

The Tangent Function

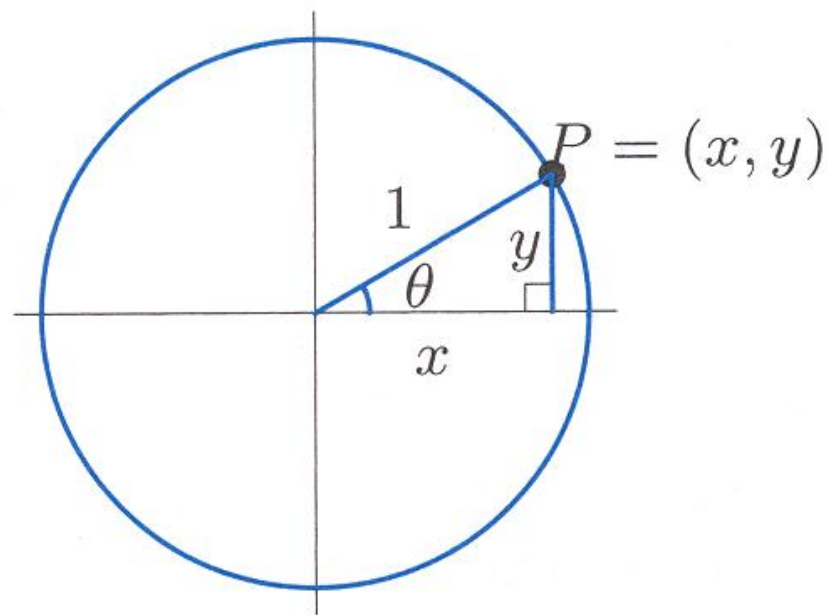
Chapter 7

Section 4

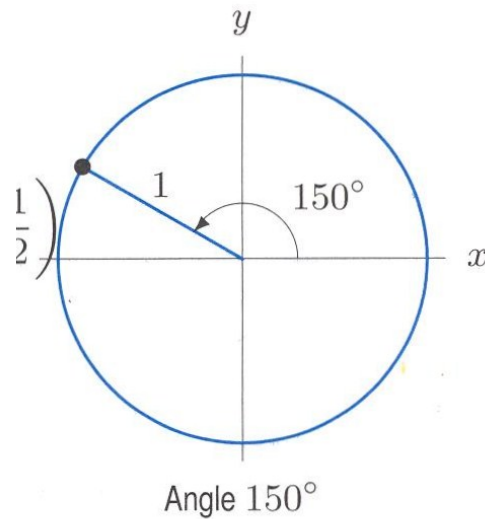
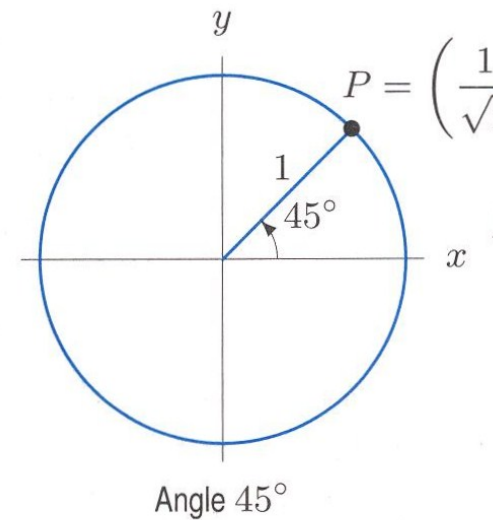
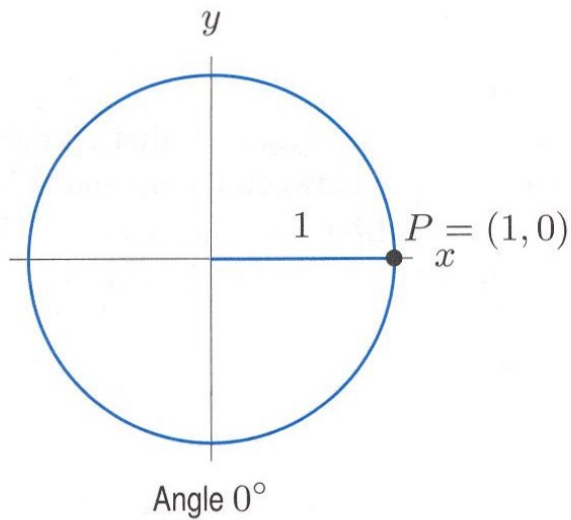
The Tangent Function on the Unit Circle

