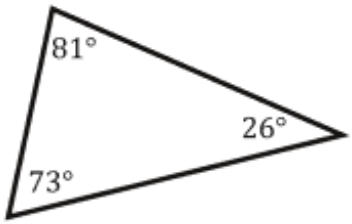
Triangle Sum Theorem

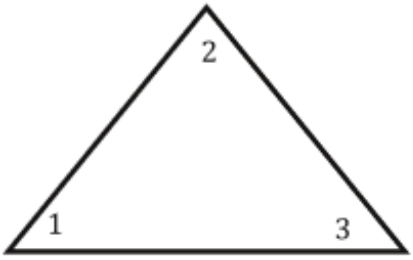
AKA: the triangle interior angle sum theorem (I know that doesn't help).

The Triangle Sum Theorem is really, really easy to explain. If you add all the interior (inside) angles of any triangle they always add to 180°. Why? Why do they ask for your phone number when you buy batteries at Radio Shack? I don't know; they just do.... It goes like this....



$81°+26°+73°=180°$

And like this...

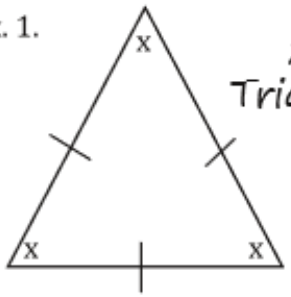


$m\angle 1+m\angle 2+m\angle 3=180°$

A couple of reminders from our section on the basics. An equilateral triangle has 3 equal angles. So. $180°/3=60°$. Every angle in an equilateral triangle is 60°. They are also all the same. Look at these two examples.

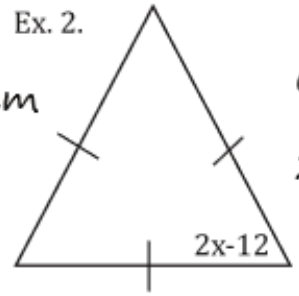
Solve for x.

Ex. 1.



$x+x+x=180°$
Triangle Sum Theorem
$\frac{3x}{3}=\frac{180°}{3}$
$x=60°$

Ex. 2.

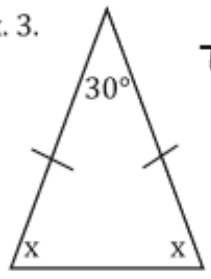


$2x-12=60°$
equilateral triangle

$2x-12=60°$
$+12\ +12°$
$2x=72°$
$\frac{2}{2}\ \frac{2}{2}$
$x=36°$

An isosceles triangle has two equal angles. Here are a couple of examples with isosceles triangles.

Ex. 3.



$x+x+30°=180°$
Triangle Sum Theorem
$2x+30°=180°$
$-30°\ \ -30°$
$\frac{2x}{2}=\frac{150°}{2}$
$x=75°$

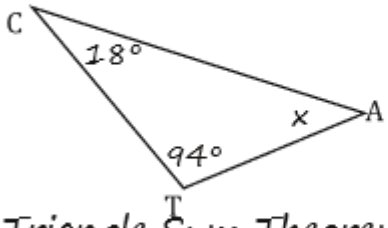
ex 4

$2x-27°=x+53°$
iscosceles triangle
$2x-27°=x+53°$
$-x\ \ \ -x$
$x-27°=53°$
$+27°+27°$
$x=80°$

Here are some examples

Mark the diagram with the given information. Then, find the measure of the indicated angle.

$m\angle C=18°$, $m\angle T=94°$. Find $m\angle A$.



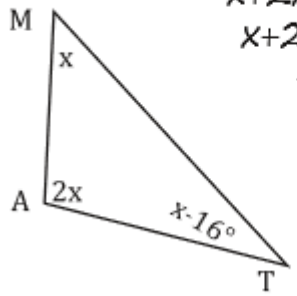
Triangle Sum Theorem

$18°+94°+x=180°$

$112°+x=180°$

$-112° \quad -112° \quad x=68° \quad m\angle A=68°$

Solve for x and find the measure of each angle.



