

# Introduction to Probability

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 24

## Q Quick Review

**Probability** measures how likely an event is. It is a number from 0 (**impossible**) to 1 (**certain**); a probability of  $\frac{1}{2}$  means **equally likely** to happen or not. When all outcomes are **equally likely**, the probability of an event is  $P(\text{event}) = \frac{\text{number of favorable outcomes}}{\text{total number of outcomes}}$ . Always write the answer as a fraction in **simplest form**. For example, rolling an even number on a standard die has 3 favorable outcomes out of 6, so  $P = \frac{3}{6} = \frac{1}{2}$ .

◇ **Example:** A bag has 4 red, 6 blue, and 2 green marbles. Find the probability of drawing a green marble.  
 ⇒ First count the total marbles:  $4 + 6 + 2 = 12$ . The favorable outcomes are the green marbles, and there are 2 of them. So the probability is  $\frac{2}{12}$ . Now simplify by dividing the top and bottom by 2:  $\frac{2}{12} = \frac{1}{6}$ . So there is a  $\frac{1}{6}$  chance of drawing green.

**Answer:**  $\frac{1}{6}$

## PRACTICE

Find each probability. Write your answer as a fraction in simplest form.

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| 1. P(heads) on one coin flip _____                     | 12. Spinner with 8 equal sections, 2 red. P(not red) _____ |
| 2. P(rolling a 3) on a standard die _____              | 13. Letters of MATH: P(choosing a vowel) _____             |
| 3. P(rolling an even number) on a die _____            | 14. Numbers 1–10: P(an even number) _____                  |
| 4. P(rolling a number $\leq 4$ ) on a die _____        | 15. Numbers 1–20: P(a multiple of 5) _____                 |
| 5. P(rolling a 7) on a standard die _____              | 16. Bag: 4 red, 6 blue, 2 green. P(blue) _____             |
| 6. P(rolling a number $< 7$ ) on a die _____           | 17. Bag: 4 red, 6 blue, 2 green. P(not blue) _____         |
| 7. P(prime number) on a die: primes are 2,3,5 _____    | 18. Days of the week: P(a day starting with S) _____       |
| 8. Bag: 3 red, 9 blue. P(red) _____                    | 19. Standard deck: P(drawing a spade) _____                |
| 9. Bag: 3 red, 9 blue. P(blue) _____                   | 20. Letters of MATHEMATICS: P(a vowel) _____               |
| 10. Bag: 5 red, 15 blue. P(red) _____                  |  |
| 11. Spinner with 8 equal sections, 2 red. P(red) _____ |  |

## ◆ Word Problems

21. A jar holds 5 cherry, 3 grape, and 2 lime candies. If you pick one without looking, what is the probability it is grape? \_\_\_\_\_
22. A spinner has 10 equal sections numbered 1 through 10. What is the probability of landing on a number greater than 7? \_\_\_\_\_
23. In a class of 24 students, 18 ride the bus. If the teacher picks one student at random, what is the probability that student does not ride the bus? \_\_\_\_\_
24. A weather app says there is a 0 probability of snow in July and a probability of 1 that the sun will rise tomorrow. Describe what each of these probabilities means. \_\_\_\_\_



