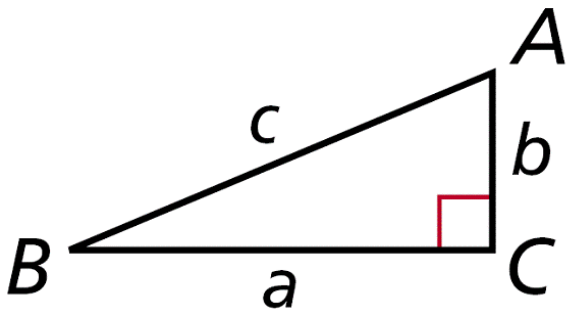
Warm Up

Use ΔABC for Exercises 1–3.



1. If $a = 60$ and $c = 61$, find b. 11

2. If $b = 6$ and $c = 10$, find $\sin B$. 0.6

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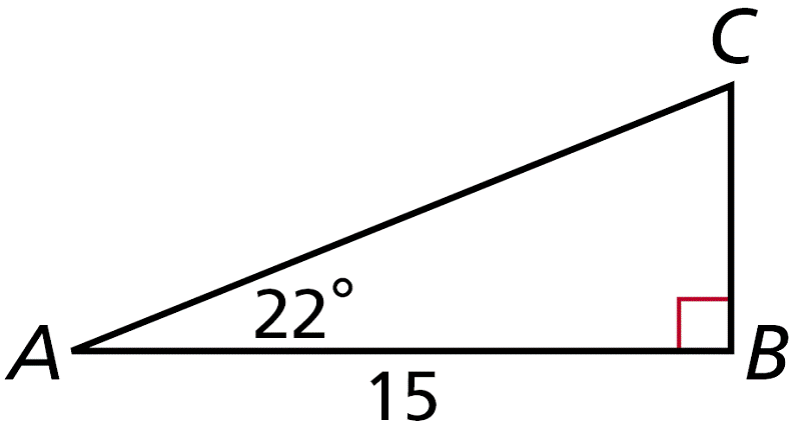
Find each length. Round to the nearest tenth.



3. *CB* 6.1

4. *AC* 16.2

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8.3 – Find missing angles using Trig -- Solve Right Triangles

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In Lesson 8-2, you learned that sin 30° = 0.5. Conversely, if you know that the sine of an acute angle is 0.5, you can conclude that the angle measures 30°. This is written as $\sin^{-1}(0.5) = 30°$.

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8-3 Solving Right Triangles

Inverse Trigonometric Functions
If $\sin A = x$, then $\sin^{-1} x = m\angle A$.
If $\cos A = x$, then $\cos^{-1} x = m\angle A$.
If $\tan A = x$, then $\tan^{-1} x = m\angle A$.

***To find unknown angles in a Right Triangle, we use inverse trig functions

****To know which trig function to use, look at what sides are given to us.

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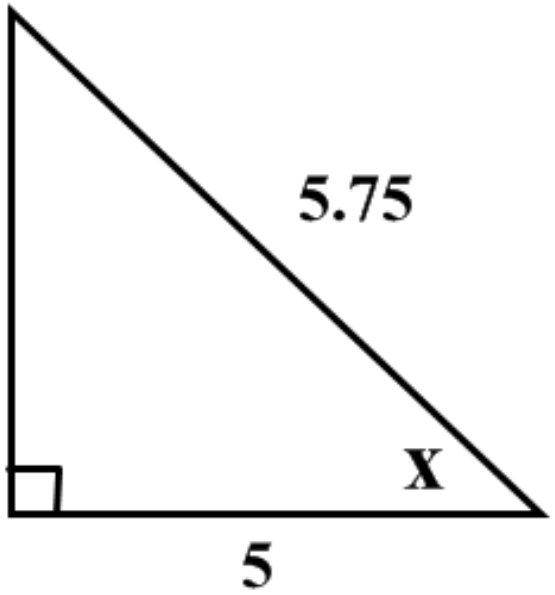
Find the measure of the missing angle.



