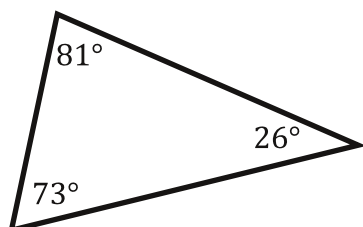


# Triangle Sum Theorem

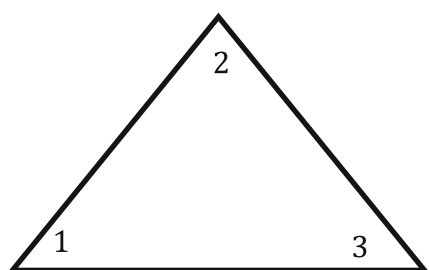
AKA: the triangle interior angle sum theorem (I know that doesn't help).

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  $180^\circ$ . 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....



$$81^\circ + 26^\circ + 73^\circ = 180^\circ$$

And like this...

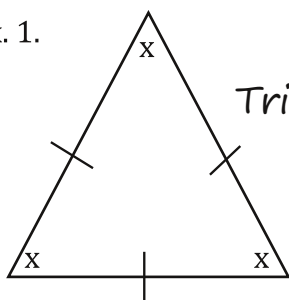


$$m\angle 1 + m\angle 2 + m\angle 3 = 180^\circ$$

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

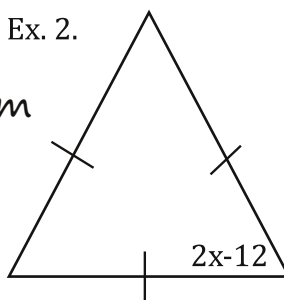
Solve for x.

Ex. 1.



$$\begin{aligned} x + x + x &= 180^\circ \\ \text{Triangle Sum Theorem} \\ \frac{3x}{3} &= \frac{180^\circ}{3} \\ x &= 60^\circ \end{aligned}$$

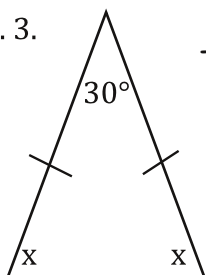
Ex. 2.



$$\begin{aligned} 2x - 12 &= 60^\circ \\ \text{equilateral triangle} \\ 2x - 12 &= 60^\circ \\ +12 \quad +12^\circ \\ \hline 2x &= 72^\circ \\ \frac{2}{2} \quad \frac{2}{2} \\ \hline x &= 36^\circ \end{aligned}$$

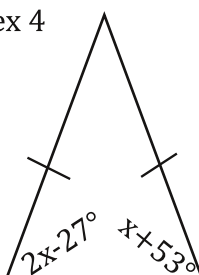
An isosceles triangle has two equal angles. Here are a couple of examples with isosceles triangles.

Ex. 3.



$$\begin{aligned} x + x + 30^\circ &= 180^\circ \\ \text{Triangle Sum Theorem} \\ 2x + 30^\circ &= 180^\circ \\ -30^\circ \quad -30^\circ \\ \hline 2x &= 150^\circ \\ \frac{2}{2} \quad \frac{2}{2} \\ \hline x &= 75^\circ \end{aligned}$$

ex 4

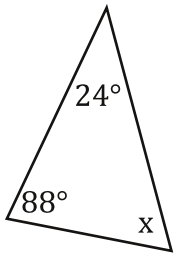


$$\begin{aligned} 2x - 27^\circ &= x + 53^\circ \\ \text{isosceles triangle} \\ 2x - 27^\circ &= x + 53^\circ \\ -x \quad -x \\ \hline x - 27^\circ &= 53^\circ \\ +27^\circ \quad +27^\circ \\ \hline x &= 80^\circ \end{aligned}$$

Let's do a bunch of problems to turn you into a Triangle Sum Theorem expert.

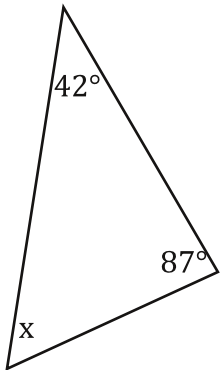
For each, find the measure of the missing angle.

