ractice

gnment Guide

Objective

A B Core 1–5, 21–23, 40

C Extension 44–45

Objective

A B Core 6–20, 24–39, 41–42

C Extension 43

ndardized Test Prep 46–51

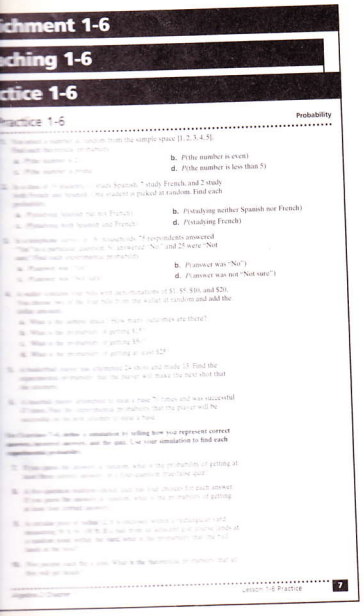
ed Review 52–63

nology Tip

ises 3, 4 Students can the expression randInt(0,1,5) e home screen of their ing calculators using the g feature. Then they can ENTER to generate a random ence of five integers where integer is either a 0 or 1. atedly pressing ENTER will rate a new sequence each Students may wish to use dea for their simulation.

r Prevention

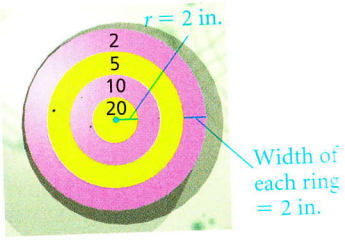
cises 24–26 Students should overlook the 31 students who neither math nor science.



Sometimes you can use areas to find theoretical probability.

5 EXAMPLE Finding Geometric Probability

Geometry Suppose that all the points on the circular dartboard shown at the right are equally likely to be hit by a dart you have thrown. Find the probability of scoring at least ten points.



P(at least 10 points)

$$= \frac{\text{area of circle with radius } 2r}{\text{area of circle with radius } 4r}$$

$$= \frac{\pi(2r)^2}{\pi(4r)^2}$$

$$= \frac{4\pi r^2}{16\pi r^2} = \frac{1}{4}$$

The theoretical probability of scoring at least ten points is $\frac{1}{4}$, or 25%.

Check Understanding 5 Use the dartboard from Example 5. Find each probability.

a. P(scoring 20 points) $\frac{1}{16}$, or 6.25%

b. P(scoring 5 points) $\frac{5}{16}$, or 31.25%

EXERCISES

For more practice, see *Extra Practice*

Practice and Problem Solving

A Practice by Example

Example 1 (page 40)

1. A class tossed coins and recorded 161 heads and 179 tails. What is the experimental probability of heads? Of tails? $\frac{161}{340} \approx 47\%$; $\frac{179}{340} \approx 53\%$

2. Another class rolled number cubes. Their results are shown in the table. What is the experimental probability of rolling each number? See margin.

Number	1	2	3	4	5	6
Occurrences	42	44	45	44	47	46

42
44
45
44
47
46
268

$\frac{42}{268} = \frac{21}{134}$

$\frac{44}{268} = \frac{22}{134}$

Example 2 (page 40)

For Exercises 3–5, define a simulation by telling how you represent correct answers, incorrect answers, and the quiz. Use your simulation to find each experimental probability. 3–4. See margin pp. 42–43.

3. If you guess the answers at random, what is the probability of getting at least two correct answers on a five-question true-or-false quiz?

4. If you guess the answers at random, what is the probability of getting at least three correct answers on a five-question true-or-false quiz ?

5. A five-question multiple-choice quiz has five choices for each answer. What is the probability of correctly guessing at random exactly one correct answer? Exactly two correct answers? Exactly three correct answers? (*Hint:* You could let any two digits represent correct answers, and the other digits represent wrong answers.) See back of book.

Graphing Calculator Hint

To generate random numbers, press MATH ◀ 1 ENTER.

Example 3 (page 41)

A jar contains 30 red marbles, 50 blue marbles, and 20 white marbles. You pick one marble from the jar at random. Find each theoretical probability.

