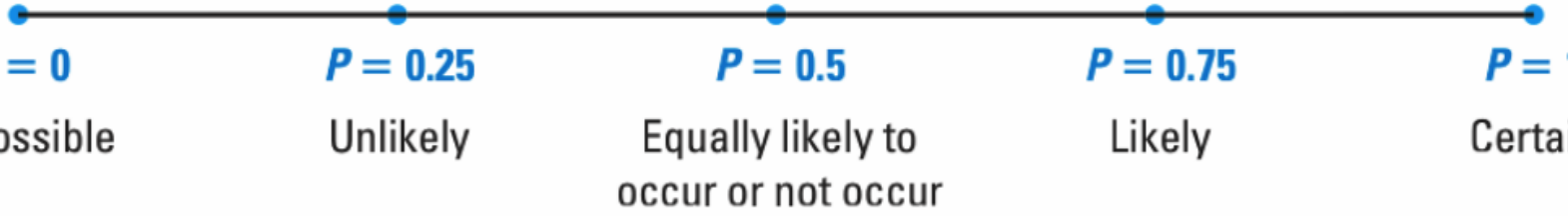
# 11.7 Use Geometric Probability

The **probability** of an event is a measure of the likelihood that the event will occur. It is a number between 0 and 1, inclusive, and can be expressed as a fraction, decimal, or percent. The probability of event $A$ is written as $P(A)$.



In a previous course, you may have found probability by calculating the ratio of the number of favorable outcomes to the total number of possible outcomes. In this lesson, you will find *geometric probabilities*.

A **geometric probability** is a ratio that involves a geometric measure such as length or area.

## KEY CONCEPT — For Your Notebook

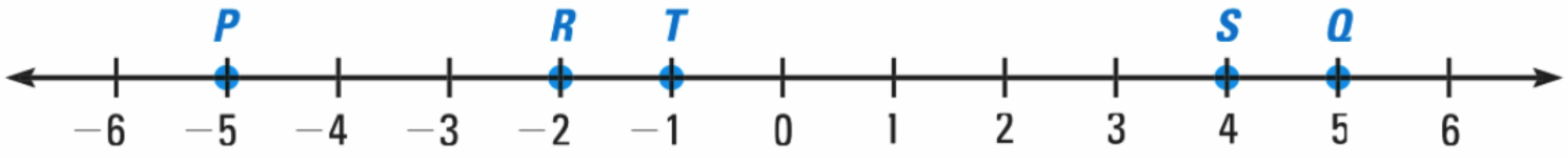
### Probability and Length

Let $\overline{AB}$ be a segment that contains the segment $\overline{CD}$. If a point $K$ on $\overline{AB}$ is chosen at random, then the probability that it is on $\overline{CD}$ is the ratio of the length of $\overline{CD}$ to the length of $\overline{AB}$.


$$P(K \text{ is on } \overline{CD}) = \frac{\text{Length of } \overline{CD}}{\text{Length of } \overline{AB}}$$

## EXAMPLE 1 Use lengths to find a geometric probability

**Find the probability that a point chosen at random on $\overline{PQ}$ is on $\overline{RS}$.**

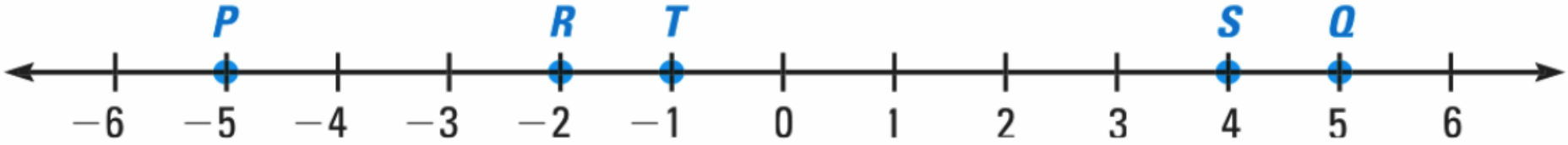


## EXAMPLE 2 Use a segment to model a real-world probability

**MONORAIL** A monorail runs every 12 minutes. The ride from the station near your home to the station near your work takes 9 minutes. One morning, you arrive at the station near your home at 8:46. You want to get to the station near your work by 8:58. What is the probability you will get there by 8:58?

## GUIDED PRACTICE for Examples 1 and 2

**Find the probability that a point chosen at random on $\overline{PQ}$ is on the given segment. Express your answer as a fraction, a decimal, and a percent.**




**1.** $\overline{RT}$

**2.** $\overline{TS}$

**3.** $\overline{PT}$

**4.** $\overline{RQ}$

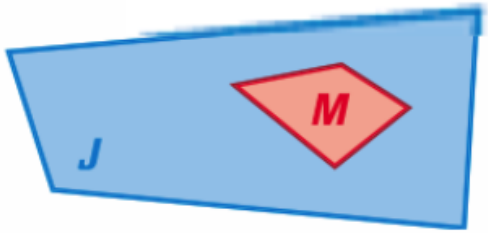
**PROBABILITY AND AREA** Another formula for geometric probability involves the ratio of the areas of two regions.