Triangle Sum Theorem

$x+2x+(x-16°)=180°$

$x+2x+x-16°=180°$

$4x-16°=180°$

$+16° \quad +16°$

$\frac{4x}{4}=\frac{196°}{4}$

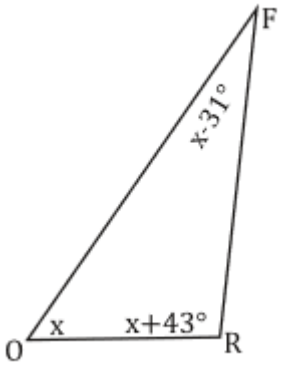
$x=49°$

$m\angle M = 49°$

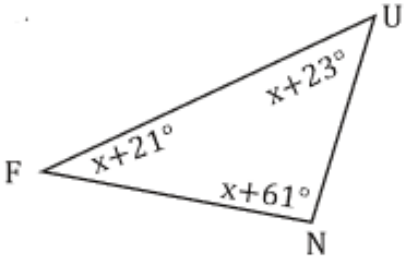
$m\angle A = 98°$

$m\angle T = 33°$

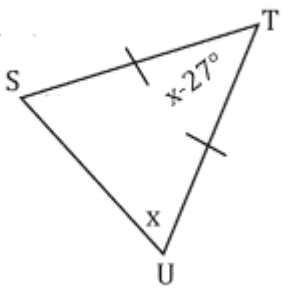
Solve for x and find the measure of each angle.



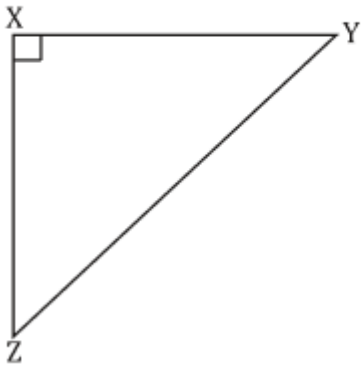
Solve for x and find the measure of each angle.



Solve for x and find the measure of each angle.
(Hint: What type of triangle is this? What does that mean you can write at $\angle S$?)

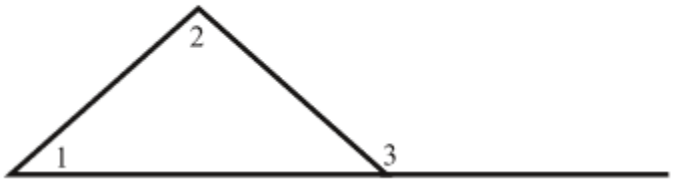


$m\angle Y=x+5°$, $m\angle Z=x-7°$. Find $m\angle Z$.



Remote Exterior Angle Theorem

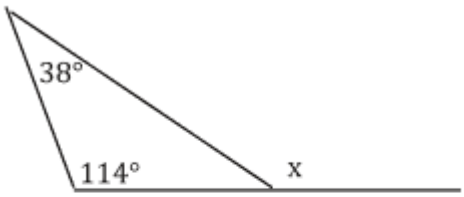
Remote Exterior Angle Theorem: The sum of the measures of two angles of a triangle is equal to the measure of the Remote Exterior Angle. $m\angle 1+m\angle 2=m\angle 3$ (memorize me)



Pay attention so you don't mess up!!!!!

Angle 3 is called "remote" because it's far away like the remote continent of Antarctica is far away. (That's the one on the bottom of the globe... remember?) IT ONLY WORKS IF THE EXTERIOR (OUTSIDE) ANGLE IS FAR AWAY FROM THE TWO INSIDE ONES.

For each find the measure of angle x.



Step 1. Write out the theorem.

$m\angle 1+m\angle 2=m\angle 3$

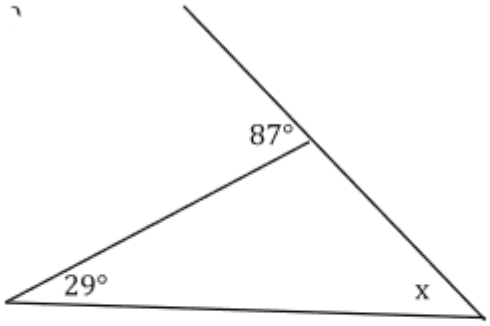
Step 2. Plug in the given values.