6. P(red) $\frac{3}{10}$, or 30%

7. P(blue) $\frac{1}{2}$, or 50%

8. P(not white) $\frac{4}{5}$, or 80%

9. P(red or blue) $\frac{4}{5}$, or 80%

pages 42–45 Exercises

2. the number 1: $\frac{21}{134}$, or about 15.7%; the number 2: $\frac{11}{67}$ or about 16.4%; the number 3: $\frac{45}{268}$ or about 16.8%; the number 4: $\frac{11}{67}$ or about 16.4%; the number 5: $\frac{47}{268}$ or about 17.5%; the number 6: $\frac{23}{134}$ or about 17.2%

3. Answers may vary. Sample: Generate random numbers between 0 and 1 using a graphing calculator. In each random number, examine the first five digits. Let even digits represent correct answers and odd digits incorrect answers. If there

10. $\frac{48}{125}$, or 38.4%

11. $\frac{19}{125}$, or 15.2%

12. $\frac{103}{125}$, or 82.4%

13. $\frac{14}{25}$, or 56%

A bag contains 36 red, 48 green, 22 yellow, and 19 purple blocks. You pick one block from the bag at random. Find each theoretical probability. 10–13. See left.

10. P(green) **11.** P(purple) **12.** P(not yellow)

13. P(green or yellow) **14.** P(yellow or not green) $\frac{77}{125}$, or 61.69%

Example 4 (page 41)

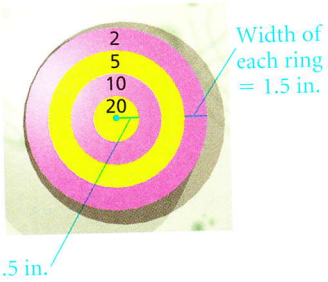
For each situation, find the sample space and the theoretical probability that a child will naturally place the left thumb on top.

15. The father has gene pair gg and the mother has Gg. {Gg, Gg, gg}; $\frac{1}{2}$, or 50%

16. The father has gene pair gg and the mother has GG. {Gg, Gg, Gg, Gg}; 1, or 100%

Example 5 (page 42)

Geometry **Suppose that a dart lands at random on the dartboard shown at the right. Find each theoretical probability.** 17–20. See left.



17. $\frac{1}{16}$, or 6.25%

18. $\frac{3}{8}$, or 37.5%

19. $\frac{1}{4}$, or 25%

20. $\frac{3}{4}$, or 75%

17. The dart lands in the bull's-eye.

18. The dart lands in a green region.

19. The dart scores at least 10 points.

20. The dart scores less than 10 points.

B Apply Your Skills

21. The common interpretation of Murphy's Law is, If something can go wrong, it will. Assume that Murphy's Law applies to the following situations, and estimate each probability as either 0 or 1.

a. P(your dog chews up your homework after you've finished it) 1

b. P(your teacher accepts your excuse for not having your homework) 0

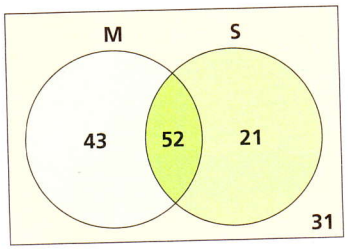
22. **Quality Control** Suppose the experimental probability is $\frac{1}{3}$ that a carton of eggs contains at least one broken egg. Use a simulation of 20 trials to find the experimental probability that three cartons selected at random contain only unbroken eggs. (*Hint:* Use any three digits to represent cartons with broken eggs and six other digits to represent cartons with unbroken eggs. Discard the tenth digit.) See margin.

23. Use the random number table at the left to simulate tossing a coin 50 times. Find the experimental probability that the outcome of a coin toss is heads. See margin.

Random Number Table

51648	40613
80927	42404
84675	68591
00460	31754
58733	00884
72294	22551
86066	93114
07790	20890
09414	51549
18407	87043
16214	46849
01322	82656
37521	77417

In a class of 147 students, 95 are taking math (M), 73 are taking science (S), and 52 are taking both math and science. One student is picked at random. Find each probability. 24–27. See left.



24. P(taking math or science or both) 43+52+21 116/147

25. P(not taking math) 52/147

26. P(taking math but not science) 43/147

27. P(taking neither math nor science) 31/147

Suppose you roll a number cube. Find each theoretical probability.

28. $P(5)$ $\frac{1}{6}$ **29.** P(an even number) $\frac{1}{2}$

30. P(a number less than 5) $\frac{2}{3}$ **31.** $P(8)$ 0

32. P(a number greater than 5) $\frac{1}{6}$ **33.** P(a number less than 8) 1

24. $\frac{116}{147}$, or 78.9%

25. $\frac{52}{147}$, or 35.4%

26. $\frac{43}{147}$, or 29.3%

27. $\frac{31}{147}$, or 21.1%

are two or more even digits, make a tally mark for that number. Do this 100 times. Find the total number of tally marks. This, as a percent, gives the experimental probability.

The simulated probability should be about 70%.

4. Answers may vary. Sample: Toss 5 coins. Keep a tally of the times 3 or more heads are tossed. (A head represents a correct answer.) Do this 100 times. The total number of tally marks, as a percent, gives the experimental probability. The simulated probability should be about 40%.

Exercise 36 If ne students that a p a whole number whose only facto itself.

