

# Probability: Simple and Compound

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

## Quick Review

**Probability** measures how likely an event is, as a number from 0 (impossible) to 1 (certain). For equally likely outcomes,  $P(\text{event}) = \frac{\text{favorable outcomes}}{\text{total outcomes}}$ . A **simple event** is a single outcome, like rolling a 5. A **compound event** involves two or more events together. When events are **independent** (one does not affect the other), multiply:  $P(A \text{ and } B) = P(A) \cdot P(B)$ . For *mutually exclusive* events (they cannot both happen), add:  $P(A \text{ or } B) = P(A) + P(B)$ . Always reduce your fraction at the end.

◇ **Example:** A fair die is rolled. Find  $P(\text{even})$  and  $P(\text{rolling a 2 then a 2 on two rolls})$ .

⇒ A die has 6 equally likely outcomes. The even numbers are 2, 4, 6 — that is 3 favorable outcomes — so  $P(\text{even}) = \frac{3}{6} = \frac{1}{2}$ . For two rolls, each roll is *independent* of the other, so we multiply.  $P(\text{a 2}) = \frac{1}{6}$  on each roll, so  $P(2 \text{ then } 2) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$ . Multiplying small chances gives an even smaller chance — that makes sense!

**Answer:**  $P(\text{even}) = \frac{1}{2}$ ,  $P(2 \text{ then } 2) = \frac{1}{36}$

## PRACTICE

Find each probability. Write answers as reduced fractions.

- |  |  |
|--|--|
| 1. $P(\text{heads on one coin flip})$ _____                              | 11. $P(\text{rolling a number less than 7})$ _____               |
| 2. $P(\text{rolling a 3 on a die})$ _____                                | 12. $P(\text{heads then heads on two coin flips})$ _____         |
| 3. $P(\text{rolling an even number on a die})$ _____                     | 13. $P(\text{tails then tails then tails on three flips})$ _____ |
| 4. $P(\text{rolling a number greater than 4})$ _____                     | 14. $P(\text{rolling a 6 then a 6})$ _____                       |
| 5. $P(\text{rolling a multiple of 3})$ _____                             | 15. $P(\text{rolling a 1 or a 2 on one die})$ _____              |
| 6. $P(\text{drawing a red marble: 5 red, 3 blue})$ _____                 | 16. $P(\text{rolling a 2, 3, or 5 on one die})$ _____            |
| 7. $P(\text{drawing a blue marble: 5 red, 3 blue})$ _____                | 17. $P(\text{coin heads and die shows 4})$ _____                 |
| 8. $P(\text{spinner lands on 1 : four equal sections 1, 2, 3, 4})$ _____ | 18. $P(\text{spinner 1, 2, 3, 4 lands on 2 twice})$ _____        |
| 9. $P(\text{spinner lands on an odd number: 1, 2, 3, 4})$ _____          | 19. $P(\text{NOT rolling a 5 on one die})$ _____                 |
| 10. $P(\text{rolling a 7 on a die})$ _____                               | 20. $P(\text{drawing green: 2 green, 4 red, 6 yellow})$ _____    |

## Word Problems

21. A bag has 4 red, 3 blue, and 5 green marbles. What is the probability of drawing a blue marble on one draw? \_\_\_\_\_
22. You flip a fair coin and roll a fair die. What is the probability of getting tails *and* a number greater than 4? \_\_\_\_\_
23. A spinner has 8 equal sections numbered 1 to 8. What is the probability of landing on a number that is a multiple of 3? \_\_\_\_\_
24. A weather app says there is a  $\frac{1}{4}$  chance of rain each day. What is the probability it rains both Saturday and Sunday, if the days are independent? \_\_\_\_\_



## Answer Keys

1.  $\frac{1}{2}$
2.  $\frac{1}{6}$
3.  $\frac{1}{2}$
4.  $\frac{1}{3}$
5.  $\frac{1}{3}$
6.  $\frac{5}{8}$
7.  $\frac{3}{8}$
8.  $\frac{1}{4}$
9.  $\frac{1}{2}$
10. 0
11. 1
12.  $\frac{1}{4}$
13.  $\frac{1}{8}$

14.  $\frac{1}{36}$
15.  $\frac{1}{3}$
16.  $\frac{1}{2}$
17.  $\frac{1}{12}$
18.  $\frac{1}{16}$
19.  $\frac{5}{6}$
20.  $\frac{1}{6}$
21.  $P(\text{blue}) = \frac{3}{12} = \frac{1}{4}$
22.  $\frac{1}{2} \cdot \frac{1}{3} = \frac{1}{6}$
23.  $P = \frac{2}{8} = \frac{1}{4}$
24.  $\frac{1}{4} \cdot \frac{1}{4} = \frac{1}{16}$

### Step-by-Step Explanations

1. A coin has 2 equally likely sides; 1 is heads, so  $\frac{1}{2}$ .
2. One favorable outcome (3) out of 6 equally likely faces.
3. Even faces are 2, 4, 6 — that is 3 of 6, so  $\frac{1}{2}$ .
4. Numbers greater than 4 are 5 and 6 — 2 of 6, so  $\frac{1}{3}$ .
5. Multiples of 3 on a die are 3 and 6 — 2 of 6, so  $\frac{1}{3}$ .
6. There are 5 red out of  $5 + 3 = 8$  marbles, so  $\frac{5}{8}$ .
7. There are 3 blue out of 8 marbles total, so  $\frac{3}{8}$ .
8. One section out of 4 equal sections, so  $\frac{1}{4}$ .
9. Odd sections are 1 and 3 — 2 of 4, so  $\frac{1}{2}$ .
10. A die has no 7, so this event is impossible: probability 0.
11. Every face (1 through 6) is less than 7, so it is certain: probability 1.
12. Independent flips:  $\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$ .
13. Independent:  $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{8}$ .
14. Independent rolls:  $\frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$ .
15. Mutually exclusive, so add:  $\frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$ .
16. Add the three single chances:  $\frac{1}{6} \cdot 3 = \frac{3}{6} = \frac{1}{2}$ .
17. Independent events:  $\frac{1}{2} \cdot \frac{1}{6} = \frac{1}{12}$ .
18. Independent spins:  $\frac{1}{4} \cdot \frac{1}{4} = \frac{1}{16}$ .
19. The complement:  $1 - \frac{1}{6} = \frac{5}{6}$ . Five faces are not 5.
20. There are 2 green out of  $2 + 4 + 6 = 12$  marbles:  $\frac{2}{12} = \frac{1}{6}$ .
21. There are 3 blue marbles out of  $4 + 3 + 5 = 12$  total, so  $P(\text{blue}) = \frac{3}{12} = \frac{1}{4}$ .
22. The flip and roll are independent.  $P(\text{tails}) = \frac{1}{2}$  and  $P(> 4) = \frac{2}{6} = \frac{1}{3}$ , so multiply:  $\frac{1}{2} \cdot \frac{1}{3} = \frac{1}{6}$ .
23. Multiples of 3 from 1 to 8 are 3 and 6 — 2 favorable sections out of 8, so  $\frac{2}{8} = \frac{1}{4}$ .
24. Since the two days are independent, multiply the chances:  $\frac{1}{4} \cdot \frac{1}{4} = \frac{1}{16}$  — raining both days is fairly unlikely.



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