

CHAPTER
11 **Performance Assessment Teacher Support**
Probability and Statistics**Purpose**

This performance task assesses the student's ability to find the probability of simple, complementary, independent, and mutually exclusive events.

Time

30–55 minutes

Grouping

Individuals

Preparation Hints

In small groups or as a whole class, simulate the game a few times. This will help students fully understand the concept of “keeping” the favorable dice and re-rolling the others. You can use standard dice or number cubes and assign a key (1, 2, or 3 = CAR; 4, 5, or 6 = blank), or you can use masking tape to cover the faces and actually write CAR on three of them.

Overview

Students find the probability of winning a game that involves rolling dice. The game is a simplification of “Let ‘Em Roll” from the TV game show *The Price is Right*. For a more in depth treatment and possible extension of the activity, see “Teaching Probability and Statistics through Game Shows” by Matthew A. Carlton and Mary V. Mortlock (*Mathematics Teacher*, April 2005, vol. 98, no. 8, pp. 564–570).

Introduce the Task

Go through the introductory paragraph and make sure all students understand how the game is played and won. As time allows, try simulating the game (see Preparation Hints).

Performance Indicators

- _____ Finds the probability of rolling CAR on one die.
- _____ Uses independent events and complements to find the probability of rolling one die three times and getting at least one CAR.
- _____ Applies the concept of mutually exclusive events to find the probability of rolling one CAR in one, two, or three rolls.
- _____ Uses independent events or binomial probability to find the probability of rolling five CARs on five dice.

Scoring Rubric

Level 4: Student solves problems correctly and gives good explanations.

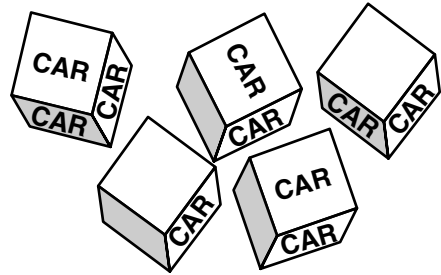
Level 3: Student solves problems but does not give satisfactory explanations.

Level 2: Student solves some problems but does not give satisfactory explanations.

Level 1: Student is not able to solve any of the problems.

CHAPTER 11 **Performance Assessment**
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You are a contestant on a game show and have the chance to win a car by simply rolling five dice. Each die has three sides that say CAR and three sides that are blank. In order for you to win the car you must roll CAR on all five dice. Luckily, you have three chances to roll the dice. On each roll, you “keep” any dice that come up CAR and re-roll only the dice that come up blank.



Imagine that you roll one die one time.

1. What is the probability of rolling CAR? _____
2. What is the complement of rolling CAR? _____
3. What is the probability of the complement? _____

Imagine that you roll one die three times.

4. When you roll one die three times, are you dealing with independent events or dependent events? _____
5. What is the probability that you never roll CAR? _____
6. What is the complement of never rolling CAR? _____
7. What is the probability of the complement? _____
8. **a.** If you roll a die once and get CAR, you would keep it. What is the probability of this happening? _____
- b.** With two rolls, what is the probability that you first roll a blank, and then roll CAR on the second roll? _____
- c.** With three rolls, what is the probability that you roll a blank twice, and then roll CAR on the third roll? _____
- d.** Using your answers from a-c, what is the probability that you get CAR and keep it, in one, two, or three rolls? _____
9. Your answers to 7 and 8d should be the same. What does this imply?

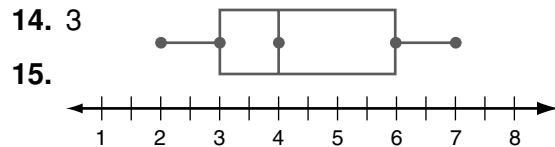
Imagine that you roll all five dice a maximum of three times each.

10. What is the probability that you roll CAR on all five dice? _____
11. Who do you think benefits from this game more: the contestant or the game show owner? Explain.

Answer Key continued

Chapter Test Form A

1. 24
2. 10
3. 90
4. $\bar{.3}$
5. 0.25
6. 0.40
7. 0.25
8. $0.5\bar{3}$ or $\frac{8}{15}$
9. 6
10. 0.38
11. 0.3024
12. $\sqrt{\frac{8}{9}}$ or ≈ 0.943
13. 9.8



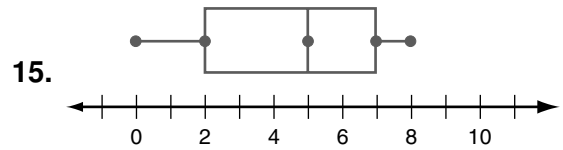
16. The mean will increase. The standard deviation will increase.
17. ≈ 0.15

Chapter Test Form B

1. 2520
2. 120
3. 160
4. 0.35
5. $0.8\bar{3}$
6. $0.41\bar{6}$
7. $0.1\bar{6}$ or $\frac{1}{6}$
8. $0.\bar{3}$ or $\frac{1}{3}$
9. 2.5
10. $\frac{17}{20}$ or 0.85
11. ≈ 0.777
12. $\sqrt{3}$ or ≈ 1.73

13. 6.7

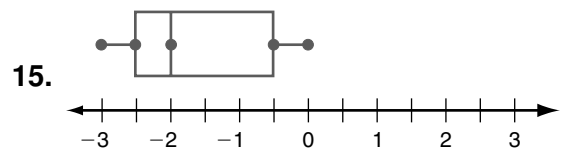
14. 16



16. The mean will stay the same. The standard deviation will decrease.
17. 0.0881

Chapter Test Form C

1. 5040
2. 495
3. 72
4. ≈ 0.61
5. $0.02\bar{7}$
6. ≈ 0.581
7. $0.1\bar{6}$ or $\frac{1}{6}$
8. 0.45 or $\frac{9}{20}$
9. 15.625
10. $\frac{478}{519}$ or ≈ 0.921
11. ≈ 0.614
12. ≈ 2.31
13. 23.6
14. 0.012



16. The mean will increase. The standard deviation will stay the same.
17. ≈ 0.054

Performance Assessment

1. $\frac{1}{2}$
2. rolling a blank
3. $1 - \frac{1}{2} = \frac{1}{2}$

Answer Key continued

4. independent events
5. $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$
6. rolling at least one CAR
7. $1 - \frac{1}{8} = \frac{7}{8}$
- 8a. $\frac{1}{2}$
- 8b. $\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$
- 8c. $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$
- 8d. $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \frac{7}{8}$
9. The probability of rolling one, two, or three CARs in three rolls is the same as rolling one CAR (and keeping it) in one, two, or three rolls.
10. $\frac{16,807}{32,768} \approx 0.513$
11. the contestant; their chance of winning is greater than 50%, the chance of the game show owner winning (the contestant losing) is less than 50%

Cumulative Test

1. A
2. H
3. C
4. J
5. B
6. H
7. B
8. F
9. C
10. J
11. D
12. H
13. D
14. G
15. B
16. H
17. A
18. G
19. A
20. J
21. A
22. H
23. D
24. H
25. B
26. G
27. D
28. H
29. C
30. J
31. C
32. H
33. C
34. J
35. B
36. G
37. A
38. H
39. D
40. H

CHAPTER 12

Section Quiz: Lessons 12-1 to 12-3

1. C
2. F
3. C
4. G
5. A