RLP-GEOB · RLP Geometry B — Solids, Coordinates, Circles and Probability

Unit 4: Conditional Probability

Practice Workbook. The same problems, in the same order, as the Practice sections of the online lessons.

Name _____ Period _____

Lesson 4.1 — Sample Spaces, Events and the Addition Rule

FLUENCY

1. Two fair dice are rolled. Find P(doubles).

2. Two fair dice are rolled. Find P(sum ≥ 9).

3. Two fair dice are rolled. Find P(at least one die shows 2).

4. Two fair dice are rolled. Find P(sum = 6).

5. Two fair dice are rolled. Find P(at least one die shows 4).

6. Two fair dice are rolled. Find P(sum ≥ 10).

7. One card is drawn from a standard 52-card deck. Find P(king or red card).

8. Find P(not a heart) for one card.

9. A coin is flipped three times. List the outcomes in “exactly two heads” and find its probability.

10. Are “sum is 7” and “doubles” mutually exclusive for two dice? Find P(sum 7 or doubles).

APPLICATION

11. *(Illustrative.)* Of 30 students, 18 play soccer, 12 are in band, and 5 do both. Find P(soccer or band) for a randomly chosen student, and P(neither).

12. Two dice are rolled. Find P(sum is 8 or doubles).

13. Describe the event “at least one die shows 6 and the sum is even” as a list, and find its probability.

CHALLENGE

14. Show that P(A or B or C) = P(A) + P(B) + P(C) − P(A and B) − P(A and C) − P(B and C) + P(A and B and C) gives the right answer for one die with A = even, B = greater than 3, C = prime.

REVIEW

15. A circle has radius 3. For a central angle of 240°, find the arc length and the sector area in terms of π.

16. Find the distance between (−6, 7) and (9, −6), and the midpoint of the segment.

17. Convert 150° to radians.

Lesson 4.2 — Two-Way Tables and Conditional Probability

FLUENCY

1. A survey records two yes/no questions. Yes to both: 50; yes to A only: 8; yes to B only: 31; no to both: 46. Find P(A), P(A and B), P(A | B), and decide whether A and B look independent.

2. A survey records two yes/no questions. Yes to both: 9; yes to A only: 48; yes to B only: 41; no to both: 58. Find P(A), P(A and B), P(A | B), and decide whether A and B look independent.

3. A survey records two yes/no questions. Yes to both: 34; yes to A only: 34; yes to B only: 60; no to both: 41. Find P(A), P(A and B), P(A | B), and decide whether A and B look independent.

4. A survey records two yes/no questions. Yes to both: 51; yes to A only: 59; yes to B only: 36; no to both: 49. Find P(A), P(A and B), P(A | B), and decide whether A and B look independent.

5. *(Illustrative data.)* Of 240 students, 90 ride the bus and live more than 2 miles away, 30 ride the bus and live closer, 40 do not ride and live farther, and 80 do not ride and live closer. Build the two-way table with totals.

6. From that table, find P(bus).

7. Find P(bus | far).

8. Find P(far | bus).

APPLICATION

9. Using the bus table, compare P(bus | far) with P(bus | near) and write one sentence interpreting the comparison.

10. Use the formula P(A | B) = P(A and B)/P(B) to find P(bus | far) from the table's relative frequencies, and confirm it matches the count method.

11. *(Illustrative.)* In a school of 400, 60% are juniors and 45% of the school has a driver's license; 35% of the school are juniors with licenses. Build the two-way table in counts.

CHALLENGE

12. For the license table above, find P(license | junior) and P(junior | license), and explain in words why they differ.

REVIEW

13. A circle has radius 7. For a central angle of 120°, find the arc length and the sector area in terms of π.

14. Find the distance between (3, −3) and (4, 1), and the midpoint of the segment.

15. A tangent segment from a point 25 units from the center of a circle of radius 7 has what length?

Lesson 4.3 — Independence in Everyday Language

FLUENCY

1. A survey records two yes/no questions. Yes to both: 16; yes to A only: 49; yes to B only: 38; no to both: 21. Find P(A), P(A and B), P(A | B), and decide whether A and B look independent.

2. A survey records two yes/no questions. Yes to both: 17; yes to A only: 23; yes to B only: 38; no to both: 52. Find P(A), P(A and B), P(A | B), and decide whether A and B look independent.

3. A survey records two yes/no questions. Yes to both: 50; yes to A only: 43; yes to B only: 8; no to both: 18. Find P(A), P(A and B), P(A | B), and decide whether A and B look independent.