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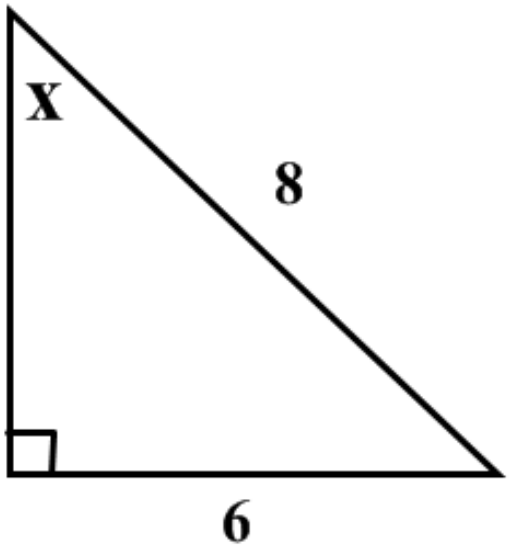
Find the measure of the missing angle.



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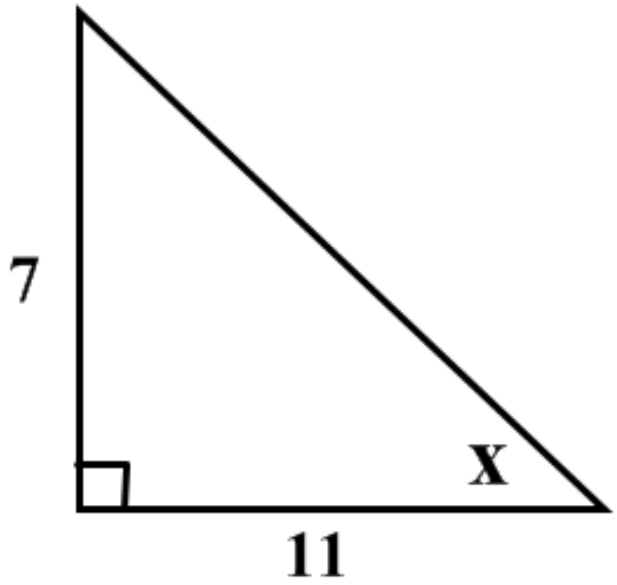
Find the measure of the missing angle.



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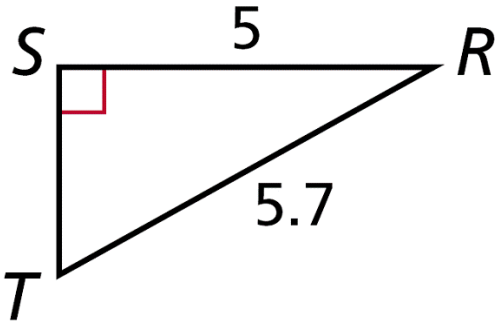
Example 3: Solving Right Triangles

Find the unknown measures. Round lengths to the nearest hundredth and angle measures to the nearest degree.



$$RT^2 = RS^2 + ST^2$$

$$(5.7)^2 = 5^2 + ST^2$$

So $ST = \sqrt{7.49} \approx 2.74$.

$$m\angle R = \cos^{-1}\left(\frac{5}{5.7}\right) \approx 29°$$

Since the acute angles of a right triangle are complementary, $m\angle T \approx 90° - 29° \approx 61°$.

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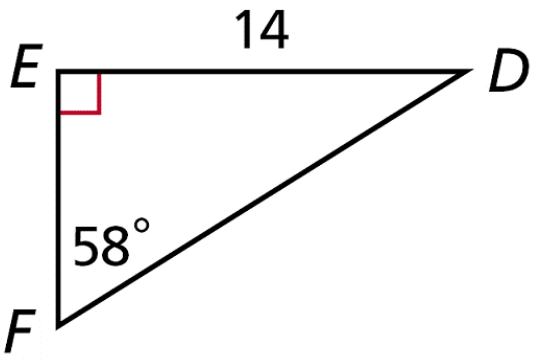
Check It Out! Example 3

Find the unknown measures. Round lengths to the nearest hundredth and angle measures to the nearest degree.