## KEY CONCEPT

*For Your Notebook*

### Probability and Area

Let $J$ be a region that contains region $M$. If a point $K$ in $J$ is chosen at random, then the probability that it is in region $M$ is the ratio of the area of $M$ to the area of $J$.




$$P(K \text{ is in region } M) = \frac{\text{Area of } M}{\text{Area of } J}$$

## EXAMPLE 3 Use areas to find a geometric probability

**ARCHERY** The diameter of the target shown at the right is 80 centimeters. The diameter of the red circle on the target is 16 centimeters. An arrow is shot and hits the target. If the arrow is equally likely to land on any point on the target, what is the probability that it lands in the red circle?

# Assignment:

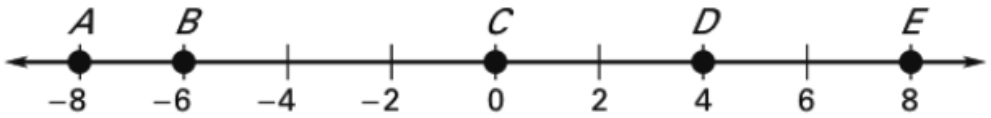
11.7 ws

LESSON 11.7

# Practice B

*For use with pages 770–777*

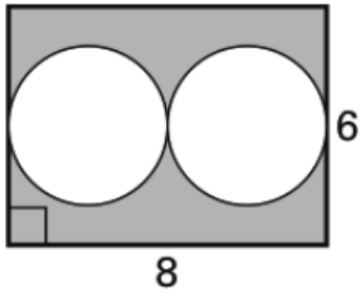
**Find the probability that a point *K*, selected randomly on $\overline{AE}$, is on the given segment. Express your answer as a fraction, decimal, and percent.**



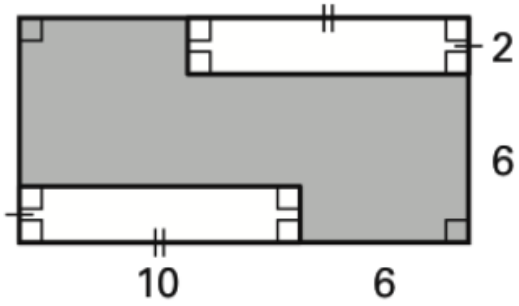

**1.** $\overline{BC}$ **2.** $\overline{BD}$ **3.** $\overline{CE}$ **4.** $\overline{AD}$

**Find the probability that a randomly chosen point in the figure lies in the shaded region.**

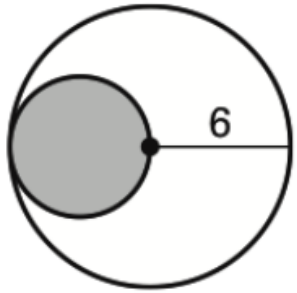
**5.**



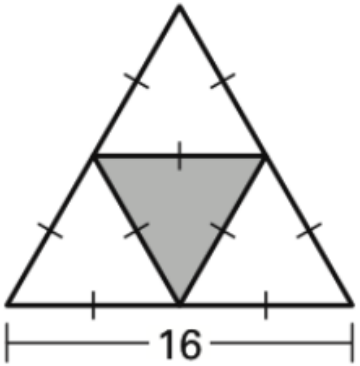

**6.**



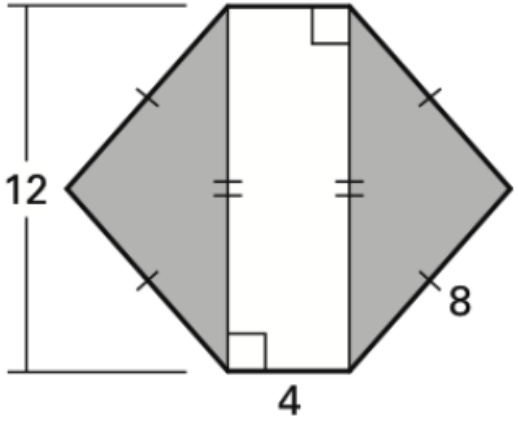

**7.**



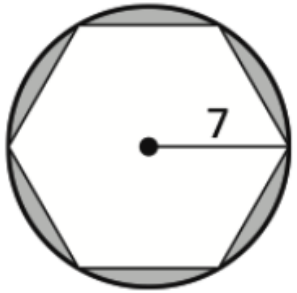
**8.**



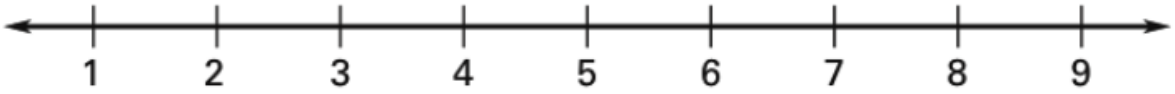

**9.**




**10.**



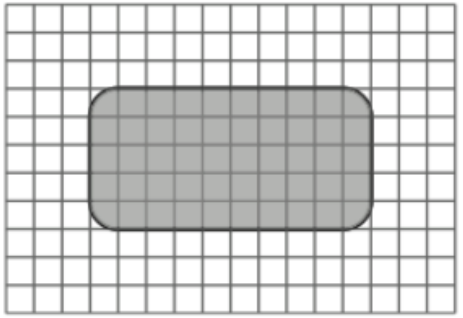
**Find the probability that a point chosen at random on the segment satisfies the inequality.**