$114°+38°=x°$

Step 3. Solve .

$152°=x$

Find the measure of angle x.



This isn't as difficult as it looks...

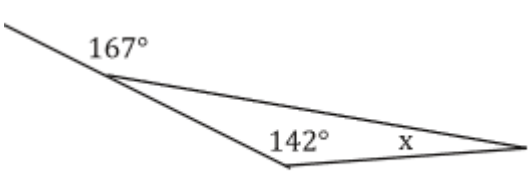
$m\angle 1+m\angle 2=m\angle 3$

$29°+x=87°$

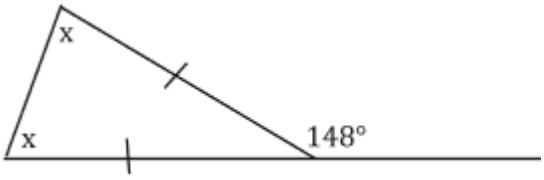
$-29° \quad -29°$

$x=$ 58°

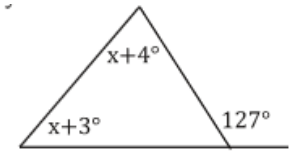
Solve for x and find the measure of each angle.



Solve for x and find the measure of each angle.



Solve for x and find the measure of each angle.



125°

$m\angle 1+m\angle 2=m\angle 3$

$(x+3°)+(x+4°)=125°$

$x+3°+x+4°=125°$

$2x+7°=125°$

$-7° \quad -7°$

$\frac{2x}{2}=\frac{118°}{2}$

$x=59°$

Now plug x back in to find the value of each angle.

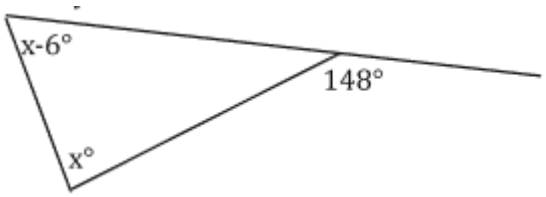
59 + 3 = 62°

59 + 4 = 63°

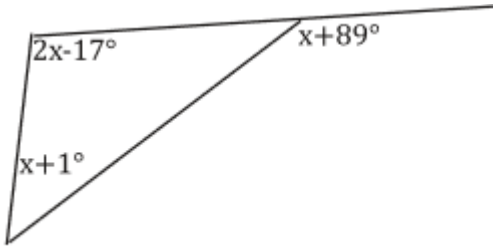
And check your work! The interior angles should add to equal the exterior angle.

62° + 63° = 125°

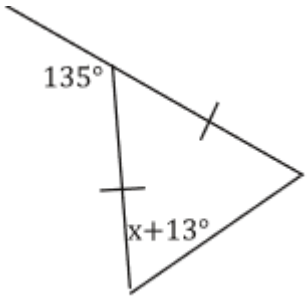
Solve for x and find the measure of each angle.



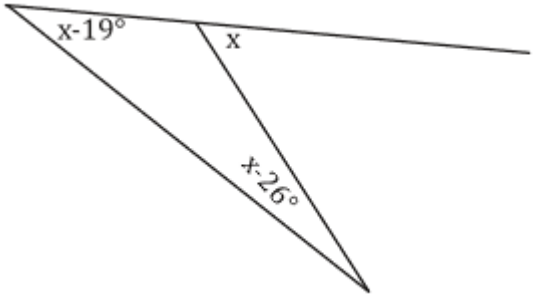
Solve for x and find the measure of each angle.



Solve for x and find the measure of each angle.
(Remember the hint about the type of triangle!?)



Solve for x and find the measure of each angle.



Challenge Problem: It helps to label everything before setting up your equation

Solve for x and find the measure of each angle.

m∠L is 51° more than two times m∠P, m∠HEP is 9° more than four times m∠P. Find m∠HEP.