Error Preventio

Exercise 38 It is number cubes ar (for example, of This means there not just one, for numbers such as rolled. It would students to list a if they find it dif the sample spac words.

English Learne

Exercise 44 Be understand that distinct from are

22. Answers may Sample: Let correspond t and 7–9 corr bad eggs. Ig digit 0, start row of the ta groups of th 20 groups in circled grou not have a 7, experimenta of getting 3 only unbroke or $\frac{1}{4}$.

23. Answers ma Sample: Let represent he digits repres the first fou table. The e probability

Assess

Lesson Quiz 1-6

1. A bowler rolled the ball 35 times and got 5 strikes. What is the experimental probability that the bowler gets a strike? $\frac{1}{7}$
2. Describe a simulation you could use that involves flipping a coin to find the experimental probability of guessing at least four correct answers on a five-question true or false quiz. **Answers may vary. Sample: Let heads represent a correct answer and tails represent an incorrect answer. Flip the coin five times. Record the number of heads. Repeat 100 times. Divide the number of times you got 4 or 5 heads by 100.**
3. What is the theoretical probability of rolling a sum less than 5 using two number cubes? $\frac{1}{6}$
4. Segments parallel to the sides are used to divide a square board 3 ft on each side into 9 equal-size smaller squares. If the board is in a level position and a grain of rice lands on the board at a random point, what is the probability that it lands on a corner section? $\frac{4}{9}$

Alternative Assessment

Have students work in groups of three. Suppose that each group is planning a vacation. From the possible flights available, the probability of at least one flight being delayed is $\frac{1}{5}$. Have students plan, describe in words, and conduct a simulation to find the experimental probability that two flights selected at random will not be delayed.

Suppose you select a number at random from the sample space {1, 2, 3, 4, 5, 6, 7, 8, 9}. Find each theoretical probability.

34. P(the number is a multiple of 3) $\frac{1}{3}$

35. P(the number is less than 5) $\frac{4}{9}$

36. P(the number is prime) $\frac{4}{9}$

37. P(the number is even) $\frac{4}{9}$

38. Suppose you roll two number cubes.

a. What is the sample space?

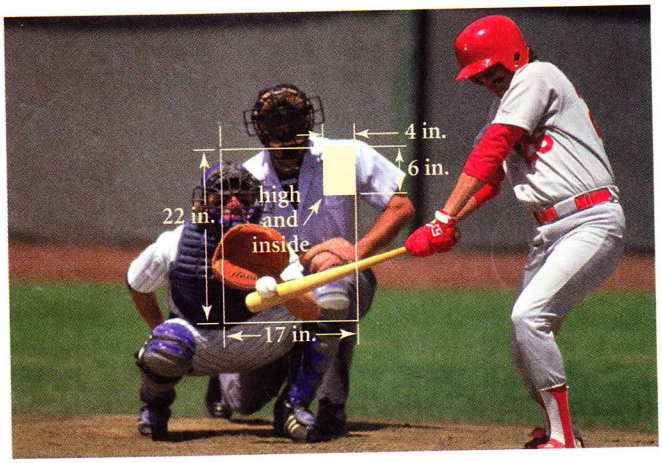
b. How many outcomes are there? **36 outcomes**

c. What is the theoretical probability of getting a sum of 12? $\frac{1}{36}$

d. What is the theoretical probability of getting a sum of 7? $\frac{1}{6}$

38a. (1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)

39. Sports The batter's strike zone depends on the height and stance of the batter. Find the geometric probability that a baseball thrown at random within the batter's strike zone as shown in the figure below will be "high and inside." This is one of the harder pitches to hit! **≈6.4%**



40. a. Sports Team A has won one game and team B has won three games in a World Series. What is the experimental probability that team A wins the next game? That team B wins the next game? $\frac{1}{4}$; $\frac{3}{4}$

b. Critical Thinking Do you think that experimental probability is a good predictor of the winner of the next game? Explain. **Answers may vary. Sample: Variables such as injuries make probability a poor predictor**

41. Writing Explain what you would need to know to determine the theoretical probability that a five-digit postal ZIP code ends in 1. **if there are any restrictions on the last digit of a ZIP code**

42. Suppose you choose a two-digit number at random. What is the theoretical probability that its square root is an integer? $\frac{1}{15}$, **or 6.7%**

Challenge

43. The odds in favor of an event are the ratio of the number of favorable outcomes to the number of unfavorable outcomes. **See left.**

a. If the odds in favor of an event are a to b or $\frac{a}{b}$, what is the probability of the event?

b. If the probability of an event is $\frac{a}{b}$, what are the odds in favor of the event?

c. Would you rather play a game where your odds of winning are $\frac{1}{2}$, or a game where your probability of winning is $\frac{1}{2}$? Explain.

