Introduction to Probability & Sample Spaces

Statistics & Probability Worksheet · Grade 7–9

Name: _____ Date: _____

Learning Objectives

- Define probability and identify key vocabulary including sample space, experiment, and outcome
- List all possible outcomes in a sample space for common experiments (die, coin, cards)
- Construct and interpret tree diagrams to represent sample spaces

Problems

1. A standard die is rolled once. List all the possible outcomes in the sample space.

$S = \{\ ?,\ ?,\ ?,\ ?,\ ?,\ ?\ \}$

2. A coin is flipped one time. List all possible outcomes in the sample space and state how many outcomes there are.

$S = \{\ ?,\ ?\ \}$

3. A coin is tossed twice. List all possible outcomes in the sample space using H for Heads and T for Tails.

$S = \{\ HH,\ ?,\ ?,\ ?\ \}$

4. How many cards are in a standard deck? Identify the four suits.

5. A card is drawn from a standard deck. How many possible outcomes are in the sample space? How many Kings are in the deck?

$n(S) = ?\,; \quad n(\text{Kings}) = ?$

6. Draw a complete tree diagram for tossing a coin twice. Use your diagram to confirm the total number of outcomes in the sample space.

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7. A die is rolled once. Fill in the table below by listing each outcome and deciding whether it is even or odd.

Outcome	Even or Odd
1	
2	
3	
4	
5	
6	

8. A coin is tossed three times. Using a tree diagram or organized list, find the total number of outcomes and list the complete sample space.

$$n(S) = 2^3 = ?$$

9. A bag contains one red marble (R), one blue marble (B), and one green marble (G). You draw one marble, record its color, put it back, and draw again. List the complete sample space and state the total number of outcomes.

$$n(S) = 3 \times 3 = ?$$

10. A die is rolled and a coin is flipped at the same time. Construct the complete sample space by listing all possible outcomes as ordered pairs (die result, coin result). Then state the total number of outcomes and use the dot plot to show how many outcomes result in an even die number.

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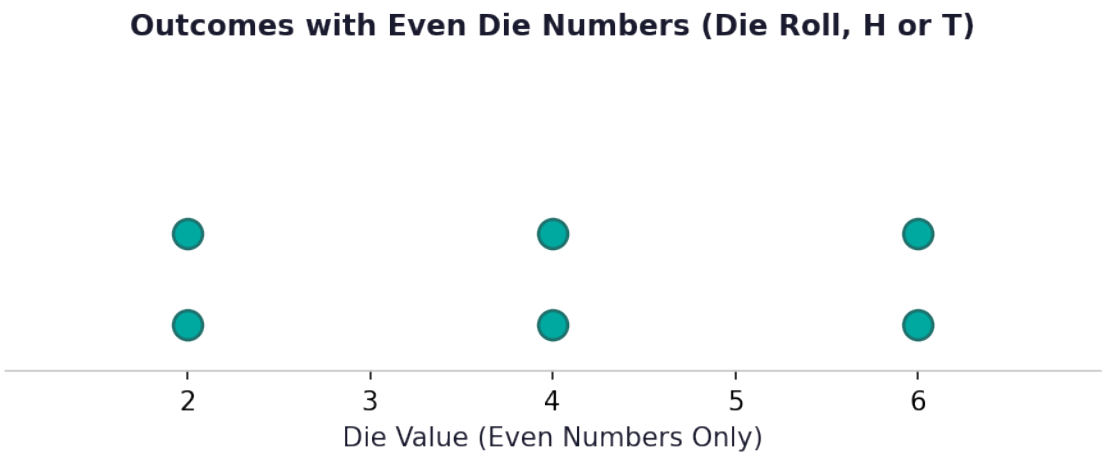

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Introduction to Probability & Sample Spaces — Answer Key

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Answer Key

1. Answer: S = {1, 2, 3, 4, 5, 6}

- A standard die is a cube with faces numbered 1 through 6.
- Every face is a possible outcome when the die is rolled.
- Sample space: S = {1, 2, 3, 4, 5, 6}, which has 6 outcomes.

2. Answer: S = {H, T}; 2 outcomes

- A coin has two sides: Heads (H) and Tails (T).
- When flipped once, only one side lands face-up.
- Sample space: S = {H, T}, which has 2 outcomes.

