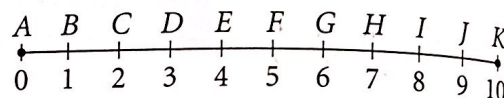




Practice by Example

Example 1 (page 402)

Find the probability that a point chosen at random from \overline{AK} is on the given segment.



1. \overline{CH} 2. \overline{FG} 3. \overline{DJ} 4. \overline{EI} 5. \overline{AK}

6. Points M and N are on \overline{ZB} with $ZM = 5$, $NB = 9$, and $ZB = 20$. A point is chosen at random from \overline{ZB} . What is the probability that the point is on \overline{MN} ?

Example 2 (page 403)

7. **Transportation** A rapid transit line runs trains every 10 minutes. Draw a geometric model and find the probability that randomly arriving passengers will not have to wait more than 4 minutes.

Traffic Patterns Main Street intersects each street below. The traffic lights on Main follow the cycles shown. As you travel along Main and approach the intersection, what is the probability that the first color you see is green?

8. Durham Avenue: green 30 s, yellow 5 s, red 25 s
9. Martin Luther King Boulevard: green 20 s, yellow 5 s, red 50 s
10. Yonge Street: green 40 s, yellow 5 s, red 25 s
11. International Drive: green 25 s, yellow 5 s, red 45 s
12. Tamiami Trail: green 35 s, yellow 8 s, red 32 s
13. Flutie Pass: green 50 s, yellow 4 s, red 26 s

Examples 3, 4
(pages 403 and 404)



Real-World Connection

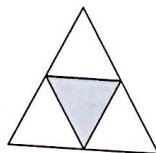
An archer receives from 1 to 10 points for an arrow that hits the target. A hit in the center zone is worth 10 points.

B Apply Your Skills

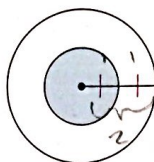
14. During May, a certain drawbridge over the Intracoastal Waterway is raised every half hour to allow boats to pass. It remains open for 5 min. What is the probability that a motorist arriving at the bridge in May will find it raised?

Target Games Darts are thrown at each of the boards shown below. A dart hits the board at a random point. Judging by appearances, find the probability that it will land in the shaded region.

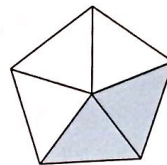
15.



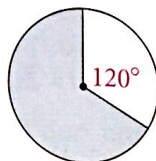
16.



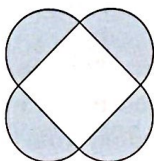
17.



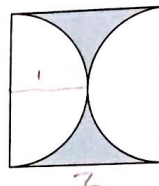
18.



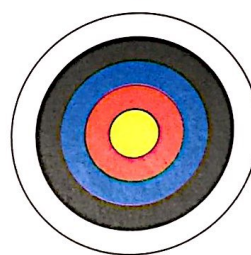
19.



20.



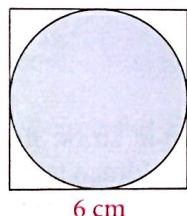
21. **Archery** An archery target with a radius of 61 cm has 5 scoring zones formed by concentric circles. The colors of the zones are yellow, red, blue, black, and white. The radius of the yellow circle is 12.2 cm. The width of each ring is also 12.2 cm. If an arrow hits the target at a random point, what is the probability that it hits the center yellow zone?



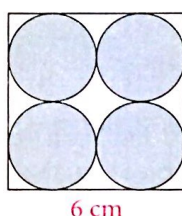
22. \overline{BZ} contains \overline{MN} and $BZ = 20$. A point is chosen at random from \overline{BZ} . The probability that the point is also on \overline{MN} is 0.3, or 30%. Find MN .

Target Games A dart hits each square dartboard at a random point. Find the probability that the dart lands inside a circle. Leave your answer in terms of π .

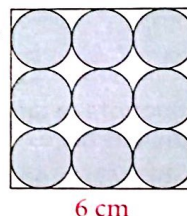
23.



24.



25.



26. A dartboard is a square of radius 10 in. You throw a dart and hit the target. Find the probability that the dart lies within $\sqrt{10}$ in. of the center of the square.
27. **Critical Thinking** Use the information given in Example 4.
- For each 1000 quarters tossed, about how many prizes would be won?
 - Suppose the game prize costs the carnival \$10. About how much profit would the carnival expect for every 1000 quarters tossed?