1.

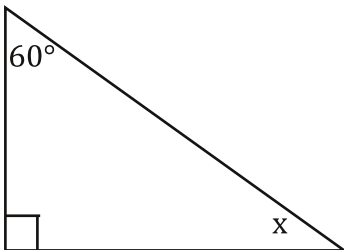


**Triangle Sum Theorem**  
 $24^\circ + 88^\circ + x = 180^\circ$   
 $112^\circ + x = 180^\circ$   
 $-112^\circ \quad -112^\circ$   
 $x = 68^\circ$

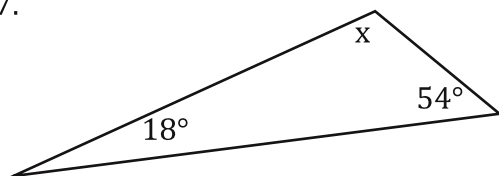
3.



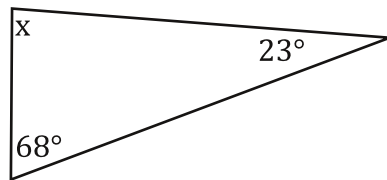
5.



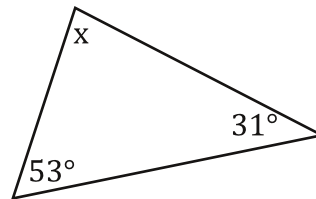
7.



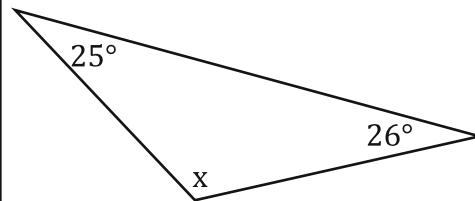
2.



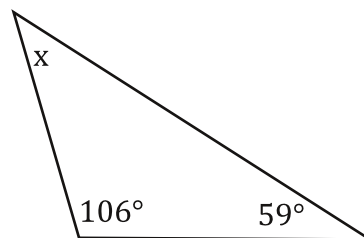
4.



6.



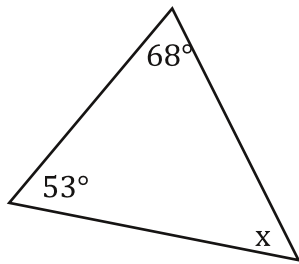
8.



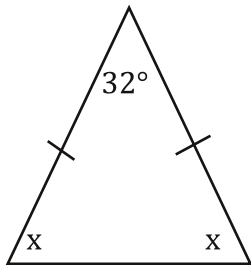
Bubble all the correct answers from above. Don't bubble incorrect answers.

☐ 68° ☐ 271° ☐ 96° ☐ 30° ☐ 120° ☐ 108° ☐ 139° ☐ 15° ☐ 129° ☐ 231° ☐ 34° ☐ 89° ☐ 51° ☐ 54°

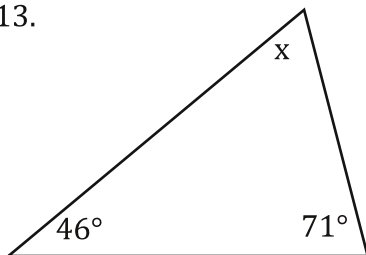
9.



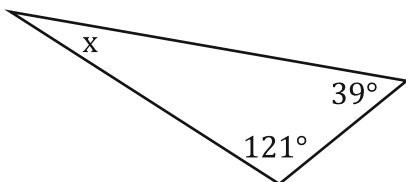
11.



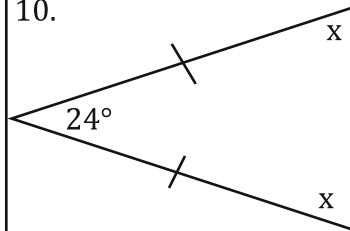
13.



