# Warm Up

Find the following values of x.

$37x + 24 - 12x = 13x + 2x - 7$

$25x + 24 = 15x - 7$

$10x = -31$

$x = -3.1$

$24x - 15 + 16x = 18x - 14x + 16$

$40x - 15 = 4x + 16$

$36x = 31$

$x = \frac{31}{36}$

$14x - 12 = 24x - 6 - 12x$

$14x - 12 = 12x - 6$

$2x = 6$

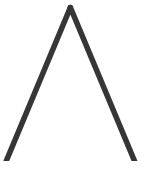
$x = 3$

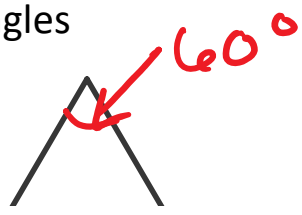
# Essential Question

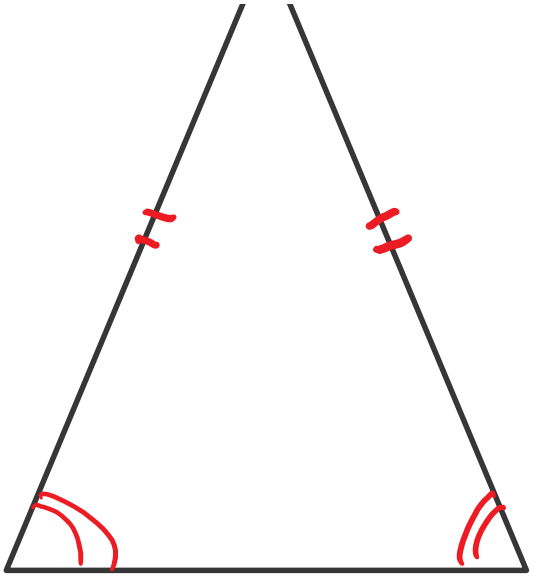
How are the side lengths and angle measures related in isosceles triangles and in equilateral triangles?

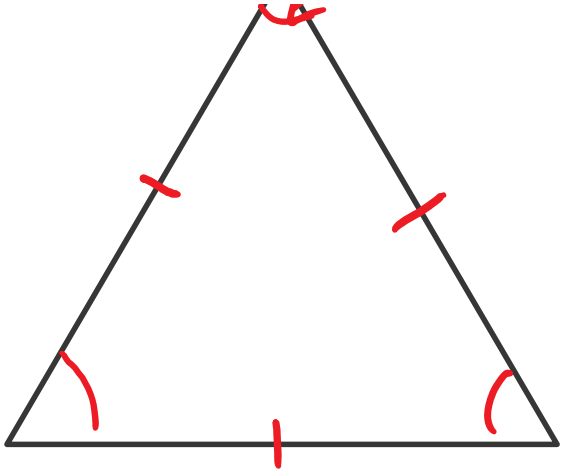
**Goal: "I can. . .**
**Apply Theorems about isosceles and equilateral triangles to solve problems."**

Side and angle relationships in Iso, and Equilateral Triangles









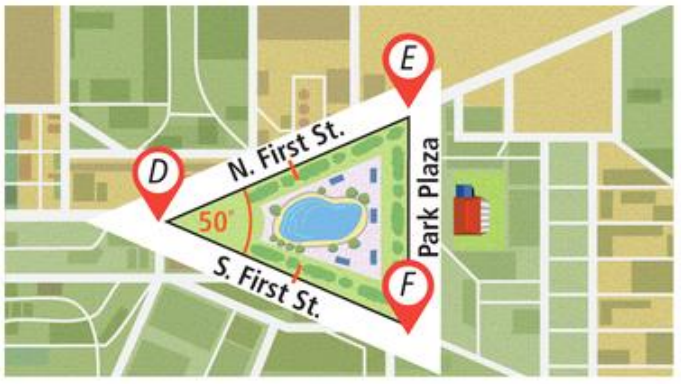
## Isosceles Triangle Theorem and the Converse

If two sides of a triangle are congruent, then the angles opposite those sides are congruent.

If two angles of a triangle are congruent, then the sides opposite those angles are congruent.

## Example 1 Using the Isosceles Triangle Theorem

An architect is designing a community park between N. First St. and S. First ST. The pathways on either side of the pool will be equal in length and will provide effective access and circulation around the pool> To Protect the landscaping and to minimize erosion, the architect will place a triangular section of triangular cobblestones at the corners along Park Plaza. What angle measure should the architect specify for the corners in her design?





