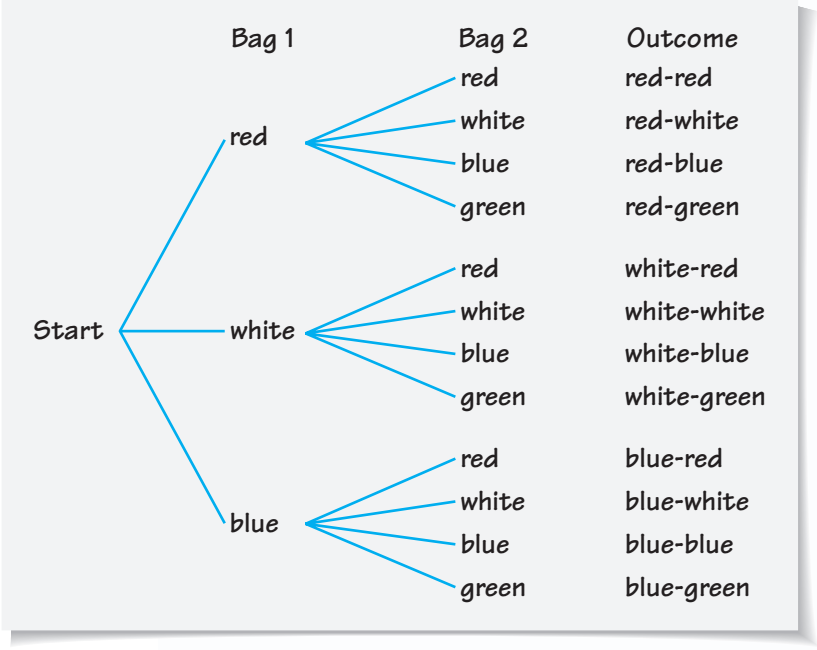
Applications

1. Bonita and Deion are using the spinners from the Making Purple game in Problem 2.1. They take turns spinning. If the colors on the two spinners make purple, Deion scores. If they do not make purple, Bonita scores. For this to be a fair game, how many points should Deion score when the spinners make purple, and how many points should Bonita score when they do not make purple?

2. At the Flag Day Festival at Parker Middle School, there is a contest where a player chooses one block from each of two different bags. A player wins if he or she picks a red and a blue block. James makes the tree diagram below to find the probability of winning.



a. What blocks are in bag 1?

b. What blocks are in bag 2?

c. Draw an area model that represents this contest.

d. What is the probability of winning this contest?

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For: Multiple-Choice Skills Practice

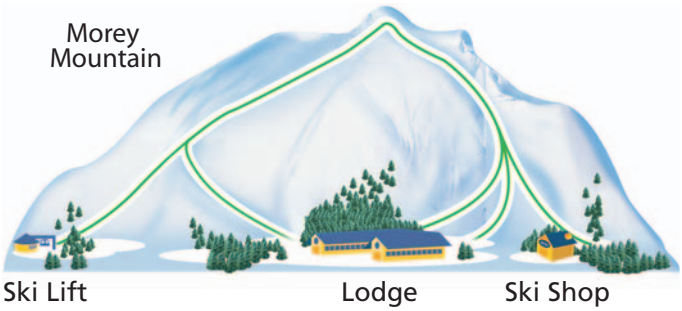
Web Code: ana-7254

3. There are two No-Cavity prize bins at a dentist's office. One bin has two hot-pink toothbrushes and three neon-yellow toothbrushes. The other bin has four packs of sugar-free gum, three grape and one strawberry. Kira has no cavities. The dentist tells her to close her eyes and choose a prize from each bin.

a. What is the probability that Kira will choose a neon-yellow toothbrush and a pack of sugar-free grape gum? Draw an area model to support your solution.

b. The dental assistant refills the bins after every patient. Suppose the next 100 patients have no cavities. How many times do you expect the patients to get the same prizes that Kira chose?

4. Al is about to ski his last run on Morey Mountain. There are five trails to the base of the mountain. Al wants to take a trail leading to the lodge. He can't remember which trail(s) to take.