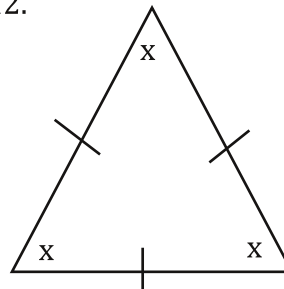
15.



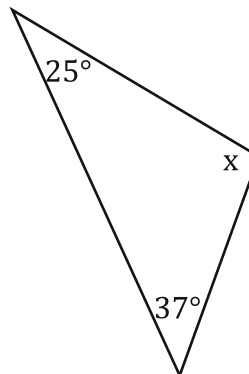
10.



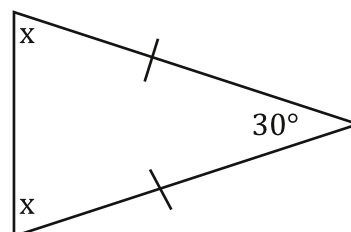
12.



14.



16.

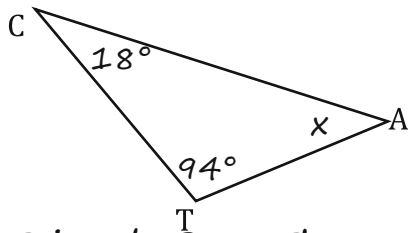


Bubble all the correct answers from above. Don't bubble incorrect answers.

☐  $30^\circ$ 
☐  $75^\circ$ 
☐  $20^\circ$ 
☐  $118^\circ$ 
☐  $78^\circ$ 
☐  $148^\circ$ 
☐  $74^\circ$ 
☐  $150^\circ$ 
☐  $60^\circ$ 
☐  $64^\circ$ 
☐  $65^\circ$ 
☐  $63^\circ$ 
☐  $21^\circ$ 
☒  $259^\circ$

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

17.  $m\angle C=18^\circ$ ,  $m\angle T=94^\circ$ . Find  $m\angle A$ .



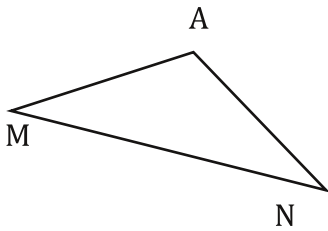
*Triangle Sum Theorem*

$$18^\circ + 94^\circ + x = 180^\circ$$

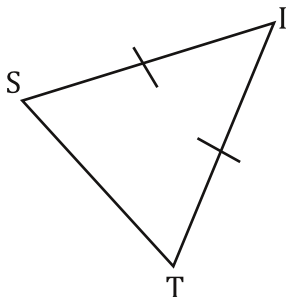
$$112^\circ + x = 180^\circ$$

$$-112^\circ \quad -112^\circ \quad x = 68^\circ \quad m\angle A = 68^\circ$$

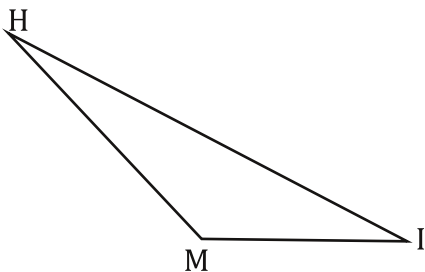
19.  $m\angle A=138^\circ$ ,  $m\angle N=17^\circ$ . Find  $m\angle M$ .



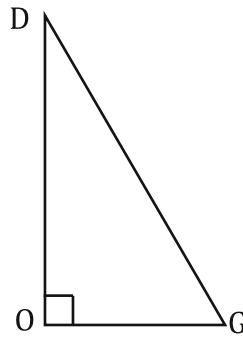
21.  $m\angle I=48^\circ$ . Find  $m\angle T$ .



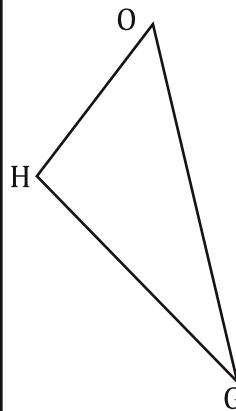
23.  $m\angle H=13^\circ$ ,  $m\angle I=24^\circ$ . Find  $m\angle M$ .