## Answer Keys

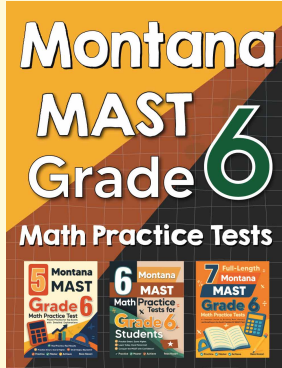
- |  |   |
|--|---|
| <p>1. <math>\frac{1}{2}</math></p> <p>2. <math>\frac{1}{6}</math></p> <p>3. <math>\frac{1}{2}</math></p> <p>4. <math>\frac{2}{3}</math></p> <p>5. 0</p> <p>6. 1</p> <p>7. <math>\frac{1}{2}</math></p> <p>8. <math>\frac{1}{4}</math></p> <p>9. <math>\frac{3}{4}</math></p> <p>10. <math>\frac{1}{4}</math></p> <p>11. <math>\frac{1}{4}</math></p> <p>12. <math>\frac{3}{4}</math></p> <p>13. <math>\frac{1}{4}</math></p> | <p>14. <math>\frac{1}{2}</math></p> <p>15. <math>\frac{1}{5}</math></p> <p>16. <math>\frac{1}{2}</math></p> <p>17. <math>\frac{1}{2}</math></p> <p>18. <math>\frac{2}{7}</math></p> <p>19. <math>\frac{1}{4}</math></p> <p>20. <math>\frac{4}{11}</math></p> <p>21. <math>\frac{3}{10}</math></p> <p>22. <math>\frac{3}{10}</math></p> <p>23. <math>\frac{1}{4}</math></p> <p>24. 0 = impossible, 1 = certain</p> |
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### Step-by-Step Explanations

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| <p>1. A coin has 2 equally likely sides and 1 is heads: <math>\frac{1}{2}</math>.</p> <p>2. There is 1 way to roll a 3 out of 6 faces: <math>\frac{1}{6}</math>.</p> <p>3. The even faces are 2, 4, 6 — that is 3 out of 6, which simplifies to <math>\frac{1}{2}</math>.</p> <p>4. The faces 1, 2, 3, 4 work — 4 out of 6, which simplifies to <math>\frac{2}{3}</math>.</p> <p>5. A die has no face showing 7, so this event is impossible: probability 0.</p> <p>6. Every face (1 through 6) is less than 7, so this event is certain: probability 1.</p> <p>7. The primes 2, 3, 5 give 3 favorable faces out of 6: <math>\frac{1}{2}</math>.</p> <p>8. There are 12 marbles total and 3 are red: <math>\frac{3}{12} = \frac{1}{4}</math>.</p> <p>9. There are 9 blue out of 12: <math>\frac{9}{12} = \frac{3}{4}</math>.</p> <p>10. 20 marbles total and 5 red: <math>\frac{5}{20} = \frac{1}{4}</math>.</p> <p>11. 2 red sections out of 8: <math>\frac{2}{8} = \frac{1}{4}</math>.</p> <p>12. 6 of the 8 sections are not red: <math>\frac{6}{8} = \frac{3}{4}</math>.</p> <p>13. MATH has 4 letters and 1 vowel (A): <math>\frac{1}{4}</math>.</p> <p>14. There are 5 even numbers from 1 to 10: <math>\frac{5}{10} = \frac{1}{2}</math>.</p> | <p>15. The multiples are 5, 10, 15, 20 — 4 out of 20: <math>\frac{4}{20} = \frac{1}{5}</math>.</p> <p>16. 12 marbles total, 6 blue: <math>\frac{6}{12} = \frac{1}{2}</math>.</p> <p>17. 6 of the 12 marbles are not blue: <math>\frac{6}{12} = \frac{1}{2}</math>.</p> <p>18. Saturday and Sunday start with S — 2 out of 7 days: <math>\frac{2}{7}</math>.</p> <p>19. A deck has 13 spades out of 52 cards: <math>\frac{13}{52} = \frac{1}{4}</math>.</p> <p>20. MATHEMATICS has 11 letters; the vowels A, E, A, I total 4: <math>\frac{4}{11}</math>.</p> <p>21. There are <math>5 + 3 + 2 = 10</math> candies in all, and 3 are grape. So the probability is <math>\frac{3}{10}</math>, which is already in simplest form.</p> <p>22. The numbers greater than 7 are 8, 9, 10 — that is 3 favorable sections out of 10, so the probability is <math>\frac{3}{10}</math>.</p> <p>23. If 18 of 24 ride the bus, then <math>24 - 18 = 6</math> do not. The probability is <math>\frac{6}{24} = \frac{1}{4}</math>.</p> <p>24. A probability of 0 means the event cannot happen at all — snow in July is treated as impossible. A probability of 1 means the event is certain to happen, like the sun rising.</p> |
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