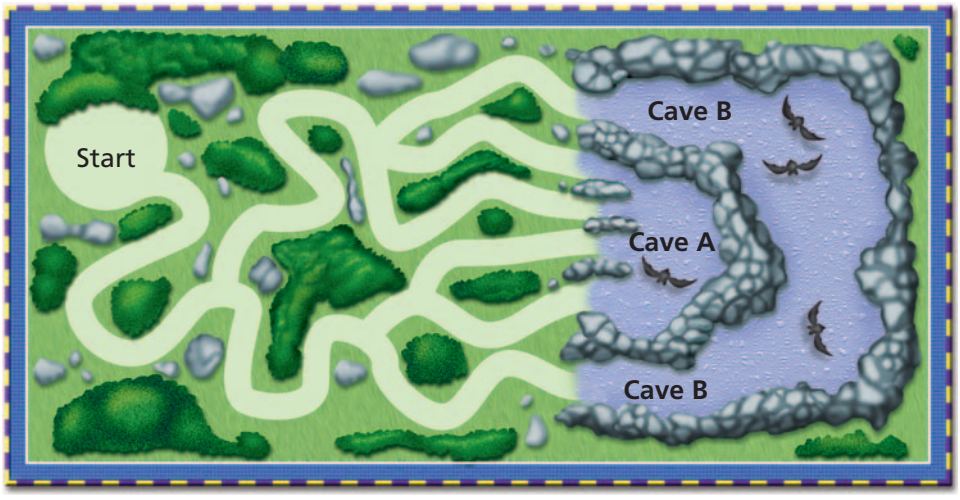


a. Design an experiment using a number cube to find the experimental probability of Al ending at the lodge. Conduct the experiment 20 times. If you do not have a number cube, write the numbers 1–6 on pieces of paper. Then select one from a hat.

b. What is the experimental probability of Al ending at the lodge? At the lift? At the ski shop?

c. Find the theoretical probability of ending at the lodge, the lift, and the ski shop. Compare the experimental and theoretical probabilities. Do you have more confidence in the experimental or the theoretical probability? Why?

5. Kenisha changes the game in Problem 2.2 so it has the paths below.

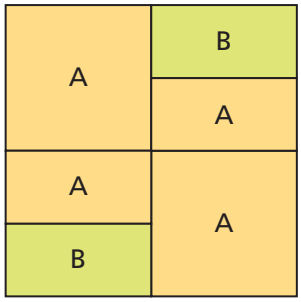


a. Suppose a player chooses a path at random at each fork. What is the theoretical probability that he or she will end in Cave A? In Cave B? Show your work.

b. If you play this game 100 times, how many times do you expect to end in Cave A? In Cave B?

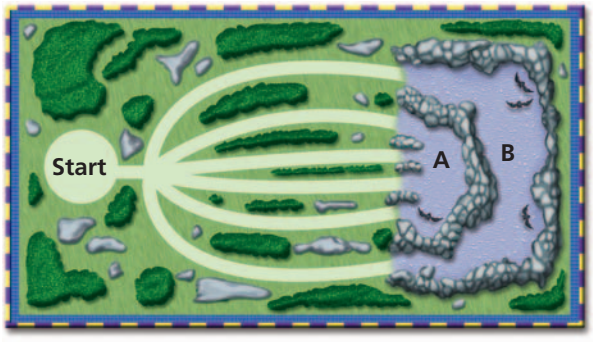
6. Kenisha designs another version of the game in Problem 2.2. The new version has a different arrangement of paths leading into Caves A and B. She makes an area model to analyze the probabilities of landing in each cave.

For Kenisha's new version, what is the probability that a player will end in Cave A? In Cave B?

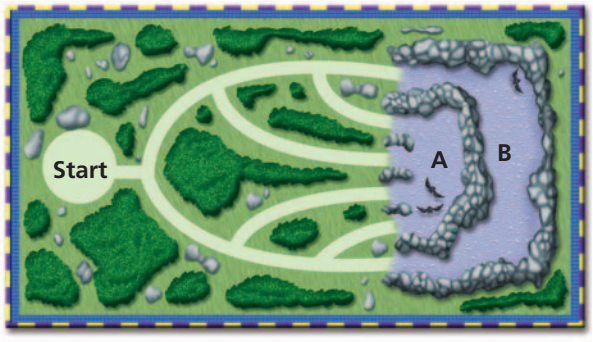


7. **Multiple Choice** Choose the map that the area model in Exercise 6 could represent.