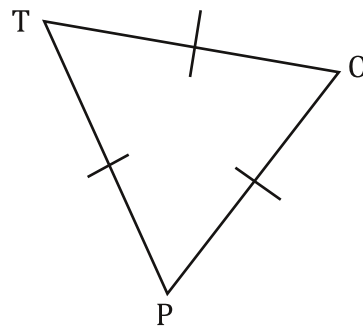
18.  $m\angle D=30^\circ$ ,  $m\angle O=90^\circ$ . Find  $m\angle G$ .



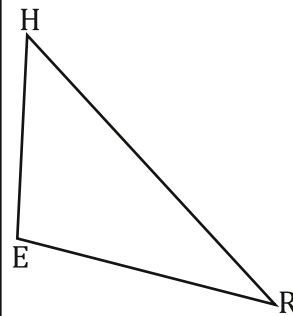
20.  $m\angle O=47^\circ$ ,  $m\angle G=43^\circ$ . Find  $m\angle H$ .



22. Find  $m\angle O$ ,  $m\angle T$ , and  $m\angle P$ .



24.  $m\angle E=118^\circ$ ,  $m\angle R=26^\circ$ . Find  $m\angle H$ .

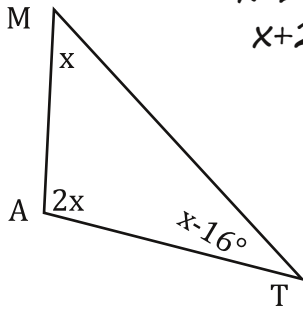


Bubble all the correct answers from above. Don't bubble incorrect answers.

☐  $68^\circ$  ☐  $112^\circ$  ☐  $66^\circ$  ☐  $132^\circ$  ☐  $143^\circ$  ☐  $37^\circ$  ☐  $36^\circ$  ☐  $20^\circ$  ☐  $60^\circ$  ☐  $90^\circ$  ☐  $60^\circ$  ☐  $30^\circ$  ☐  $25^\circ$  ☐  $120^\circ$

Solve for x.

25.



Triangle Sum Theorem

$$x + 2x + (x - 16^\circ) = 180^\circ$$

$$x + 2x + x - 16^\circ = 180^\circ$$

$$4x - 16^\circ = 180^\circ$$

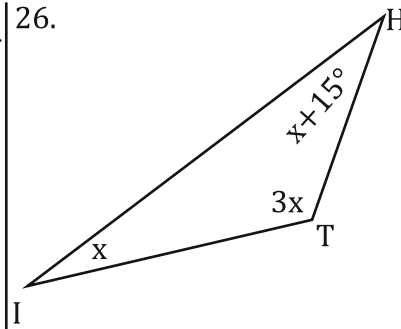
$$+16^\circ \quad +16^\circ$$

$$4x = 196^\circ$$

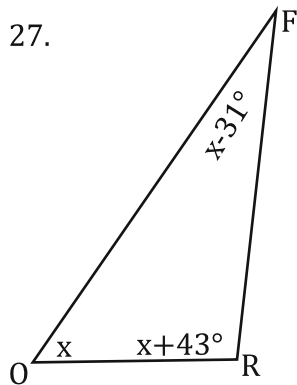
$$\frac{4}{4} \quad \frac{196}{4}$$

$$x = 49^\circ$$

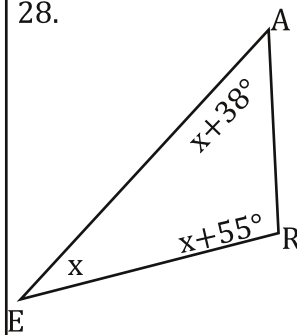
26.



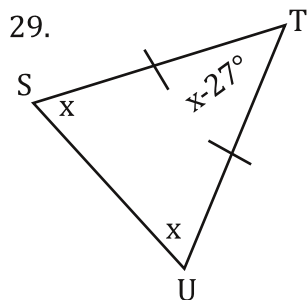
27.