Since the acute angles of a right triangle are complementary, $m\angle D = 90° - 58° = 32°$.

$\tan 32° = \frac{EF}{14}$, so $EF = 14 \tan 32°$. $EF \approx 8.75$

$DF^2 = ED^2 + EF^2$

$DF^2 = 14^2 + 8.75^2$

$DF \approx 16.51$

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Problem Solving Application

A contractor is building a wheelchair ramp for a doorway that is 1.2 ft above the ground. To meet ADA guidelines, the ramp will make an angle of 4.8° with the ground. To the nearest hundredth of a foot, what is the horizontal distance covered by the ramp?

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Example 4: Solving a Right Triangle in the Coordinate Plane

The coordinates of the vertices of $\triangle PQR$ are $P(-3, 3)$, $Q(2, 3)$, and $R(-3, -4)$. Find the side lengths to the nearest hundredth and the angle measures to the nearest degree.

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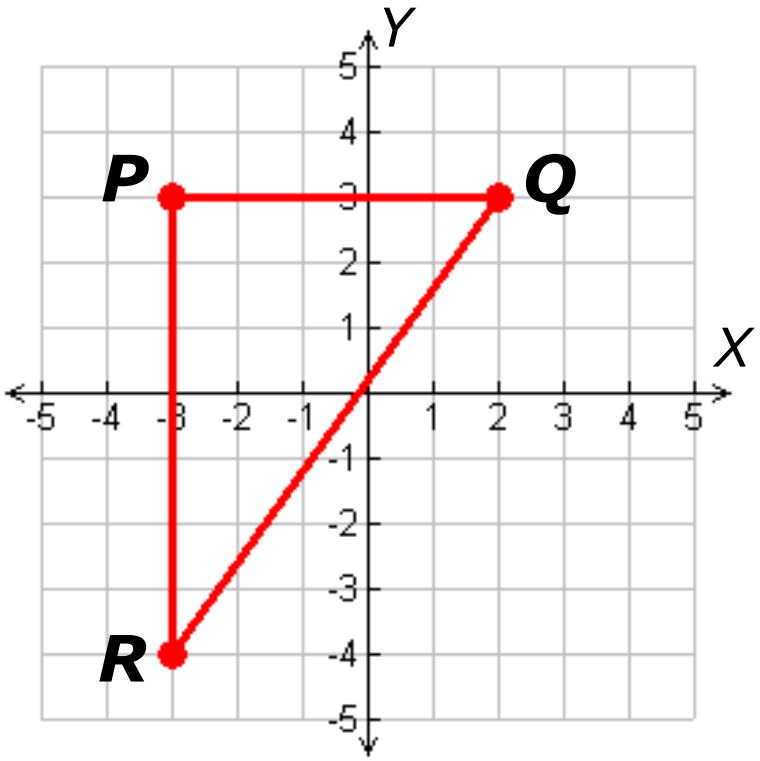
Example 4 Continued

Step 1 Find the side lengths. Plot points *P*, *Q*, and *R*.