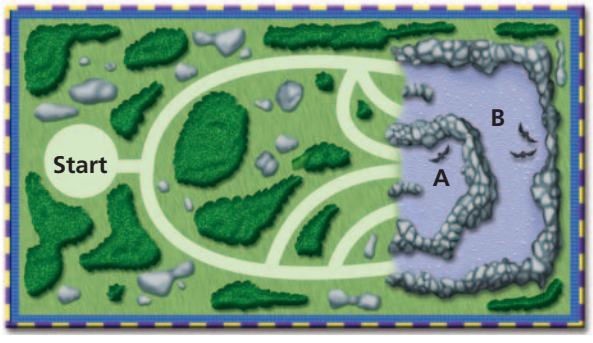
A.



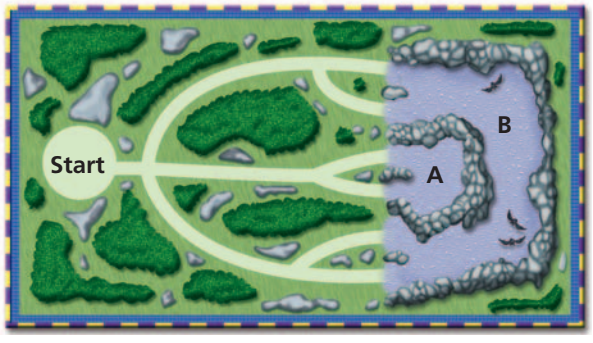
B.



C.



D.



For Exercises 8–10, suppose a bag contains three orange marbles and two blue marbles. You are to choose a marble, return it to the bag, and then choose again.

8. Choose an appropriate method from those below for finding the possible outcomes. Describe how you would use your choice.

a. make a tree diagram

b. make a list

c. use an area model

d. make a table or chart

9. Suppose you do this experiment 50 times. Use the method you chose in Exercise 8 to predict the number of times you will choose two marbles of the same color.

10. Suppose this experiment is a two-person game in which one player scores if the marbles match, and the other player scores if they do not match. Suppose the two players play the game many times and total the points scored. Describe a scoring system that makes this a game in which each person has an equally likely chance of having the winning score.

Brianna (from Problem 2.3) is given each set of marbles to distribute between two containers. What arrangement gives Emmanuel the best chance of choosing a green marble?

11. three blue and two green marbles

12. two blue and three green marbles

Connections

13. In a survey, 100 seniors at a high school were asked these questions:

- Do you favor a rule that allows only seniors to drive to school?
- Do you drive to school?

For: Help with Exercise 13
Web Code: ane-7213

Driving Survey

	Drives to School	Does Not Drive to School	Row Totals
Favors Rule	40	30	70
Opposes Rule	20	10	30
Total	60	40	100

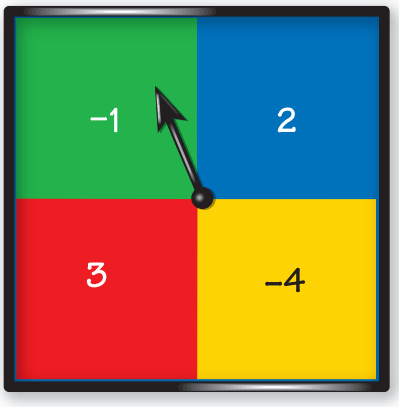
a. Based on this survey, what is the probability that a senior chosen at random favors the rule?

b. What is the probability that a senior chosen at random drives to school and favors the rule?

c. What is the probability that a senior chosen at random drives to school or opposes the rule?

d. Are the results of this survey a good indicator of how all the students at the high school feel about the driving rule? Explain.