3. Answer: S = {HH, HT, TH, TT}

- The first flip can be H or T; the second flip can also be H or T.
- Combine each first-flip result with each second-flip result.
- Possible outcomes: HH (Heads-Heads), HT (Heads-Tails), TH (Tails-Heads), TT (Tails-Tails).
- Sample space: S = {HH, HT, TH, TT}, which has 4 outcomes.

4. Answer: 52 cards; suits are Hearts, Diamonds, Clubs, Spades

- A standard deck has 4 suits: Hearts, Diamonds, Clubs, and Spades.
- Each suit contains 13 cards (Ace, 2–10, Jack, Queen, King).
- Total cards: 4 suits × 13 cards = 52 cards.

5. Answer: n(S) = 52; n(Kings) = 4

- A standard deck has 52 cards, so the sample space has 52 outcomes.
- There is one King in each of the 4 suits (King of Hearts, Diamonds, Clubs, Spades).
- Number of Kings = 4.

6. Answer: 4 outcomes: HH, HT, TH, TT

- Start with a single node (the start).
- Branch into H and T for the first flip.
- From each of those branches, draw two more branches: H and T for the second flip.
- Follow each path to the end: HH, HT (from first H); TH, TT (from first T).
- Total branches at the end = 4, confirming the sample space has 4 outcomes.

7. Answer: See completed table

Outcome	Even or Odd
1	Odd

Outcome	Even or Odd
2	Even
3	Odd
4	Even
5	Odd
6	Even

- List outcomes 1–6 from rolling a standard die.
- Even numbers (divisible by 2): 2, 4, 6.
- Odd numbers: 1, 3, 5.
- Fill in the table accordingly.

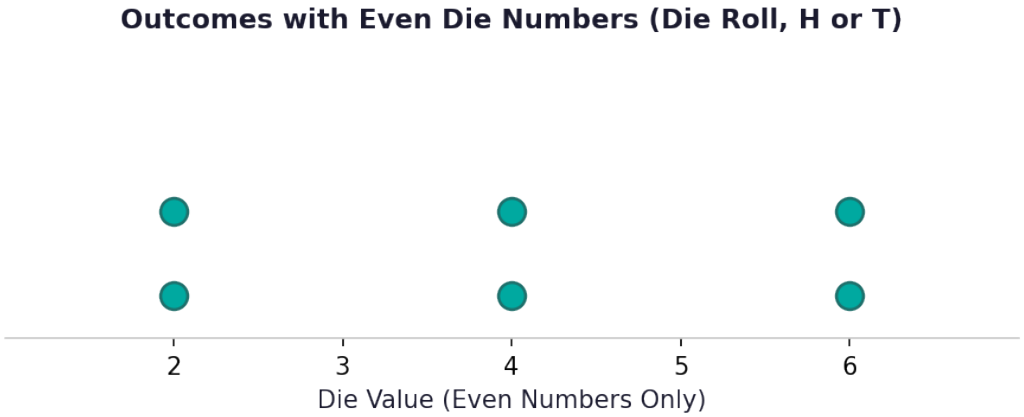
8. Answer: n(S) = 8; S = {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}

- Each flip has 2 outcomes (H or T), and there are 3 flips.
- Using the counting principle: total outcomes = 2 × 2 × 2 = 8.
- List all outcomes systematically: HHH, HHT, HTH, HTT, THH, THT, TTH, TTT.
- Sample space has 8 elements.

9. Answer: n(S) = 9; S = {RR, RB, RG, BR, BB, BG, GR, GB, GG}

- The first draw has 3 outcomes: R, B, G.
- Since the marble is replaced, the second draw also has 3 outcomes: R, B, G.
- Total outcomes = 3 × 3 = 9.
- Listing all combinations: RR, RB, RG, BR, BB, BG, GR, GB, GG.

10. Answer: n(S) = 12; 6 outcomes have an even die number: (2,H),(2,T),(4,H),(4,T),(6,H),(6,T)



- The die has 6 outcomes: 1, 2, 3, 4, 5, 6. The coin has 2 outcomes: H, T.
- Total outcomes = 6 × 2 = 12.
- Full sample space: (1,H),(1,T),(2,H),(2,T),(3,H),(3,T),(4,H),(4,T),(5,H),(5,T),(6,H),(6,T).
- Even die numbers: 2, 4, 6 — each paired with H or T gives 6 outcomes with an even die result.
- The dot plot shows 2 dots at 2, 2 dots at 4, and 2 dots at 6 — confirming 6 such outcomes.

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