4. P(A) = 0.3, P(B) = 0.5 and P(A and B) = 0.15. Are A and B independent?

5. P(A) = 0.4, P(B) = 0.5 and P(A and B) = 0.1. Are A and B independent? Find P(A | B).

6. A coin is flipped and a die is rolled. Find P(tails and a number greater than 4).

7. Two cards are drawn *with* replacement. Find P(both hearts).

8. A and B are mutually exclusive with P(A) = 0.2 and P(B) = 0.3. Are they independent?

APPLICATION

9. Rewrite in P(|) notation and critique: “Most drivers in accidents had been driving less than 5 miles, so short trips are the most dangerous.”

10. A player has hit 5 free throws in a row and says the next is “due” to miss. If her shots are independent with P(make) = 0.7, what is P(make) on the next shot?

11. Using the illustrative bus table (240 students; bus 120; far 130; bus and far 90), test whether riding the bus and living far away are independent.

CHALLENGE

12. Prove: if A and B are independent, then A and “not B” are independent.

REVIEW

13. A circle has radius 5. For a central angle of 60°, find the arc length and the sector area in terms of π.

14. Find the distance between (4, 5) and (7, 7), and the midpoint of the segment.

15. An inscribed quadrilateral has angles 75° and 110° at A and B. Find the angles at C and D.

Lesson 4.4 — The Multiplication Rule, Counting and Compound Events

FLUENCY

1. A group has 5 juniors and 3 seniors. If 5 are chosen at random, find the probability that exactly 2 are juniors.

2. A group has 9 juniors and 4 seniors. If 5 are chosen at random, find the probability that exactly 3 are juniors.

3. In how many ways can 2 different offices be filled from 10 candidates?

4. A group has 4 juniors and 3 seniors. If 2 are chosen at random, find the probability that exactly 1 is a junior.

5. A group has 6 juniors and 6 seniors. If 3 are chosen at random, find the probability that exactly 1 is a junior.

6. A group has 5 juniors and 1 seniors. If 5 are chosen at random, find the probability that exactly 5 are juniors.

7. Two cards are drawn without replacement. Find P(both are hearts).

8. Three cards are drawn without replacement. Find P(all three are aces).

9. A box has 5 red and 7 blue markers. Three are chosen at random. Find P(exactly 2 red).

APPLICATION

10. *(Illustrative numbers.)* A condition affects 2% of a population. A test detects it 95% of the time when present and gives a false positive 10% of the time when absent. Using 10,000 people, find P(condition | positive).

11. A club of 12 chooses a president, vice-president and treasurer. How many ways? If the three are instead a committee, how many?

12. A 4-digit PIN uses digits 0-9 with repetition allowed. What is the probability a random guess is right? If no digit may repeat, how many PINs are possible?

CHALLENGE

13. Find the probability that at least two people in a group of 23 share a birthday (ignore February 29 and assume 365 equally likely days).

REVIEW

14. A circle has radius 13. For a central angle of 90°, find the arc length and the sector area in terms of π.

15. Find the distance between (5, −9) and (3, −9), and the midpoint of the segment.

16. Find P(sum = 9) for two dice.

Unit 4 checkpoint

1. For two dice, P(sum = 6) = _____/36.
2. P(queen or spade) for one card is:
   A. 17/52
   B. 16/52
   C. 13/52
   D. 4/52
3. True or false: P(A or B) = P(A) + P(B) for any two events.
4. In a table, 45 of 150 students play an instrument, and 18 of those 45 are seniors. P(senior | instrument) is:
   A. 18/150
   B. 18/45
   C. 45/150
   D. 27/45
5. If P(A and B) = 0.12 and P(B) = 0.4, then P(A | B) = _____.
6. P(A) = 0.6, P(B) = 0.5 and P(A and B) = 0.3. A and B are:
   A. Independent
   B. Mutually exclusive
   C. Dependent
   D. Complementary
7. True or false: After four tails in a row with a fair coin, heads is more likely than 1/2.
8. True or false: Mutually exclusive events with positive probabilities are independent.
9. Two cards are drawn without replacement. P(both kings) is:
   A. 1/169
   B. 1/221
   C. 1/13
   D. 2/52
10. The number of 3-person committees from 9 people is _____.

11. The number of ways to award gold, silver and bronze among 8 runners is _____.
12. A two-dice game: A wins on a sum of 6, 7 or 8. P(A wins) is:
    A. 3/11
    B. 4/9
    C. 1/2
    D. 1/3
13. True or false: A procedure that gives each of 25 students a 3/25 chance at one of 3 seats can be a random draw of 3 names.

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