$PR = 7$ $PQ = 5$

By the Distance Formula,

$$QR = \sqrt{(-3-2)^2 + (-4-3)^2}$$

$$= \sqrt{(-5)^2 + (-7)^2}$$

$$= \sqrt{25+49} = \sqrt{74} \approx 8.60$$

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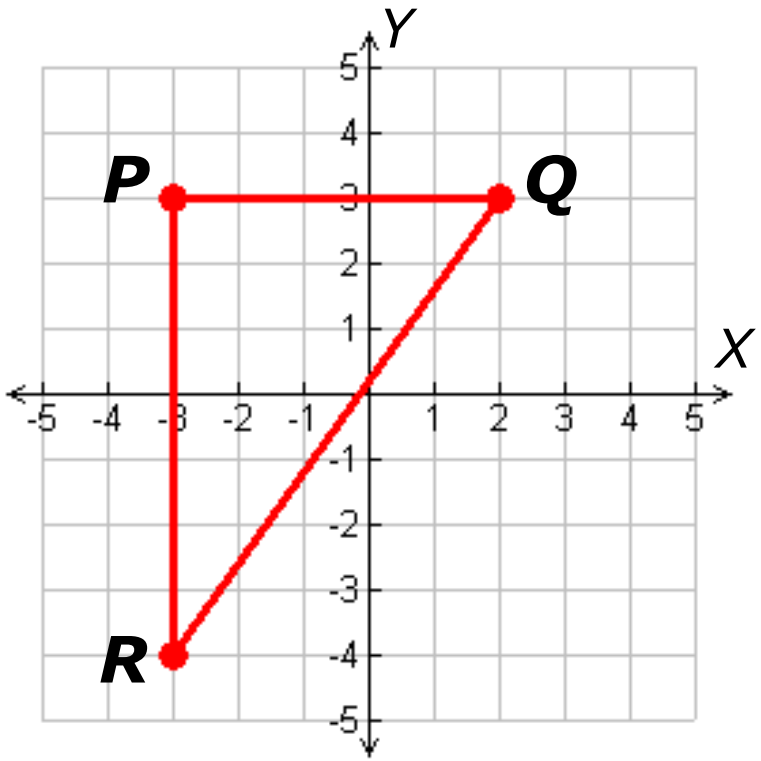
Example 4 Continued

Step 2 Find the angle measures.



$m\angle P = 90°$ $\overline{PQ}$ and $\overline{PR}$ are $\perp$.

$\overline{PR}$ is opp. $\angle Q$,

and $\overline{PQ}$ is adj. to $\angle Q$.

$$m\angle Q = \tan^{-1}\left(\frac{7}{5}\right) \approx 54°$$

The acute $\angle$s of a rt. Δ are comp.

$m\angle R \approx 90° - 54° \approx 36°$

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Check It Out! Example 4

The coordinates of the vertices of ΔRST are $R(-3, 5)$, $S(4, 5)$, and $T(4, -2)$. Find the side lengths to the nearest hundredth and the angle measures to the nearest degree.

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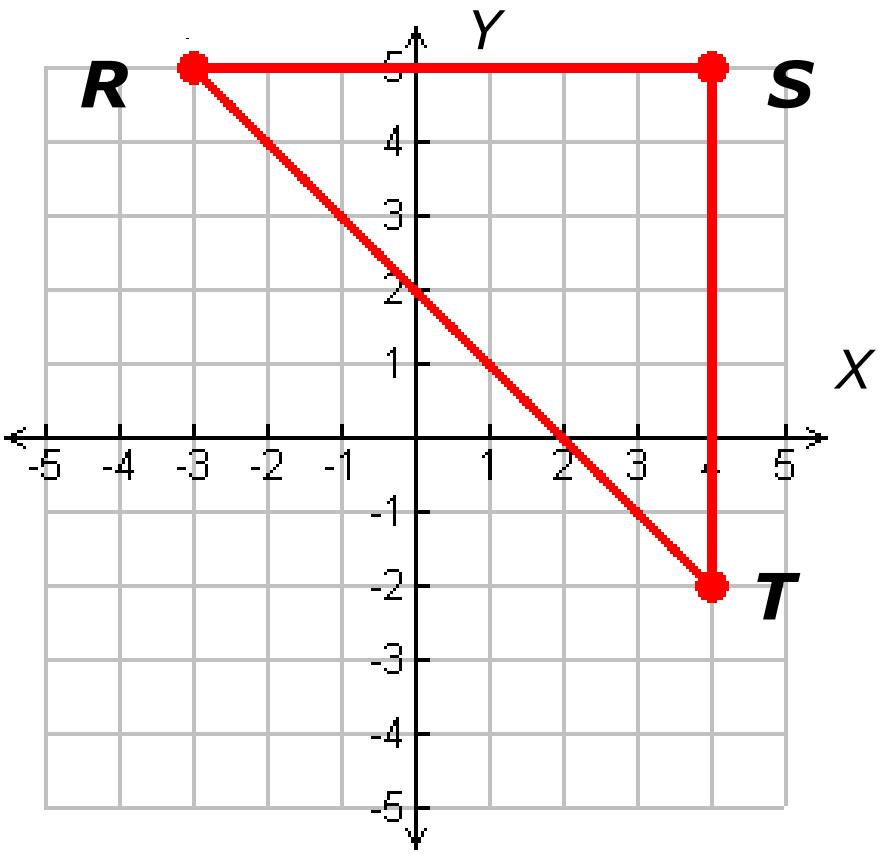
Check It Out! Example 4 Continued

