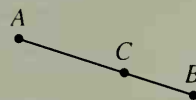# 11-8 *Geometric Probability*

The geometric probability problems in this section can be solved by using one of the following two principles.

1. Suppose a point P of $\overline{AB}$ is picked at random. Then:

$$\text{probability that } P \text{ is on } \overline{AC} = \frac{\text{length of } \overline{AC}}{\text{length of } \overline{AB}}$$

A

C

B

2. Suppose a point P of region S is picked at random. Then:

$$\text{probability that } P \text{ is in region } R = \frac{\text{area of } R}{\text{area of } S}$$

R *S*

Example 1 Every ten minutes a bus pulls up to a hotel and waits for two minutes while passengers get on and off. Then the bus leaves. If a person walks out of the hotel front door at a random time, what is the probability that a bus is there?

Solution Think of a time line in which the colored segments represent times when the bus is at the hotel. For *any* ten-minute period, a two-minute subinterval is colored. Thus:

0 2   10   20   time
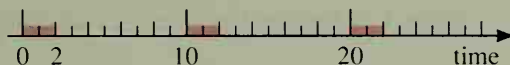
$$\frac{\text{probability that a}}{\text{bus will be there}} = \frac{\text{length of colored segment}}{\text{length of whole segment}}$$

$$= \frac{2}{10} = \frac{1}{5}$$

Example 2 A person who is just beginning archery lessons misses the target frequently. And when a beginner hits the target, each spot is as likely to be hit as another. If a beginner shoots an arrow and it hits the target, what is the probability that the arrow hits the red bull's eye?

3

2

1

Solution probability arrow hits bull's eye if it hits target $=$

$$\frac{\text{area of bull's eye}}{\text{area of target}} = \frac{\pi \cdot 1^2}{\pi \cdot 3^2} = \frac{1}{9}$$