Introduction to Probability

Name: _____	Date: _____	Score: _____ / 24

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.

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

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

1. $\boxed{\frac{1}{2}}$
2. $\boxed{\frac{1}{6}}$
3. $\boxed{\frac{1}{2}}$
4. $\boxed{\frac{2}{3}}$
5. $\boxed{0}$
6. $\boxed{1}$
7. $\boxed{\frac{1}{2}}$
8. $\boxed{\frac{1}{4}}$
9. $\boxed{\frac{3}{4}}$
10. $\boxed{\frac{1}{4}}$
11. $\boxed{\frac{1}{4}}$
12. $\boxed{\frac{3}{4}}$
13. $\boxed{\frac{1}{4}}$
14. $\boxed{\frac{1}{2}}$
15. $\boxed{\frac{1}{5}}$
16. $\boxed{\frac{1}{2}}$
17. $\boxed{\frac{1}{2}}$
18. $\boxed{\frac{2}{7}}$
19. $\boxed{\frac{1}{4}}$
20. $\boxed{\frac{4}{11}}$
21. $\boxed{\frac{3}{10}}$
22. $\boxed{\frac{3}{10}}$
23. $\boxed{\frac{1}{4}}$
24. $\boxed{0 = \text{impossible},\quad 1 = \text{certain}}$

Step-by-Step Explanations

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

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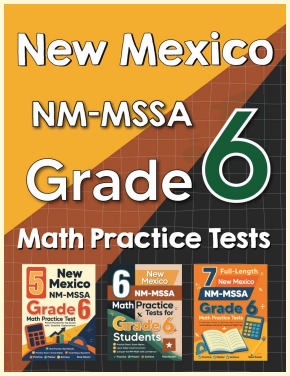

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