$2x + 50 = 180$

$2x = 30$

$x = 15$

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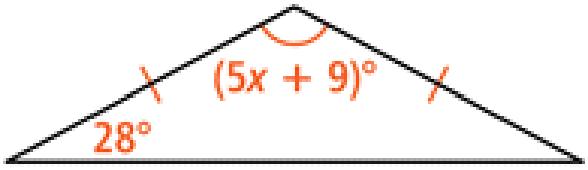
What is the value of x?

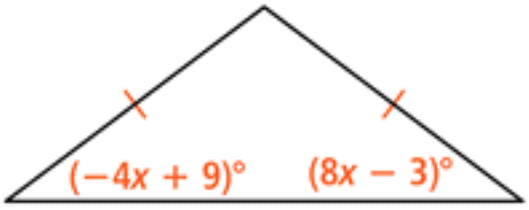



$5x + 9 + 56 = 180$

$5x + 65 = 180$

$5x = 115$

$x = 23$




$-4x + 9 = 8x - 3$

$12 = 12x$

$1 = x$

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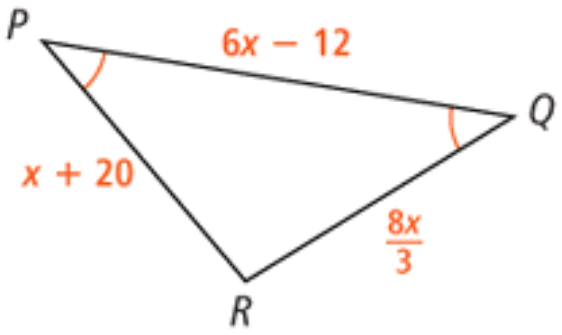
## Example 2 Using the Converse Isosceles Triangle Theorem

What are the lengths of all three sides of the triangle?




$x+20=\frac{8x}{3}$

$3x+60=8x$

$60=5x$

$12=x$

---

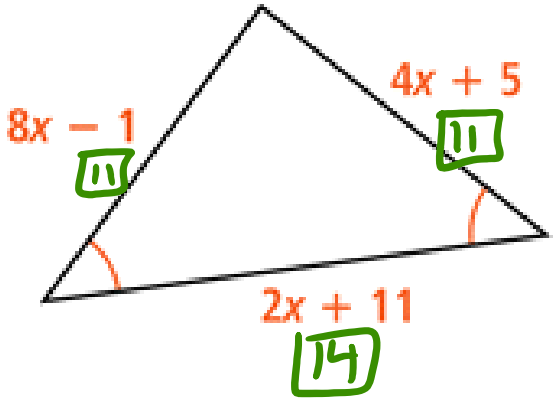
Find x.

What are the side lengths of the triangle?

$8x-1=4x+5$

$4x=6$

$x=\frac{3}{2}$

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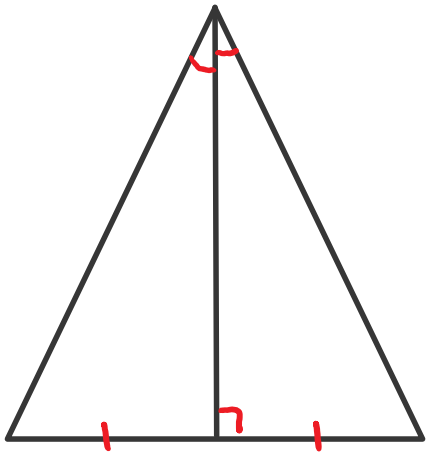
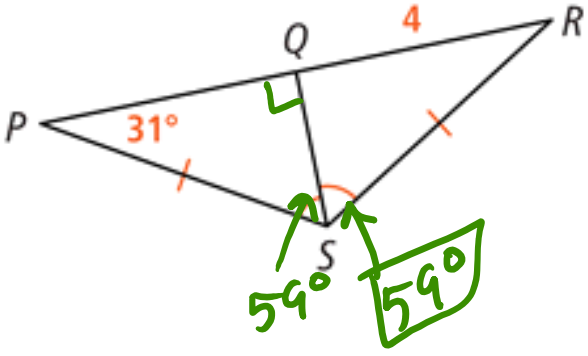
If a line, line segment, or ray bisects the vertex angle of an isosceles triangle, then it is also the perpendicular bisector of the opposite side.