A third trigonometric function, the tangent function, is defined in terms of the coordinates (x, y) of the point P on the unit circle by

$$\tan \theta = \frac{y}{x} \quad \text{for } x \neq 0.$$

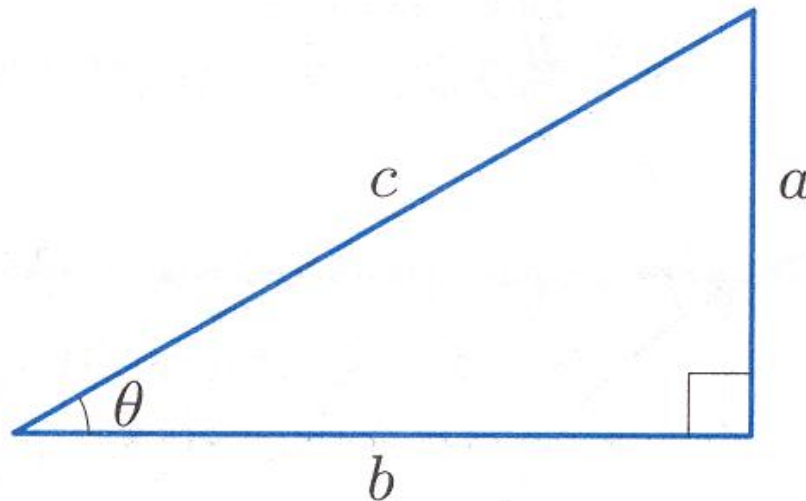


Find $\tan 0^\circ$, $\tan 45^\circ$, $\tan 150^\circ$



The Tangent Function in Right Triangles

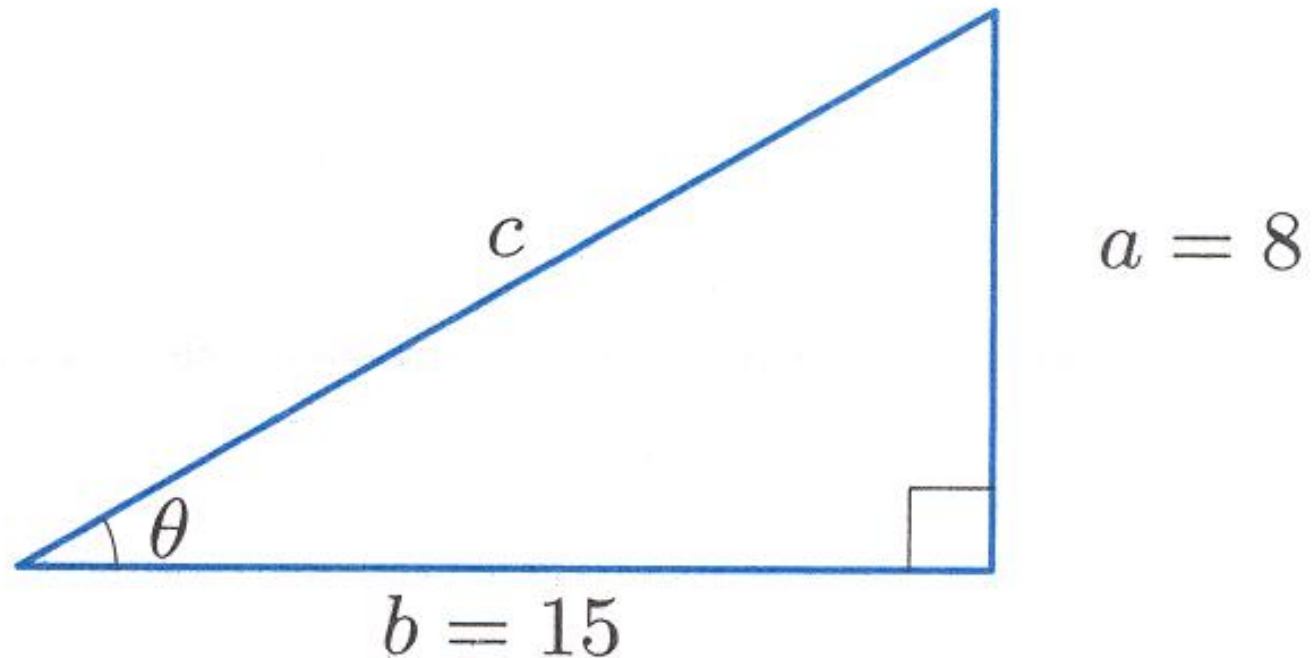
Like the sine and cosine, we can interpret the tangent as a ratio of sides of a right triangle



$$\tan \theta = \frac{a}{b} = \frac{\text{opposite}}{\text{adjacent}}$$

Finding a Tangent in a Right Triangle

Find $\tan \theta$ in the right triangle pictured below.