Step 1 Find the side lengths. Plot points *R*, *S*, and *T*.



$RS = ST = 7$

By the Distance Formula,

$$RT = \sqrt{(4-(-3))^2 + (-2-5)^2}$$

$$= \sqrt{(7)^2 + (-7)^2}$$

$$= \sqrt{49+49} = 7\sqrt{2} \approx 9.90$$

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Check It Out! Example 4 Continued

Step 2 Find the angle measures.

$m\angle S = 90°$

$\overline{RS}$ and $\overline{ST}$ are $\perp$.

$m\angle T = \tan^{-1}\left(\frac{7}{7}\right) = 45°$

$\overline{RS}$ is opp. $\angle T$, and $\overline{ST}$ is adj. $\angle T$.

$m\angle R \approx 90° - 45° \approx 45°$

The acute $\angle$s of a rt. Δ are comp.

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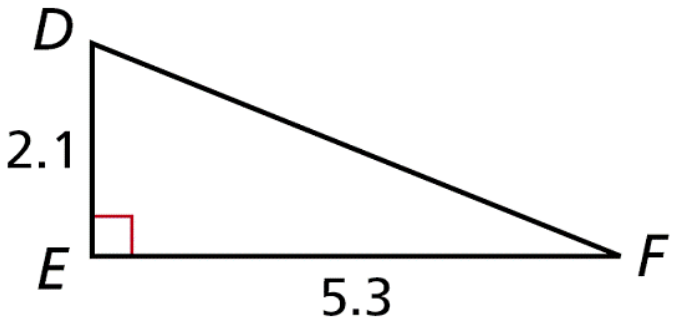
Lesson Quiz: Part II

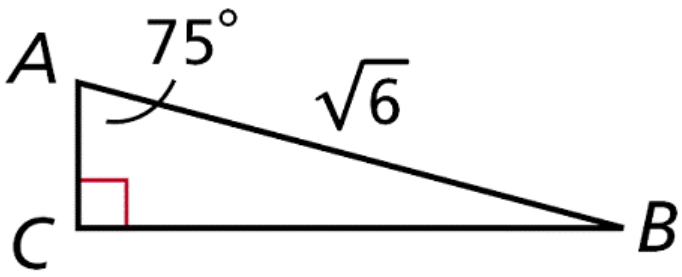
Find the unknown measures. Round lengths to the nearest hundredth and angle measures to the nearest degree.

4.



$DF \approx 5.7$; $m\angle D \approx 68°$; $m\angle F \approx 22°$

5.



$AC \approx 0.63$; $BC \approx 2.37$; $m\angle B = 15°$

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Lesson Quiz: Part III

6. The coordinates of the vertices of ΔMNP are $M(-3, -2)$, $N(-3, 5)$, and $P(6, 5)$. Find the side lengths to the nearest hundredth and the angle measures to the nearest degree.

$MN = 7$; $NP = 9$; $MP \approx 11.40$; $m\angle N = 90°$; $m\angle M \approx 52°$; $m\angle P \approx 38°$

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Homework:

WS 8.3

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