Section 7.1 – Solving Right Triangles

angles b

+ find all sides

> find all angles

Don't forget

Iriconon

Note that a calculator will be needed for most of the problems we will do in class. Test problems will involve angles for which no calculator is needed (e.g.,  $30^{\circ}$ ,  $45^{\circ}$ ,  $60^{\circ}$ ,  $120^{\circ}$ , etc.). So, you will still need those unit circle values.

We'll use right triangle trigonometry to find the lengths of all of the sides and the measures of all of the angles. In some problems, you will be asked to find one or two specific pieces of information, but often you'll be asked to "solve the triangle," that is, to find all lengths and measures that were not given.



Example 2: In  $\triangle ABC$  with right angle C,  $\angle A = 40^{\circ}$  and AC = 12. Find *BC*. Round the answer to the nearest hundredth. (two decirals)



$$\tan 40^\circ = \frac{\times}{12}$$

$$X = R \tan(40^{\circ}) \quad (exan answer)$$
$$X \cong 10.07 \quad (with calculator)$$



## Always

wall

G G 216ft

41°

Example 3: Draw a diagram to represent the given situation. Then find the indicated measures to the nearest tenth of a degree.

An isosceles triangle has sides measuring 20 inches, 54 inches and 54 inches. What are the measures of its angles?

A . Note that 
$$m(\hat{B}) = m(\hat{C})$$
  
. In the yellow-should right triangle  
.  $Cos(\hat{C}) = \frac{10}{54} - \frac{5}{27} \implies \hat{C} = Cos^{-1}(\frac{5}{27})$   
 $\hat{C} = 79.3^{\circ}$   
 $m(\hat{B}) = m(\hat{C}) = 79.3^{\circ}$   
 $m(\hat{A}) = 2 \times 10.7^{\circ} = 21.4^{\circ}$   
 $\Rightarrow To find \hat{A} = 180^{\circ} - (\hat{B} + \hat{C}) = 100^{\circ} - 158.6^{\circ} = 21.4^{\circ}$ 

Example 4: Draw a diagram to represent the given situation. Then find the indicated measure to the nearest tenth. one decinal

A 216 foot ladder is leaned against the side of a building. If the ladder forms a  $41^{\circ}$  angle with the ground, how high up the side of the building does the ladder reach?

All this problem is surmed  
up to this equation:  

$$\sin(41^{\circ}) = \frac{\chi}{216}$$
  
ground  
 $\longrightarrow \chi = 216 + \sin(41^{\circ})$   
 $\chi = 141 \cdot \frac{7}{2}$   
hearest teth

## Angle of Elevation; Angle of Depression:

An angle of elevation is an angle that is formed by a horizontal ray and another ray above the horizontal. For example, in viewing an object at a point above the horizontal, the angle between the line of sight and the horizontal is the angle of elevation as shown in the figure below.



## dows

An angle of depression is an angle that is formed by a horizontal ray and another ray below the horizontal. For example, in viewing an object at a point below the horizontal, the angle between the line of sight and the horizontal is the angle of depression as shown in the figure below.



Example 5: Draw a diagram to represent the given situation. Then find the indicated measure to the nearest tenth.  $\theta_{ne} - de cined$ 

The angle of elevation to the top of a building from a point on the ground 125 feet away from the building is 8°. How tall is the building?



Example 6: Draw a diagram to represent the given situation. Then find the indicated measure to the nearest tenth.

Dave is at the top of a hill. He looks down and spots his car at a  $60^{\circ}$  angle of depression. If the hill is 48 meters high, how far is his car from the base of the hill?