**11.** $x + 3 \leq 5$ **12.** $2x - 3 \leq 3$ **13.** $3x + 5 \geq 17$ **14.** $2x - 12 \geq 8$

**Use the scale drawing.**

**15.** What is the approximate area of the shaded figure in the scale drawing?



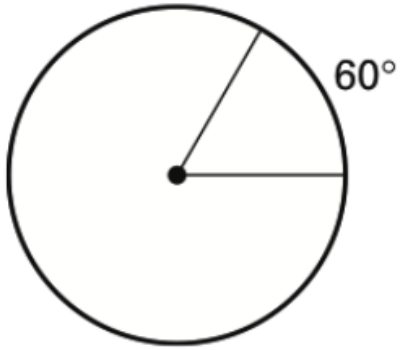
**16.** Find the probability that a randomly chosen point lies in the shaded region.

**17.** Find the probability that a randomly chosen point lies outside of the shaded region.

**18. Boxes and Buckets** A circular bucket with a diameter of 18 inches is placed inside a two foot cubic box. A small ball is thrown into the box. Find the probability that the ball lands in the bucket.

**In Exercises 19 and 20, use the following information.**

**Arcs and Sectors** The figure to the right shows a circle with a sector that intercepts an arc of 60°.

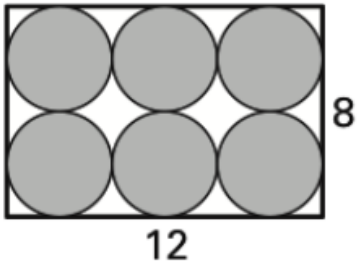



**19.** Find the probability that a randomly chosen point on the circle lies on the arc.

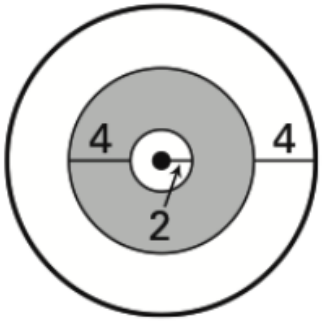
**20.** Find the probability that a randomly chosen point in the circle lies in the sector.

**Find the probability that a randomly chosen point in the figure lies in the shaded region.**

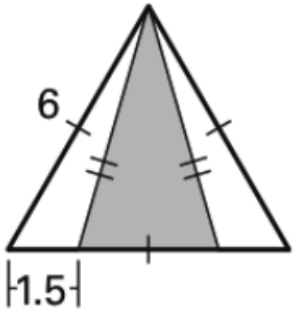
**21.**



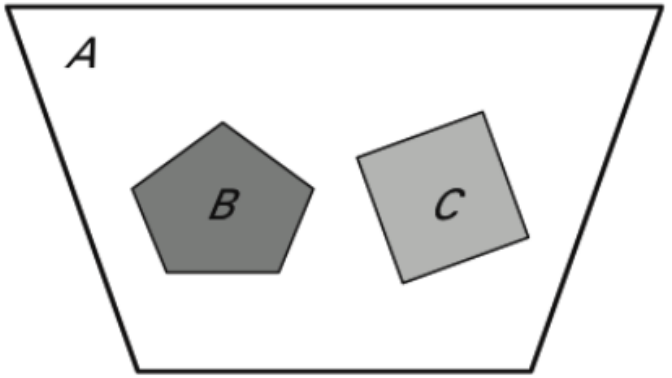

**22.**




**23.**



**24. Multiple Choice** A point $X$ is chosen at random in region $A$, and $A$ includes region $B$ and region $C$. What is the probability that $X$ is not in $B$?




**A.** $\dfrac{\text{Area of } A + \text{Area of } C}{\text{Area of } A}$

**B.** $\dfrac{\text{Area of } A + \text{Area of } C - \text{Area of } B}{\text{Area of } A + \text{Area of } C}$

**C.** $\dfrac{\text{Area of } A - \text{Area of } B}{\text{Area of } A}$

**25. Subway** At the local subway station, a subway train is scheduled to arrive every 15 minutes. The train waits for 2 minutes while passengers get off and on, and then departs for the next station. What is the probability that there is a train waiting when a pedestrian arrives at the station at a random time?

**In Exercises 26–28, use the following information.**

**School Day** The school day consists of six block classes with each being 60 minutes long. Lunch is 25 minutes. Transfer time between classes and/or lunch is 3 minutes. There is a fire drill scheduled to happen at a random time during the day.

**26.** What is the probability that the fire drill begins during lunch?

**27.** What is the probability that the fire drill begins during transfer time?

**28.** If you are 2 hours late to school, what is the probability that you missed the fire drill?