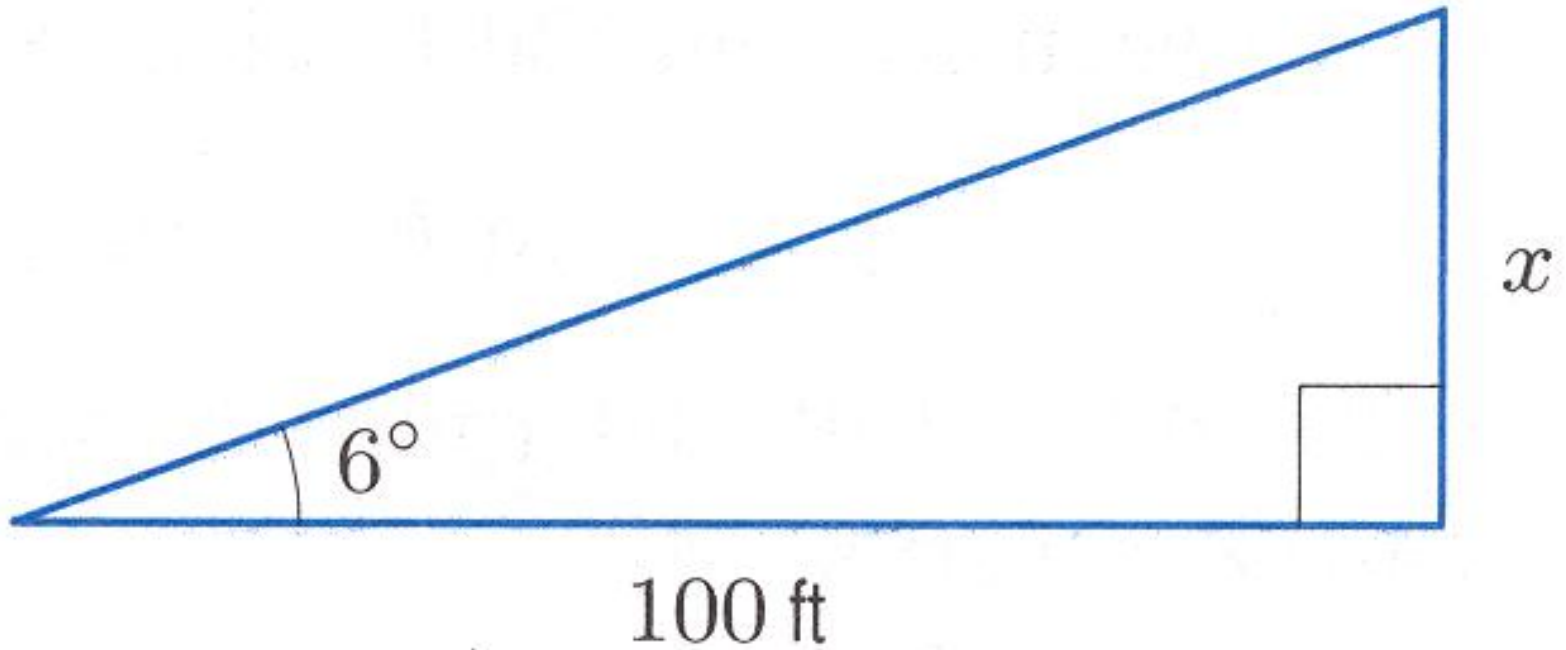


Road Grades

The grade of a road is calculated from its vertical rise per 100 feet. For instance, a road that rises 8 ft in every one hundred feet has a grade of $8 \text{ ft} / 100 \text{ ft} = 8\%$.