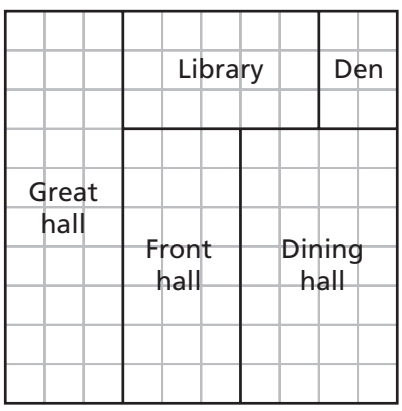
14. Marni and Ira are playing a game with this square spinner. A game is 10 turns. Each turn is 2 spins. The numbers for the 2 spins are added. Marni scores 1 point for a sum that is negative, and Ira scores 1 point for a sum that is positive. After 10 turns, each player totals their points. The one with more points wins.



a. List all of the possible outcomes.

b. Are Marni and Ira equally likely to win?

Megan is designing a computer game called *Treasure Hunt*. The computer chooses a square at random on the grid at the right, and then hides a treasure in the room containing that square. For Exercises 15–19, use the grid to find the probability that the computer will hide the treasure in each room.



15. Library

16. Den

17. Dining hall

18. Great hall

19. Front hall

20. **Multiple Choice** Megan enlarges the floor plan in the game grid above by a scale factor of 2. How does this affect the probabilities that the treasure is in each room?

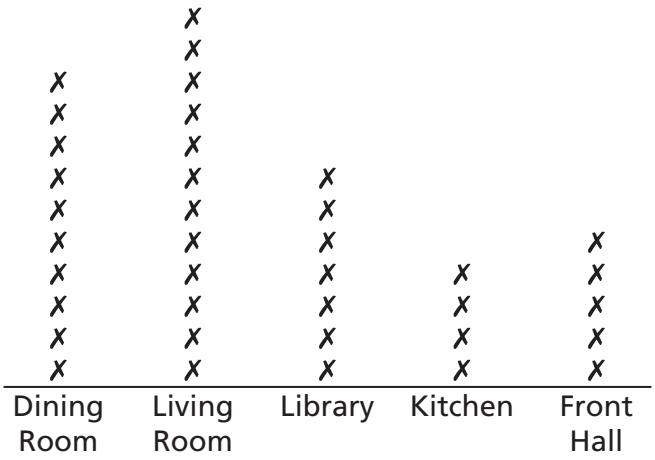
F. They are unchanged.

G. They are $\frac{1}{2}$ the original probability.

H. They are twice the original.

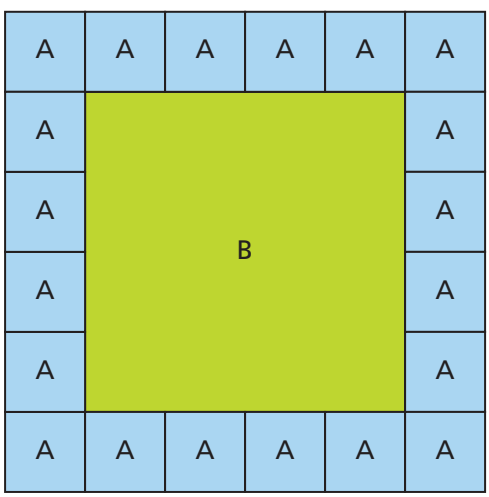
J. They are four times the original.

21. Carlos is also designing a *Treasure Hunt* game. He keeps track of the number of times the computer hides the treasure in each room. Here is a line plot of his results.



Design a floor plan that could give this data. State the area of each room on your floor plan.

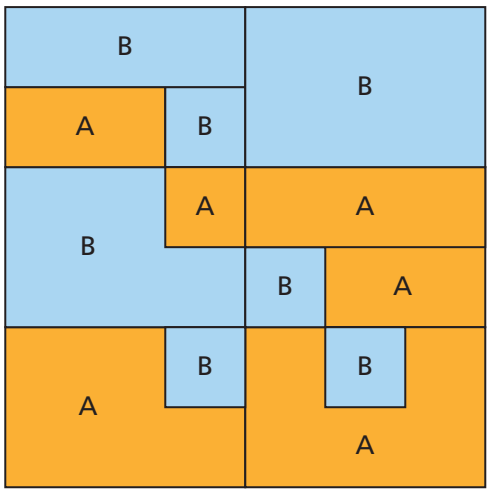
22. Fergus designs a dartboard for a school carnival. His design is shown below. He must decide how much to charge a player and how much to pay out for a win. To do this, he needs to know the probabilities of landing in sections marked A and B. Assume the darts land at random on the dartboard.



