Classical Probability

Probability Worksheet · Grade 9–12

Name: _____ Date: _____

Learning Objectives

- Identify the sample space for a given probability experiment
- Calculate classical probability as a fraction of favorable outcomes over total outcomes
- Express probability as a decimal and percentage using a calculator

Problems

1. A bag contains 10 red marbles and 5 blue marbles. What is the probability of randomly picking a red marble? Express as a fraction, decimal, and percentage.

$$P(\text{red}) = \frac{\text{favorable outcomes}}{\text{sample space}}$$

2. A hat contains 45 marbles: 18 are green and the rest are yellow. What is the probability of randomly selecting a yellow marble? Express as a fraction, decimal, and percentage.

$$P(\text{yellow}) = \frac{?}{45}$$

3. A standard six-sided die is rolled once. What is the probability of rolling a number greater than 2? Express as a fraction, decimal, and percentage.

$$P(x > 2) = \frac{?}{6}$$

4. A survey of 2,500 adults found that 975 of them exercise daily. If one adult is selected at random, what is the probability that the selected adult exercises daily? Express as a fraction, decimal, and percentage.

$$P(\text{exercises daily}) = \frac{975}{2500}$$

5. A group of 80 car owners is surveyed. 12 of them own electric cars. What is the probability that a randomly selected owner owns an electric car? Express as a fraction, decimal, and percentage.

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$$P(\text{electric}) = \frac{12}{80}$$

6. From a standard deck of 52 cards, what is the probability of drawing an ace? Express as a fraction, decimal, and percentage.

$$P(\text{ace}) = \frac{4}{52}$$

7. A standard six-sided die is rolled once. What is the probability of rolling an odd number or a number greater than 4? Express as a fraction, decimal, and percentage.

$$P(\text{odd or} > 4) = \frac{?}{6}$$

8. Use the table below showing survey results about online shopping habits. Fill in the missing probability values for each category by dividing by the total of 2,048 people surveyed. Round decimals to 4 places.

Category	Count	Probability (fraction)	Probability (decimal)
Shopped Online	800	800/2048	
Never Shopped Online	1248	1248/2048	
Male	1200	1200/2048	
Female	848	848/2048	
Total	2048	2048/2048	1.0000

9. From a standard deck of 52 cards, what is the probability of drawing a card that is either a face card (Jack, Queen, or King) or a card from the Hearts suit? Express as a fraction, decimal, and percentage.

$$P(\text{face or heart}) = \frac{?}{52}$$

10. A survey of 3,200 students found the data shown in the table below. Using the table, find: (a) the probability a randomly selected student is a freshman, (b) the probability a student prefers math given they are a sophomore, and (c) the probability a student prefers science or is a junior.

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Grade	Prefers Math	Prefers Science	Prefers English	Row Total
Freshman	320	280	200	800
Sophomore	400	360	240	1000
Junior	300	250	150	700
Senior	250	260	190	700
Column Total	1270	1150	780	3200

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Classical Probability — Answer Key

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Answer Key

1. Answer: 10/15 ≈ 0.667 or 66.7%

- Sample space = 10 + 5 = 15 total marbles
- Favorable outcomes = 10 red marbles
- P(red) = 10/15 ≈ 0.667 or 66.7%

2. Answer: 27/45 = 0.6 or 60%

- Yellow marbles = 45 - 18 = 27
- Sample space = 45
- P(yellow) = 27/45 = 0.6 or 60%

3. Answer: 4/6 ≈ 0.667 or 66.7%

- Sample space = {1, 2, 3, 4, 5, 6}, so 6 outcomes
- Numbers greater than 2: {3, 4, 5, 6} = 4 favorable outcomes
- P(x > 2) = 4/6 ≈ 0.667 or 66.7%

4. Answer: 975/2500 = 0.39 or 39%

- Sample space = 2500 adults surveyed
- Favorable outcomes = 975 adults who exercise daily
- P(exercises daily) = 975/2500 = 0.39 or 39%

5. Answer: 12/80 = 0.15 or 15%

- Sample space = 80 car owners
- Favorable outcomes = 12 electric car owners
- P(electric) = 12/80 = 0.15 or 15%

6. Answer: 4/52 ≈ 0.077 or 7.7%

- Sample space = 52 cards in a standard deck
- There are 4 aces (one per suit) in the deck
- P(ace) = 4/52 ≈ 0.077 or 7.7%

7. Answer: 4/6 ≈ 0.667 or 66.7%

- Sample space = {1, 2, 3, 4, 5, 6}
- Odd numbers: {1, 3, 5}; numbers greater than 4: {5, 6}
- Union (no duplicates): {1, 3, 5, 6} = 4 outcomes
- P(odd or > 4) = 4/6 ≈ 0.667 or 66.7%

8. Answer: See completed table

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Category	Count	Probability (fraction)	Probability (decimal)
Shopped Online	800	800/2048	0.3906
Never Shopped Online	1248	1248/2048	0.6094
Male	1200	1200/2048	0.5859
Female	848	848/2048	0.4141
Total	2048	2048/2048	1.0000

- Divide each count by the total sample space of 2048
- 800 / 2048 ≈ 0.3906
- 1248 / 2048 ≈ 0.6094
- 1200 / 2048 ≈ 0.5859
- 848 / 2048 ≈ 0.4141
- All probabilities sum to 1.0000, confirming correctness

9. Answer: 22/52 ≈ 0.423 or 42.3%

- Face cards: 3 per suit × 4 suits = 12 face cards
- Hearts: 13 cards total
- Face cards that are also Hearts (overlap): Jack, Queen, King of Hearts = 3
- By addition rule: 12 + 13 - 3 = 22 favorable outcomes
- P(face or heart) = 22/52 ≈ 0.423 or 42.3%

10. Answer: (a) 800/3200 = 0.25 or 25%; (b) 400/1000 = 0.40 or 40%; (c) 1150/3200 + 700/3200 - 250/3200 = 1600/3200 = 0.50 or 50%

- Part (a): Sample space = 3200; Freshmen = 800; P(freshman) = 800/3200 = 0.25 or 25%
- Part (b): Restrict sample space to sophomores = 1000; Sophomores who prefer math = 400; P(math | sophomore) = 400/1000 = 0.40 or 40%
- Part (c): Students who prefer science = 1150; Juniors = 700; Juniors who prefer science (overlap) = 250
- By addition rule: 1150 + 700 - 250 = 1600
- P(science or junior) = 1600/3200 = 0.50 or 50%

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