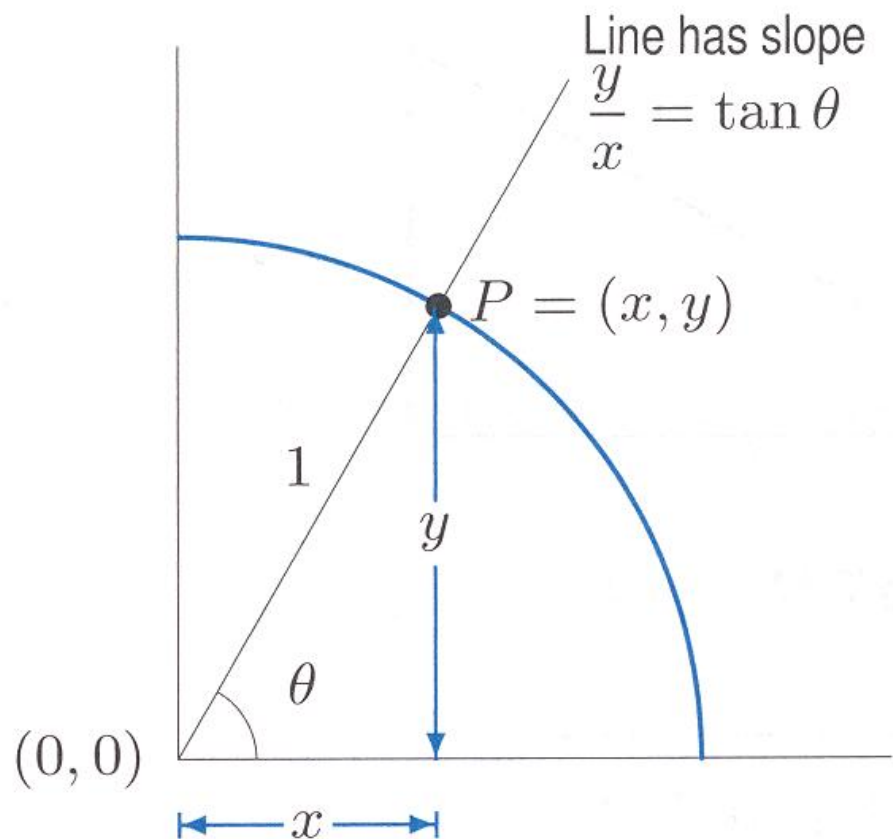
Suppose a road climbs at an angle of 6° to the horizontal. Draw a corresponding right triangle. Calculate the grade.

Road Grade Triangle

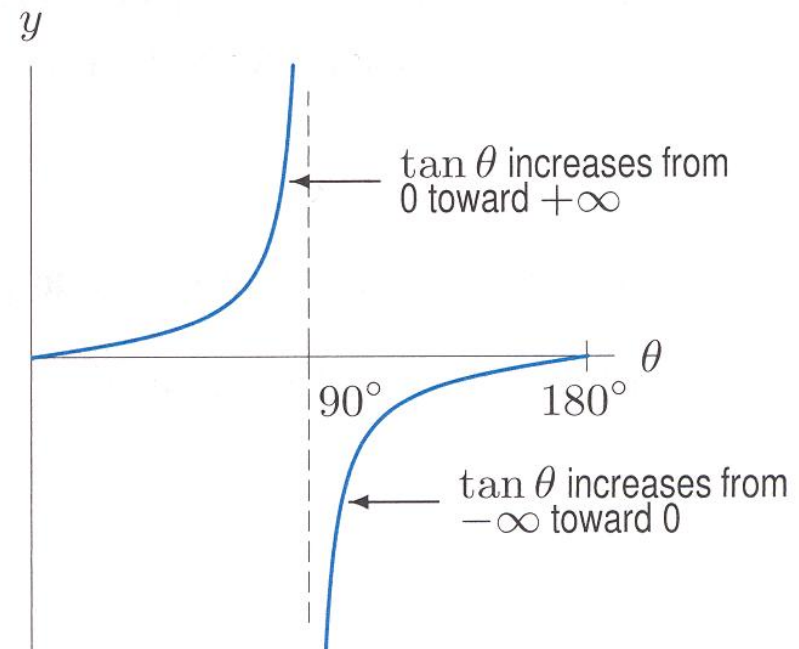
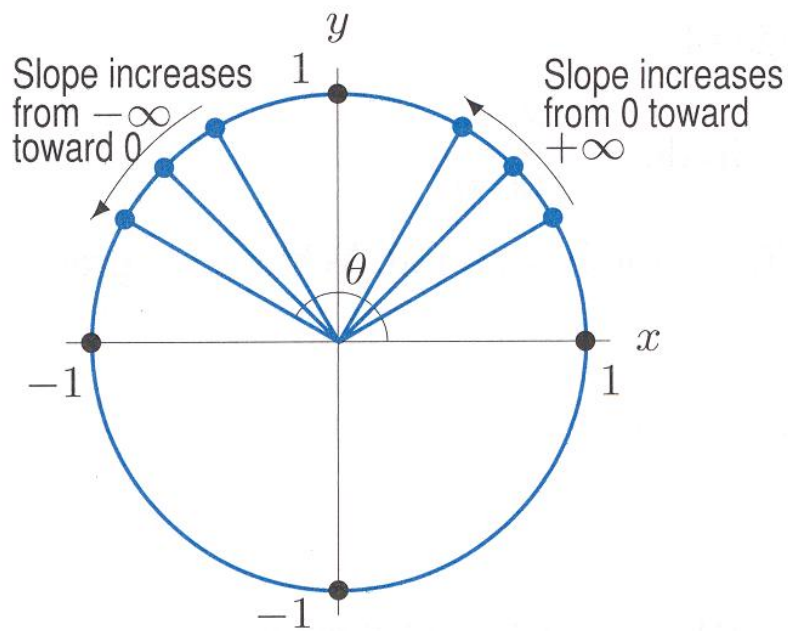


