx}$

4. Solve the equation.

$12 \cdot sinx = 18 \cdot sin38°$ → $sinx = \frac{18 sin38°}{12} = \frac{18(0.616)}{12} = 0.923$

$x = sin^{-1}(0.923) = 67.44°$

There is also The Law of Cosines:

$$c^2 = a^2 + b^2 - 2ab \cdot cosC \quad \text{or} \quad a^2 = b^2 + c^2 - 2bc \cdot cosA \quad \text{or} \quad b^2 = a^2 + c^2 - 2ac \cdot cosB$$
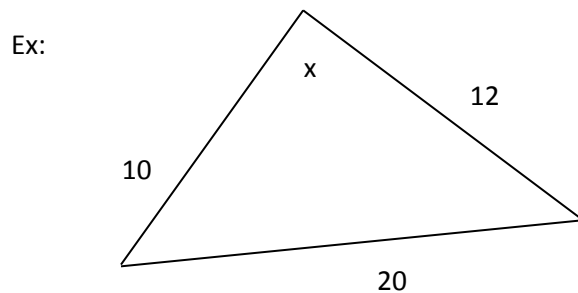
Ex

6

x

46°

12

1. Label the sides and angles.

2. Look at what you've got.

x = a   ,   6 = c   , 12 = b   , 46 = A

3. Write the equation. $x^2 = 12^2 + 6^2 - 2(12)(6)cos46°$

4. Solve the equation. $x^2 = 144 + 36 - 2(12)(6)(0.695)$ → $x^2 = 144 + 36 - 100.031$

$x^2 = 79.969$ → $x = 8.943$

Ex:

x

12

10

20

1. Label the sides and angles.

2. Look at what you've got.

10 = c   ,   12 = a   , 20 = b   , x = B

3. Write the equation. $20^2 = 12^2 + 10^2 - 2(12)(10)cosB$

4. Solve the equatio$400 = 144 + 100 - 240cosB$ n. →$400 = 244 - 240cosB$ →

$160 = -240cosB$ → $-0.6667 = cosB$ → $B = \cos^{-1}(-0.6667) = 131.81°$