LAB 11.1
Angles and Slopes

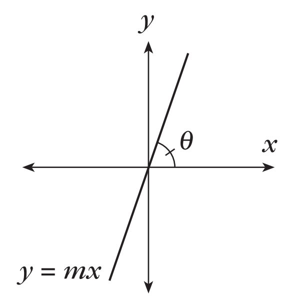
Name(s) ____________________________

■ **Equipment:** CircleTrig geoboard, CircleTrig geoboard sheet

The CircleTrig geoboard and the CircleTrig geoboard sheet include ruler and protractor markings.

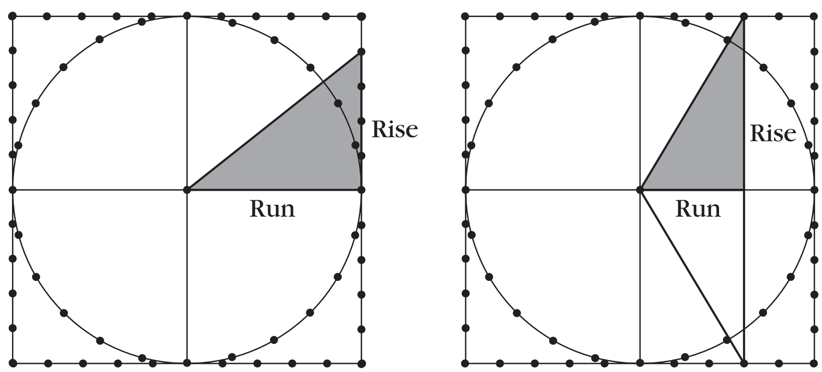
1. Label the rulers on the sheet (not on the actual geoboard) in 1-cm increments.
2. Label the protractor markings on the sheet in 15° increments. Start at 0° on the positive x-axis, going counterclockwise. Include angles greater than 180°.
3. Repeat Problem 2, going clockwise. In this direction, the angles are considered negative, so this time around, 345° will be labeled –15°.

Think of the line with equation $y = mx$, and of the angle θ it makes with the positive x-axis (θ is the Greek letter *theta*). Each slope m corresponds to a certain angle between –90° and 90°.



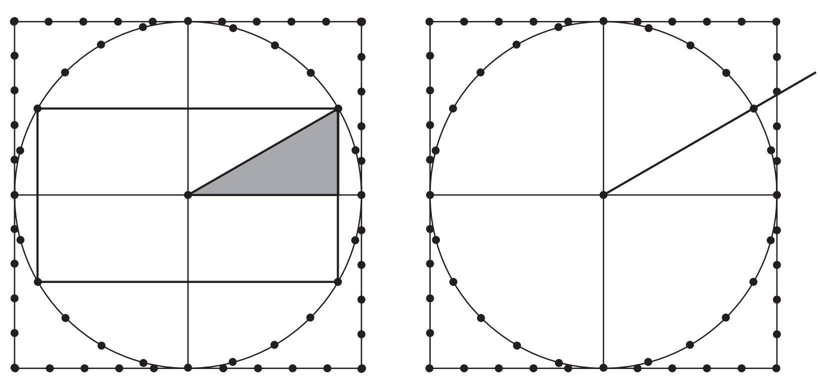
You can think about this relationship by making a right triangle on your CircleTrig geoboard like one of those shown below. The legs give the rise and run for the slope of the hypotenuse. You can read off the angle where the hypotenuse crosses the protractor to find the angle that corresponds to a given slope.

Note that even though both examples at right show positive slopes, you can use the CircleTrig geoboard to find the angles corresponding to negative slopes as well.



Two ways to find the angle for a given slope (Problem 4)

You can also find slopes that correspond to given angles. Two examples of how to do this are shown at right. In the first example, you can read rise off the y-axis and run off the x-axis. In the second example, the rubber band is pulled around the 30° peg, past the right edge. You can read rise off the ruler on the right edge. (What would run be in that example?)



Two ways to find the slope for a given angle (Problem 5)

4. Fill out the table below. Continue a pattern of going around the outer pegs of the geoboard to supply slopes where the table is blank. For angles, give answers between –90° and 90°. (That is, make your slope triangles in the first and fourth quadrants.)

m	0	0.2	0.4	0.6	0.8	1	1.25	1.67				–5		
θ											90°			

5. Fill out the table below.

θ	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°
m													

Discussion

A. What patterns do you notice when filling out the tables? What is the relationship between the slopes of complementary angles? For what angles is the slope positive? Negative? 0? For what angles is the slope between 0 and 1? Greater than 1?

B. Why is there no slope for the angle of 90°?

C. Explain how you chose one or another of the four types of slope triangles to help you fill out the tables.

D. Some of the slope triangles you used to fill out the tables are "famous right triangles." Check that the angles and slopes you found are correct by comparing your answers with those you got in Lab 10.7.