Interpreting the Tangent Function as a Slope

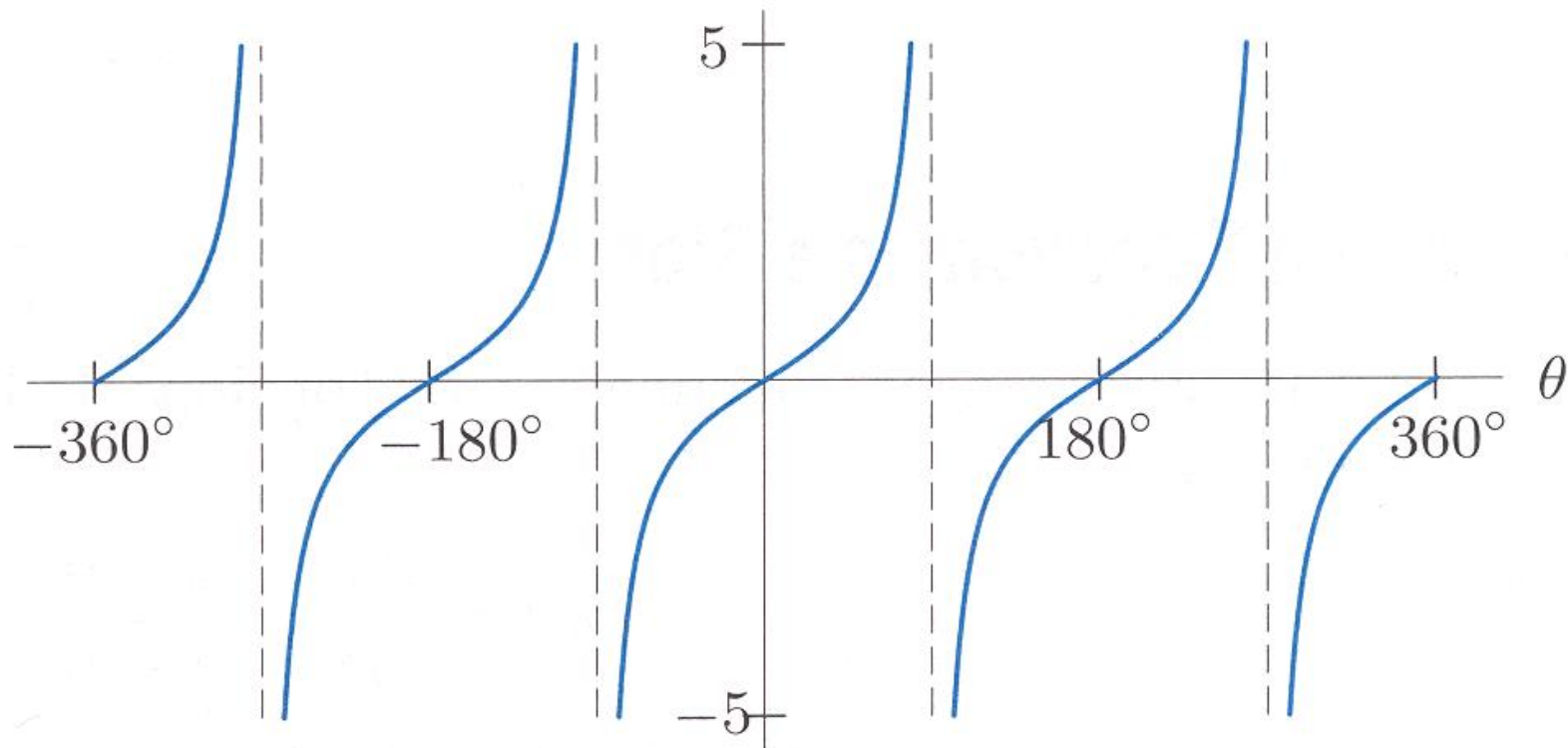
One can think about the tangent function in terms of slope.



