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, $P(\text{event}) = \dfrac{\text{favorable outcomes}}{\text{total outcomes}}$. 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 $P(\text{rolling a } 2 \text{ then a } 2 \text{ on two rolls})$.

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

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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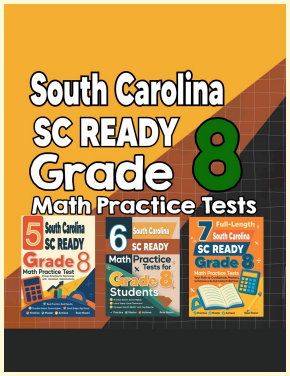

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