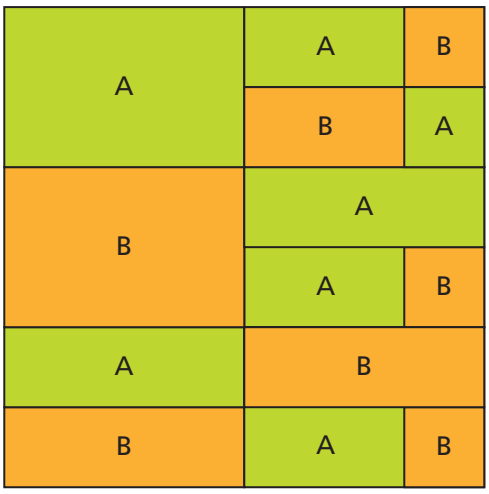
a. What is the probability of landing in a section marked A?

b. What is the probability of landing in a section marked B?

23. Fergus designs two more dartboards for the school carnival.



Dartboard 1



Dartboard 2

a. What is the probability of landing in sections marked A on Dartboard 1? On Dartboard 2? Explain.

b. A player pays \$1 to play and wins \$2 if the dart lands in sections marked B. If the dart lands in sections marked A, the player wins no money.

i. How much money will the player expect to make (or lose) after 36 turns using Dartboard 1? Using Dartboard 2? Explain.

ii. How much money will the carnival expect to make (or lose) after 36 turns using Dartboard 1? Using Dartboard 2?

c. Can the carnival expect to make a profit on this game with either board? Explain.

24. a. If you roll one number cube two times, what is the probability of getting a factor of 5 both times?

b. Suppose you roll two different number cubes. What is the probability of getting a factor of 5 on both cubes?

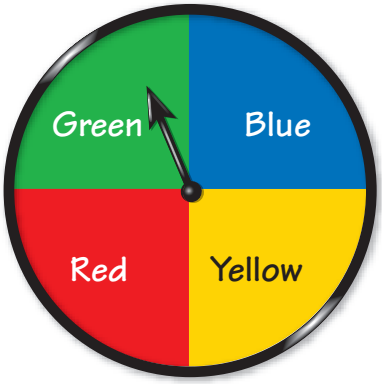
c. How do your answers to parts (a) and (b) compare? Explain why the answers have this relationship.

Connections

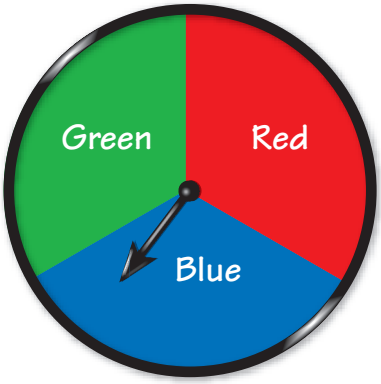
Extensions

25. Suppose you play a game using the two spinners below. You get two spins. You may spin each spinner once, or you may spin one of the spinners twice. If you get a red on one spin and a blue on the other spin (the order makes no difference), you win. To have the greatest chance of winning, should you spin Spinner A twice, spin Spinner B twice, or spin each spinner once? Explain.

Spinner A



Spinner B



26. Suppose Brianna (from Problem 2.3) is given two green marbles, two blue marbles, and three buckets. How can she put the marbles in the three buckets to have the best chance of choosing a green marble?

27. Della is chosen as a contestant on a game show. The host gives her two red marbles, two green marbles, and two yellow marbles.

Della will put the marbles into two identical cans in any way she chooses. The host will then rearrange the cans, leaving the marbles as Della placed them. Della will then select a can and choose a marble. If she chooses a red marble, she wins a prize.

How should Della arrange the marbles so she has the best chance of choosing a red marble?

28. Make up your own marbles and buckets problem. Find the solution.