43a. $\frac{a}{a+b}$

b. a to $b - a$ or $\frac{a}{b-a}$

c. A game where the probability of winning is $\frac{1}{2}$; when the odds of winning are $\frac{1}{2}$, the probability of winning is only $\frac{1}{3}$.

44. Open-Ended Use a telephone book. Select 50 telephone numbers at random and record the first three digits (the "exchange") of each number. Summarize your results using probability statements. **Check students' work.**

45. On a TV game show, you want to win a prize that is hidden behind one of three doors. You choose one door, but before it is opened the host opens another door and shows that the prize is not there. Now you can switch to the other unopened door or stick with your original choice.

a. Find the experimental probability of winning the prize if you stick with your original choice. (*Hint:* Simulate the doors with index cards and the prize with a mark on one side of one card. One person can act as the host and another as the contestant.) about $\frac{1}{3}$

b. Find the experimental probability of winning if you switch to the other door. about $\frac{2}{3}$

FCAT Practice

Multiple Choice

46. What is the theoretical probability of getting a 2 or a 3 when rolling a number cube? B

A. $\frac{1}{2}$ B. $\frac{1}{3}$ C. $\frac{1}{4}$ D. $\frac{1}{6}$

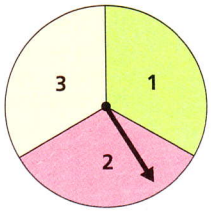
47. How many outcomes are in the sample space for rolling a number cube and tossing a coin? H

F. 2 G. 6 H. 12 I. 24

48–51. See margin.

Short Response

48. What is the sample space for spinning the spinner at the right twice? Are all the outcomes equally likely?



49. What is the probability of spinning a 1 on both of two spins? Explain.

Extended Response

50. Which is more likely on two spins, an even sum or a sum that is not prime? Include all the steps of your solution.

Reading Comprehension

51. Read the passage below. Do you agree with the statement in the last sentence? Explain.

> The chances of the chromosomes being defective are 1 in 250, which sounds like reasonable odds. Except that all odds are, in reality, 50-50: it may happen and it may not.

FCAT Online
FCAT Format quiz at www.PHSchool.com
Web Code: aga-0106

Mixed Review

Lesson 1-5 Solve each absolute value equation. Check your answers.

52. $|x + 3| = 9$ −12, 6
53. $|3x - 5| = 10$ $-\frac{5}{3}$, 5
54. $|2x + 7| + 3 = 22$ −13, 6
55. $|3x - 6| - 7 = 14$ −5, 9
56. $|2x + 3| - 9 = 14$ −13, 10
57. $|6 - 5x| = 18$ $-\frac{12}{5}, \frac{24}{5}$

Lesson 1-5 Solve each absolute value inequality.

58. $2|x| - 3 \geq 5$ $x \leq -4$ or $x \geq 4$
59. $|2x - 4| + 16 \leq 24$ $-2 \leq x \leq 6$
60. $|3x - 5| - 2 > 0$ $x < 1$ or $x > 2\frac{1}{3}$
61. $|2x + 4| - 6 < 0$ $-5 < x < 1$
62. $2|x + 3| \geq 10$ $x \leq -8$ or $x \geq 2$
63. $6|x + 9| \leq 36$ $-15 \leq x \leq -3$

Pages 42–45 Exercises

44. [2] (11, 12, 13, 21, 22, 23, 31, 32, 33); all the pairs are equally likely because the three regions have the same area (or are congruent), and the outcome of the first spin does not affect the outcome of the second spin.

[1] answers one of the two parts

49. [2] $\frac{1}{9}$; the probability of spinning a 1 on each spin is $\frac{1}{3}$. The probability of spinning a 1 on both spins is $\frac{1}{3} \cdot \frac{1}{3}$ or $\frac{1}{9}$.

[1] no explanation included

FCAT Practic

Resources
For additional practice with variety of test item formats
- FCAT Practice, p. 51
- FCAT Strategies, p. 46
- FCAT Daily Practice and Strategies Transparencie

50. [4] a. The favorable outcomes for even sum are 13, 22, 31, an

b. The probabili an even sum no. of favorable o total no. of outc $= \frac{5}{9}$.

c. The favorable outcomes for composite su 13, 22, 31, an

d. The probabili a composite is $\frac{4}{9}$.

e. $\frac{5}{9} > \frac{4}{9}$, so an e sum is more than a comp sum.

[3] omits one of the parts of the ans

[2] omits two OR t the five parts of answer

[1] omits four of the parts of the ans

51. No; not all odds are 50–50. In this case are $\frac{1}{249}$, which mea 1 out every 250 pe will have defective chromosomes.