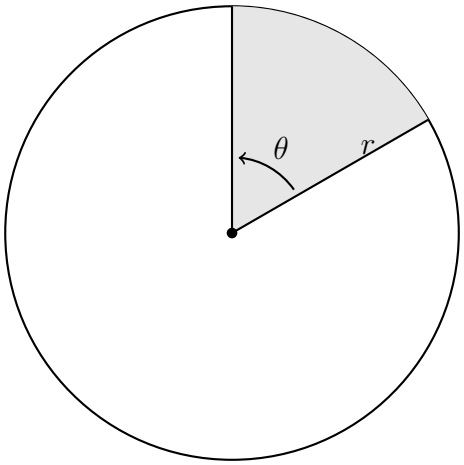
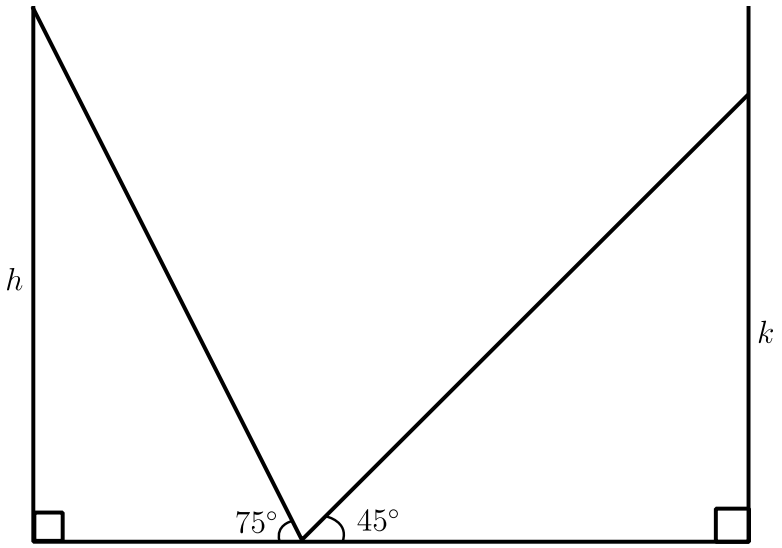
1. Convince the rest of your group that the area of the sector shown below is equal to $A = \frac{1}{2}r^2\theta$ where r is the radius of the circle and θ is the angle of the sector.

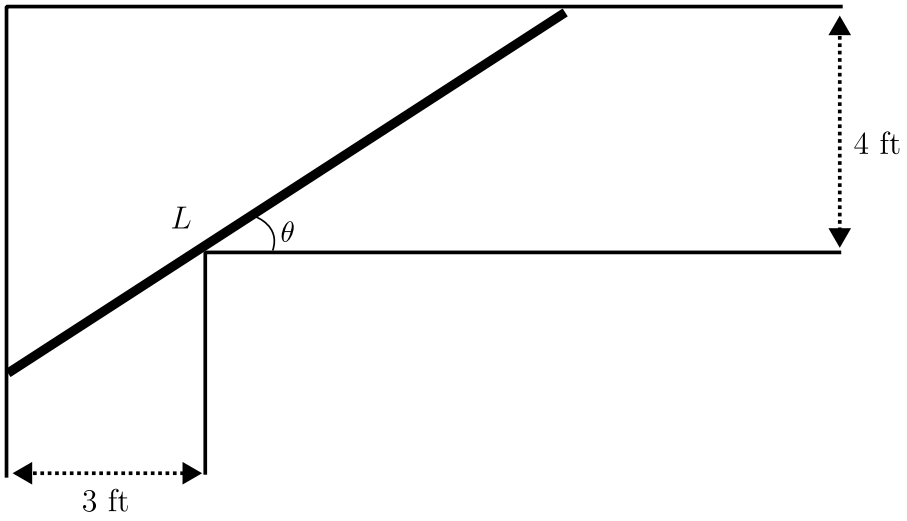


2. Earth is approximately circular in cross section, with a circumference at the equator of 40,075 kilometers. Suppose we are able to wrap a rope around the equator tightly. How much longer must the rope be made in order to be lifted 1 meter from the surface at all points? First give your best guesstimate, then calculate the exact value.

3. Two ladders of length l lean against opposite walls of an alley with their feet touching. One ladder extends h feet up the wall and makes a 75° angle with the ground. The other ladder extends k feet up the opposite wall and makes a 45° angle with the ground. Find the width of the alley in terms of h.



4. A pole of length L is carried horizontally around a corner where a 3 ft wide hallway meets a 4 ft wide hallway. For $0 < \theta < \frac{\pi}{2}$, find the relationship between L and θ at the moment when the pole simultaneously touches both walls and the corner P. Estimate θ when $L = 10$ ft.



5. A toy rocket is launched from atop a 50 ft building. The height of the rocket above the ground at time t is given by the function

$$h(t) = -16t^2 + 64t + 50.$$

(a) What is the maximum height that the rocket reaches? At what time does the rocket's path reach its peak?

(b) How long is the rocket in the air before it reaches the ground?