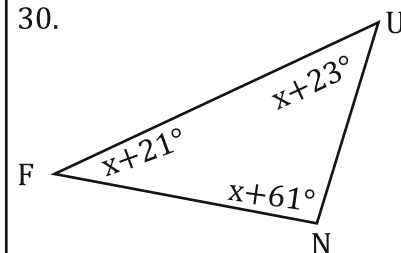
28.



29.



30.

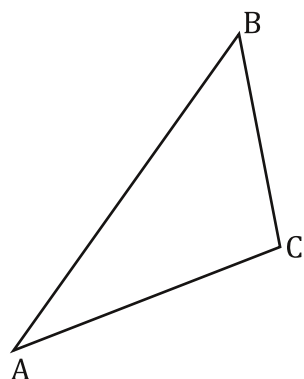


Bubble all the correct answers from above. Don't bubble incorrect answers.

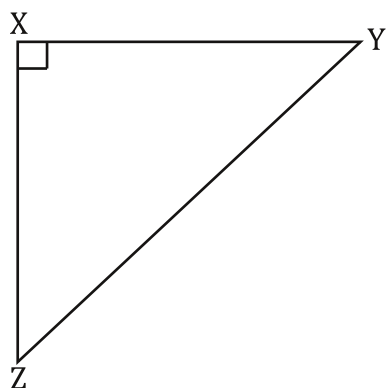
☐  $165^\circ$    ☐  $25^\circ$    ☐  $69^\circ$    ☐  $27^\circ$    ☐  $29^\circ$    ☐  $55^\circ$    ☐  $56^\circ$    ☐  $39^\circ$    ☐  $33^\circ$    ☐  $49^\circ$

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

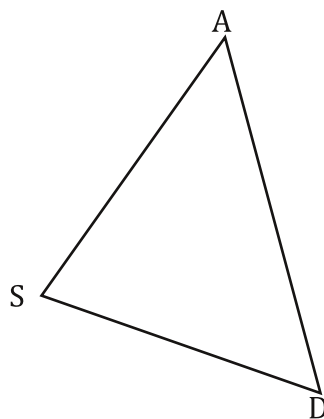
31.  $m\angle A = X$ ,  $m\angle B = 2X$ .  $m\angle C = 2X + 30^\circ$ . Find  $m\angle B$ .



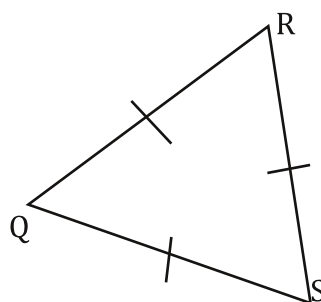
33.  $m\angle Y = x + 5^\circ$ ,  $m\angle Z = x - 7^\circ$ . Find  $m\angle Z$ .



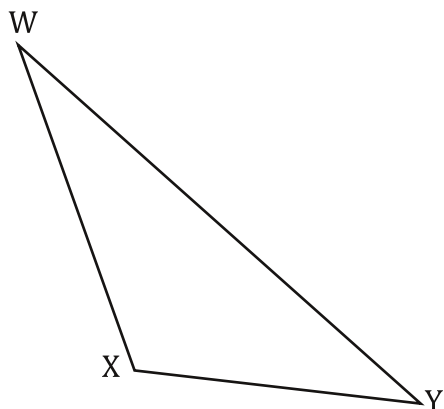
32.  $m\angle S = 2x$ ,  $m\angle A = X - 23$ .  $m\angle D = X - 17^\circ$ .  
Find  $m\angle S$ .



34. Find  $m\angle R$ ,  $m\angle Q$ , and  $m\angle S$ .



35.  $m\angle W = x - 22^\circ$ ,  $m\angle X = 3x + 19^\circ$ ,  $m\angle Y = x - 17^\circ$ . Find  $m\angle X$ .



Bubble all the correct answers from above. Don't bubble incorrect answers.

☐  $39^\circ$    ☐  $60^\circ$    ☐  $139^\circ$    ☐  $60^\circ$    ☐  $110^\circ$    ☐  $55^\circ$    ☐  $50^\circ$    ☐  $46^\circ$    ☐  $31^\circ$    ☐  $92^\circ$