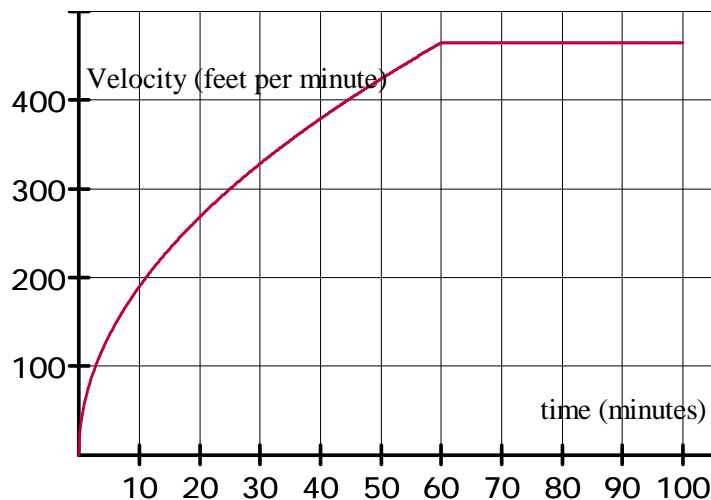


## Learning to Work with Area

As you pull out on the highway on your bicycle and gradually increase your speed according to the graph below. Then you notice your speedometer approaching 465 ft per minute so you tap hand brake to slow down your speed to a constant rate of 465 feet per minute.



How far do you travel between time  $t=60$  minutes and  $t=100$  minutes?  $465 \times 40$  or  $18,600$  feet

Explain how you found this answer. How is this distance represented in the graph? Shade this region in on the graph. The distance traveled is represented by a rectangle that measures 465 feet per minute by 40 minutes. Therefore, the distance traveled is the area of this rectangle.

How many feet are represented by one shaded in square. Explain your reasoning. 10 minutes by 100 feet per minute or 1000 feet.

If a square was shaded in as illustrated at the right, to the nearest 0.1, what portion of the square is shaded? 0.6 of the square.



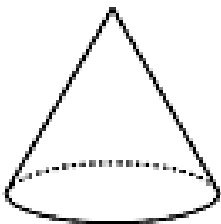
How many feet would be represented by this shaded in portion? 600 feet

Find the distance traveled from  $t=0$  to  $t=60$  minutes about 16,500 feet

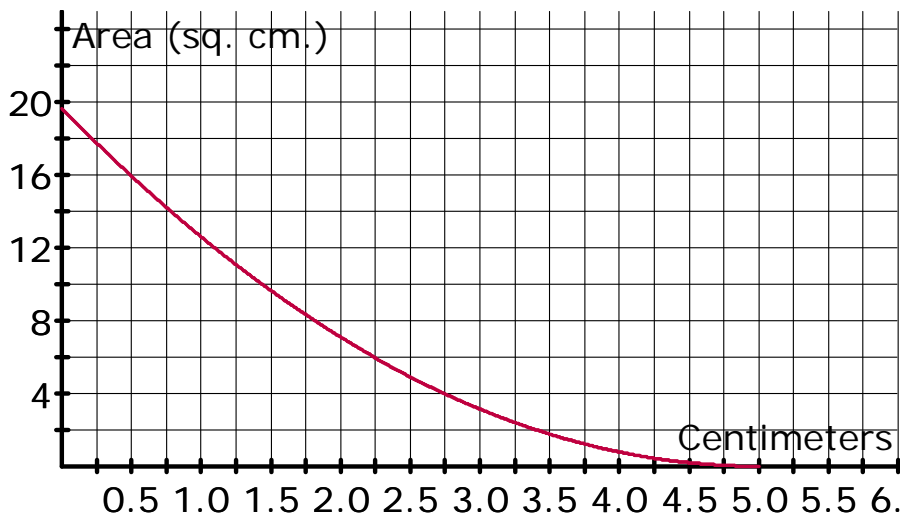
Find out how far your bicycle traveled in the first 100 minutes of the trip. 35,100 feet

The distance traveled by your bicycle is represented by the bounded area under the velocity graph and above the time axis. This area is called the **definite integral of the velocity** from time  $t=0$  to  $t=100$  minutes.

You have just found a geometric method to calculate a definite integral of the velocity from  $t=0$  to  $t= 60$  minutes.



A right circular cone is placed on its circular base. The cone is sliced parallel to the base, at points  $x$  distance from the base, to create cross sections that are circles. The area of each circular cross section is graphed at the below as a function of its distance from the base. Find the volume of the right circular cone by determining the area bounded by the graph and the  $x$  axis.



What is the largest area of a cross sectional area? **About 19.6 sq. cm.**

What is the area of the circle created 1.75 cm from the base? **About 8 sq. cm.**

At what distance from the base was a 4 square centimeter circle cut? **About 2.75 cm.**

What are the units for the definite integral of the area with respect to  $x$  in this problem? **Cubic centimeters**

What does the definite integral represent in this problem? **The volume of the cone.**

Estimate the definite integral of  $y$ , the area, with respect to  $x$  for  $0 \leq x \leq 5$ . Show work that leads to your answer. **About 32.5 cubic centimeters (Each square in the graph represents 0.5 cubic centimeters.)**