28. **Commuting** Suppose a bus arrives at a bus stop every 25 min and waits 5 min before leaving. Sketch a geometric model. Use it to find the probability that a person has to wait more than 10 min for a bus to leave.

29. **Traffic Patterns** The traffic lights at Fourth and Commercial Streets repeat themselves in 60-second cycles. Ms. Li regularly has students drive on Fourth Street through the Commercial Street intersection. By experience, she knows that they will face a red light 60% of the time. Use this information to estimate how long the Fourth Street light is red during each 1-min cycle.



Need Help?

For Exercise 28, draw a typical 25-min interval from one bus departure to the next.

For Exercises 30 and 31, sketch a geometric model and solve.

30. **Astronomy** Meteoroids (mostly dust-particle size) are continually bombarding Earth. The surface area of Earth is about 65.7 million square miles. The area of the United States is about 3.7 million square miles. What is the probability that a meteoroid landing on Earth will land in the United States?

31. **Tape Recording** Amy made a tape recording of a chorus rehearsal. The recording began 21 min into the 60-min tape and lasted 8 min. Later she accidentally erased a 15-min segment somewhere on the tape.
- In your model show the possible starting times of the erasure. Explain how you know that the erasure did not start after the 45-min mark.
 - In your model show the starting times of the erasures that would erase the entire rehearsal. Find the probability that the entire rehearsal was erased.



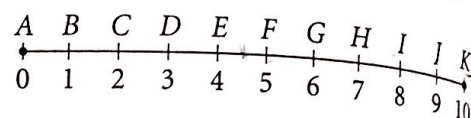
Need Help?

$$0 \leq P(\text{event}) \leq 1$$

$P(\text{event}) = 0$ means the event will not occur.

$P(\text{event}) = 1$ means the event will occur.

32. **Algebra** Find the probability that coordinate x of a point chosen at random from \overline{AK} satisfies the inequality.



32. $2 \leq x \leq 8$

33. $x \geq 7$

34. $2x \leq 9$

35. $\frac{1}{2}x - 5 \geq 0$

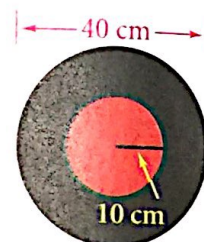
36. $2 \leq 4x \leq 3$

37. $0 \leq \frac{1}{3}x + 1 \leq 5$

38. $|x - 6| \leq 1.5$

39. $\sqrt{2} \leq \pi x \leq \sqrt{10}$

40. **Dunk Tank** At a fund-raiser, a volunteer sits on a platform above a tank of water. She gets dunked when you throw a ball and hit the red target. The radius of the ball is 3.6 cm. What is the probability that a ball heading randomly for the given background shape would hit the given target shape?



40. Background (at right): a circle 40 cm across
Target: a circle with 10-cm radius

41. Background: a square with 40-cm sides
Target: a circle with 10-cm radius

42. Background: a circle 40-cm across
Target: a square with 20-cm sides

43. Background: a square with 40-cm sides
Target: a square with 20-cm sides

44. Kimi has a 4-in. straw and a 6-in. straw. She wants to cut the 6-in. straw into two pieces so that the three pieces form a triangle.
- If she cuts the straw to get two 3-in. pieces, can she form a triangle?
 - If the two pieces are 1 in. and 5 in., can she form a triangle?
 - If Kimi cuts the straw at a random point, what is the probability that she can form a triangle?

45. a. **Open-Ended** Design a dartboard game to be used at a charity fair. Specify the size and shape of the regions of the board.

- b. **Writing** Describe the rules for using your dartboard and the prizes that winners receive. Explain how much money you would expect to raise if the game were played 100 times.



Challenge



46. **Graphing Calculator** A circular dartboard has radius 1 m and a yellow circle in the center. Assume you hit the target at a random point. For what radius of the yellow center region would $P(\text{hitting yellow})$ equal each of the following? Use the table feature of a calculator to generate all six answers. Round to the nearest centimeter.

a. 0.2

b. 0.4

c. 0.5

d. 0.6

e. 0.8

f. 1.0



Real-World Connection

A mere touch of the target by the ball triggers the dunk.