

6.2: Trig Applications

“I WILL...

...solve right triangles using trigonometry.

...solve word problems using trigonometry.”

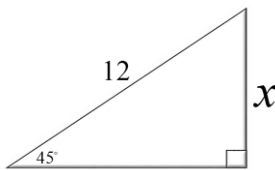
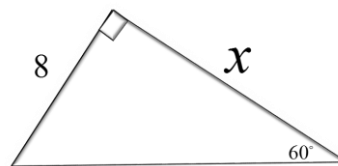
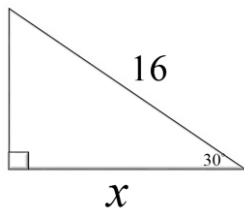
I. Triangle Sum Theorem

A. Triangle Sum Theorem: The sum of all the measures equal 180°

B. Not ALL triangles are right triangles

C. ONLY in a RIGHT triangle, use the Pythagorean Theorem

II. Special Right Triangles

A. $45^\circ, 45^\circ, 90^\circ = x, x, x\sqrt{2}$ B. $30^\circ, 60^\circ, 90^\circ = x, x\sqrt{3}, 2x$ Ex 1: Find the exact value of x without using a calculatorEx 2: Find the exact value of x without using a calculatorYour Turn: Find the exact value of x without using a calculator

III. If the unknown is a Side Measure

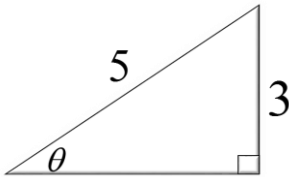
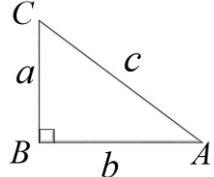
A. Make sure the calculator remains in degree mode

B. Either multiply or divide the side with the angle measure depending on what is given

<p>Ex 3: Solve the equation, $\cos 50^\circ = \frac{x}{10}$ and round to 4 decimal places</p>	<p>Ex 4: Solve the equation, $\sin 48^\circ = \frac{12}{x}$ and round to 4 decimal places</p>
<p>Your Turn: Solve the equation, $\tan 48^\circ = \frac{12}{x}$ and round to 4 decimal places</p>	

IV. If the unknown is an Angle Measure

- Make sure the calculator remains in degree mode
- Press [2nd] Trig function to determine the angle.
- It is known as the Inverse or -1 notation. It is NOT an exponent
- It is written as: $\sin^{-1} \theta$ or $\arcsin \theta$

<p>Ex 5: Find the angle measure and round to 4 decimal places</p> 	<p>Your Turn: Find the angle measure of angle A and angle C and round to 4 decimal places if $a = 4$ and $c = 6$</p> 
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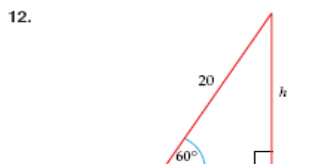
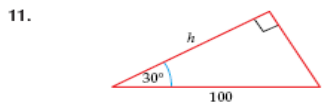
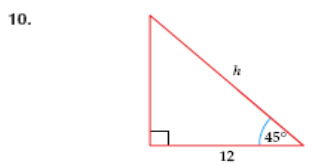
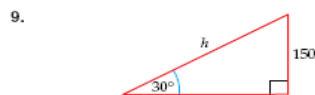
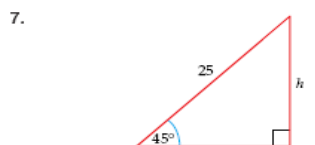
V. Angle of Elevation vs Angle of Depression

- A. Angle of Elevation is a measurement above the horizontal line
- B. Angle of Depression is a measurement below the horizontal line

VI. Steps in Application Problems

- A. Draw a picture
- B. Label the sides of the triangle and the missing side as x
- C. Determine which of the 3 basic trig functions to use
- D. Write the equation in calculator-ready form

<p>Ex 6: A flagpole casts a 60-foot shadow when the angle of elevation of the sun is 35°. Find the height of the flagpole.</p>	<p>Ex 7: A wire needs to reach from the top of a building to the point on the ground. The building is 10 meters tall and the angle of depression from the top of the building to the point on the ground is 22°. How long should the wire be?</p>
<p>Ex 8: A person on the edge of a canal observes a lamp post on the other side with an angle of elevation of 12° to the top of the lamp post and an angle of depression of 7° to the bottom of the lamp post from eye level. The person's eye level is 152 cm. Find the height of the lamp post.</p>	<p>Your Turn: A boat is observed from the top of a 30 foot tower. The angle of depression from the tower to the boat is 15°. How far is the boat from the tower?</p>