Using the Unit Circle to Construct the Graph of the Tangent Function



Graph of the Tangent Function



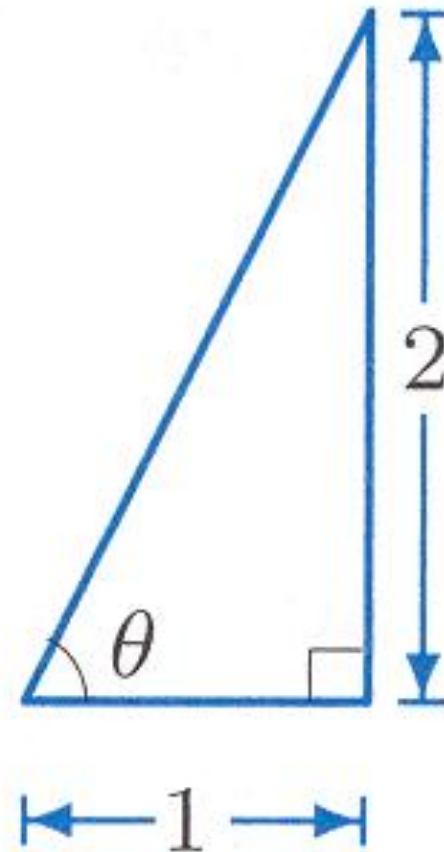
Exercise #3

Use the figure to the right to find the following exactly:

$$\tan \theta$$

$$\sin \theta$$

$$\cos \theta$$



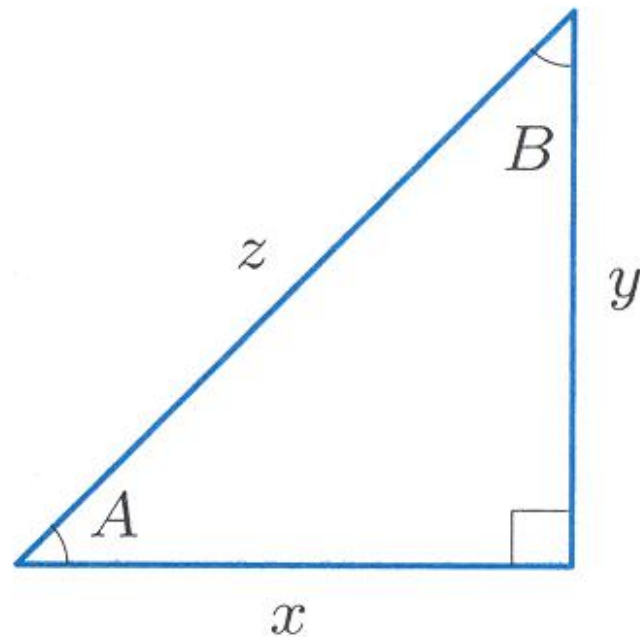
Exercises #11, #13, #15

Use the figure to the right to find exact values of q and r .

#11 $A=17^\circ$, $B=73^\circ$,
 $x=q$, $y=r$, $z=7$.

#13 $A=37^\circ$, $B=53^\circ$,
 $x=6$, $y=q$, $z=r$.

#15 $B=77^\circ$, $x=9$,
 $y=q$, $z=r$.



Problem #32

Determine the height of the Seafirst Tower and the distance x . See the figure to the right.