## Example 3

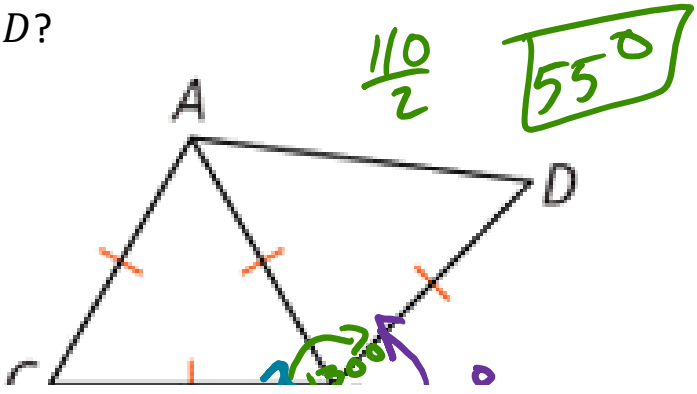
Using the figure, what is the $m\angle RSQ$? What is *PR*?

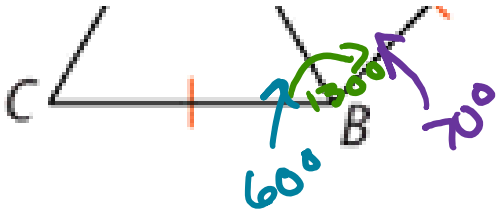
180°




If $m\angle CBD = 130$, what is the $m\angle BAD$?

$\frac{110}{2}$ 55°



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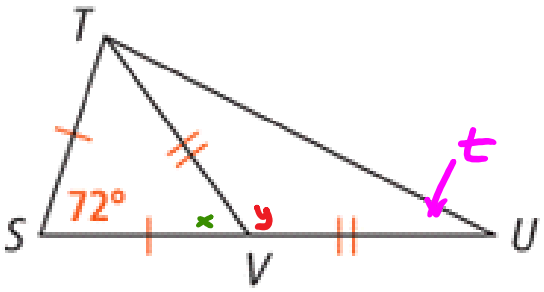
What is the $m\angle U$?




$x = \frac{180-72}{2}$

$x = \frac{108}{2}$

$x = 54$

$x + y = 180$

$y = 126$

$2t + 126 = 180$

$2t = 54$

$t = 27$

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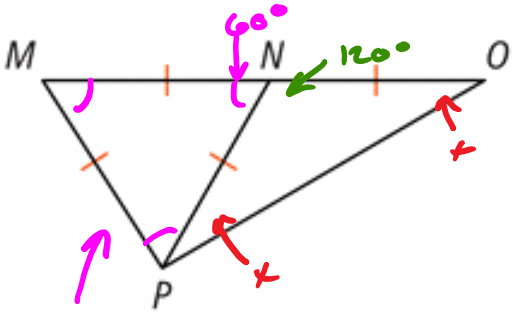
What is the $m\angle PNO$? 120°

What is the $m\angle NOP$? 30°




Equilateral

$2x + 120 = 180$

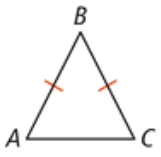
$2x = 60$

$x = 30$

## Isosceles and Equilateral Triangles

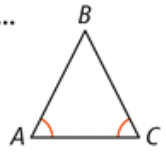
### ISOSCELES TRIANGLES

If...




$\overline{AB} \cong \overline{BC}$

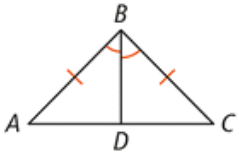
Then...




$\angle ACB \cong \angle BAC$

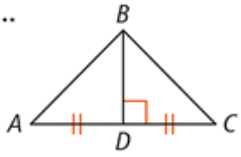
### PERPENDICULAR BISECTOR

If...




$\overline{AB} \cong \overline{BC}$ and $m\angle ABD = m\angle CBD$

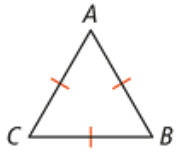
Then...




$\overline{BD} \perp \overline{AC}$ and $AD = DC$

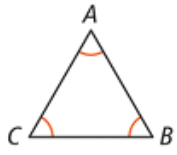
### EQUILATERAL TRIANGLES

If...




$\overline{AB} \cong \overline{BC} \cong \overline{AC}$

Then...




$\angle A \cong \angle B \cong \angle C$

# Homework

## Pg. 164
## 12, 18-23, 26, 29, 30