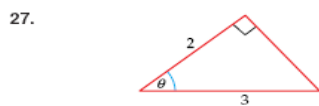
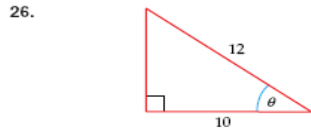
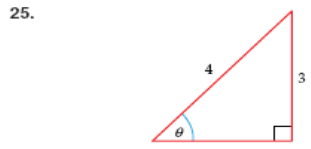
In Exercises 13–16, find the indicated value without using a calculator.

- 13. $a = 4$ $m\angle A = 60^\circ$ Find c .
- 14. $c = 5$ $m\angle A = 60^\circ$ Find a .
- 15. $c = 10$ $m\angle A = 30^\circ$ Find a .
- 16. $a = 12$ $m\angle A = 30^\circ$ Find c .

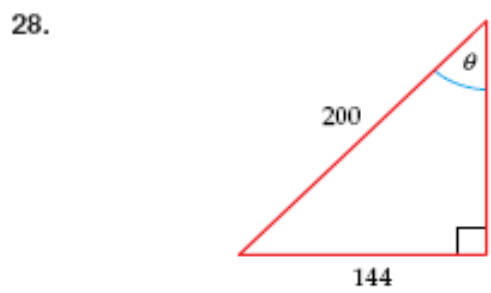
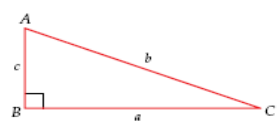
In Exercises 17–24, solve the triangle with the given conditions.

- 17. $b = 10$ $m\angle C = 50^\circ$
- 18. $c = 12$ $m\angle C = 37^\circ$
- 19. $a = 6$ $m\angle A = 14^\circ$
- 20. $a = 8$ $m\angle A = 40^\circ$
- 21. $c = 5$ $m\angle A = 65^\circ$
- 22. $c = 4$ $m\angle C = 28^\circ$
- 23. $b = 3.5$ $m\angle A = 72^\circ$
- 24. $a = 4.2$ $m\angle C = 33^\circ$

In Exercises 25–28, find angle θ .



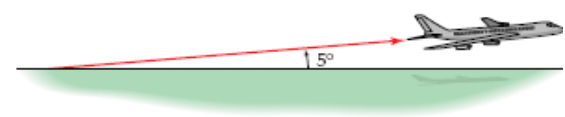
Use the figure below for Exercises 13–24.



In Exercises 29–36, use the figure for Exercises 13–24 to find angles A and C under the given conditions.

- 29. $a = 4$ and $c = 6$ 30. $b = 14$ and $c = 5$
- 31. $a = 7$ and $b = 10$ 32. $a = 5$ and $c = 3$
- 33. $b = 18$ and $c = 12$ 34. $a = 4$ and $b = 9$
- 35. $a = 2.5$ and $c = 1.4$

- 37. A 24-ft ladder positioned against a wall forms an angle of 75° with the ground.
 - a. How high up the wall does the ladder reach?
 - b. How far is the base of the ladder from the wall?
- 38. A guy wire stretches from the top of an antenna tower to a point on level ground 18 feet from the base of the tower. The angle between the wire and the ground is 63° . How high is the tower?
- 39. A plane takes off at an angle of 5° . After traveling 1 mile along this flight path, how high (in feet) is the plane above the ground? (1 mi = 5280 ft)



- 40. A plane takes off at an angle of 6° traveling at the rate of 200 feet/second. If it continues on this flight path at the same speed, how many minutes will it take to reach an altitude of 8000 feet?
- 41. The Ohio Turnpike has a maximum uphill slope of 3° . How long must a straight uphill segment of the road be in order to allow a vertical rise of 450 feet?
- 47. A buoy in the ocean is observed from the top of a 40-meter-high radar tower on shore. The angle of depression from the top of the tower to the base of the buoy is 6.5° . How far is the buoy from the base of the radar tower?
- 51. A rocket shoots straight up from the launch pad. Five seconds after lift-off, an observer 2 miles away notes that the rocket's angle of elevation is 3.5° . Four seconds after that, the angle of elevation is 41° . How far did the rocket rise during those 4 seconds?