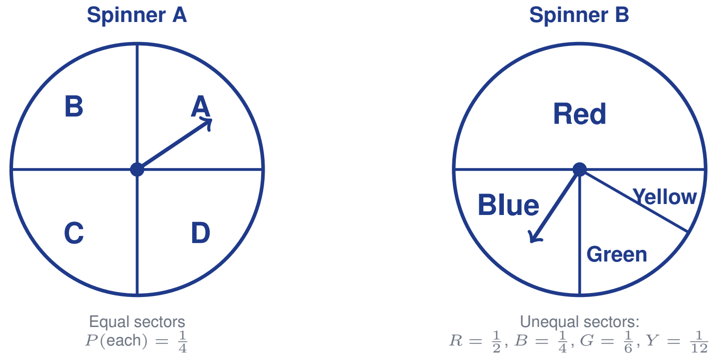
Probability of Simple Events

Name: ____________	Date: ____________	Score: ______ / 17

A **simple event** is a single outcome from one experiment—like rolling an even number or drawing a heart from a deck. Your main job is to count carefully and figure out which outcomes belong to the event. A helpful trick: sometimes it is faster to find the **complement** (everything that is *not* the event) and subtract from 1. Good probability work comes down to organized counting and careful checking!



Key Concepts & Quick Review

Unequal sectors: $P(\text{sector}) = \dfrac{\text{sector angle}}{360°}$ or $P(\text{sector}) = \dfrac{\text{sector area}}{\text{total area}}$.

Standard deck (52 cards): 4 suits (13 each), 12 face cards, 4 aces. **Complement check:** all event probabilities must sum to 1.

Examples

① Spinner B above has Red $(180°)$, Blue $(90°)$, Green $(60°)$, Yellow $(30°)$. Find $P(\text{Red or Blue})$ and $P(\text{not Green})$.

Think It Through: For an unequal spinner, probability is based on angle out of $360°$. Red takes $180°$, so $P(\text{Red}) = \frac{180}{360} = \frac{1}{2}$. Blue takes $90°$, so $P(\text{Blue}) = \frac{90}{360} = \frac{1}{4}$. Since red and blue cannot happen at the same time, add their probabilities: $\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$. For $P(\text{not Green})$, use the complement rule: green has probability $\frac{60}{360} = \frac{1}{6}$, so not green is $1 - \frac{1}{6} = \frac{5}{6}$.

Answer: $P(R \text{ or } B) = \frac{3}{4}$; $P(\text{not } G) = \frac{5}{6}$

② One card is drawn from a standard 52-card deck. Find: (a) $P(\text{red card})$ (b) $P(\text{king})$ (c) $P(\text{red king})$ (d) $P(\text{not a face card})$.

Think It Through: A standard deck has 52 cards, with 26 red cards, 4 kings, and 12 face cards. So part (a) is $\frac{26}{52} = \frac{1}{2}$ and part (b) is $\frac{4}{52} = \frac{1}{13}$. For part (c), the red kings are the king of hearts and king of diamonds, so there are 2 favourable cards and the probability is $\frac{2}{52} = \frac{1}{26}$. For part (d), use the complement: if 12 cards are face cards, then $52 - 12 = 40$ are not face cards, giving $\frac{40}{52} = \frac{10}{13}$.

Answer: *(a)* $\frac{1}{2}$; *(b)* $\frac{1}{13}$; *(c)* $\frac{1}{26}$; *(d)* $\frac{10}{13}$

Practice Problems

Find each probability. Simplify all fractions.

1. One card is drawn from a standard 52-card deck. Find $P(\text{ace})$. ________
2. One card is drawn from a standard deck. Find $P(\text{black card})$. ________
3. One card is drawn from a standard deck. Find $P(\text{number card})$. ________
4. One card is drawn from a standard deck. Find $P(\text{spade or club})$. ________
5. One card is drawn from a standard deck. Find $P(\text{7 of hearts})$. ________
6. One card is drawn from a standard deck. Find $P(\text{not ace})$. ________
7. A spinner has sectors Red $120°$, Blue $150°$, and Green $90°$. Find $P(\text{Red})$. ________
8. For that spinner, find $P(\text{Blue or Green})$. ________
9. For that spinner, find $P(\text{not Blue})$. ________
10. One letter is chosen from FLORIDA. Find $P(\text{vowel})$. ________
11. One letter is chosen from MATHEMATICS. Find $P(A)$. ________
12. One letter is chosen from STATISTICS. Find $P(T)$. ________
13. A bag has 6 red, 4 green, and 2 blue counters. Find $P(\text{green})$. ________
14. For that bag, find $P(\text{not blue})$. ________
15. For that bag, find $P(\text{red or blue})$. ________

Study Tips

- For unequal spinners, the sector's **angle as a fraction of** $360°$ gives its probability. A $120°$ sector $\Rightarrow P = 120/360 = 1/3$.
- **Memorise the deck:** 52 cards, 4 suits of 13, 12 face cards (J/Q/K in each suit), 4 aces. These numbers appear in nearly every card probability problem.
- When events are mutually exclusive (can't both happen), $P(A \text{ or } B) = P(A) + P(B)$.

Word Problems

16. A carnival game wheel has 10 equal sections: 3 are red (win \$5), 2 are blue (win \$2), 4 are white (win nothing), and 1 is gold (win \$20). (a) Find the probability of winning something on one spin. (b) Find the probability of winning \$5 or \$20. (c) If you spin 100 times, about how many times do you expect to land on gold? ________

17. Scrabble tiles for the word PROBABILITY are placed face-down in a bag. (a) How many tiles are there in total? (b) A tile is drawn at random. Find $P(B)$, $P(\text{vowel})$, and $P(\text{consonant})$. (c) If all vowels are removed first, what is $P(B)$ now? ________

Answer Keys

1) $\frac{1}{13}$
2) $\frac{1}{2}$
3) $\frac{9}{13}$
4) $\frac{1}{2}$
5) $\frac{1}{52}$
6) $\frac{12}{13}$
7) $\frac{1}{3}$
8) $\frac{2}{3}$
9) $\frac{7}{12}$
10) $\frac{3}{7}$
11) $\frac{2}{11}$
12) $\frac{3}{10}$
13) $\frac{1}{3}$
14) $\frac{5}{6}$
15) $\frac{2}{3}$
16) (a) $\frac{3}{5}$; (b) $\frac{2}{5}$; (c) 10 times
17) (a) 11 tiles; (b) $\frac{2}{11}$, $\frac{4}{11}$, $\frac{7}{11}$; (c) $\frac{2}{7}$

Step-by-Step Explanations

Strategy: For Mean, Median, Mode, and Range, put the data in order first so the center and spread measures come from a clean list. A quick data check is to verify that the statistic matches the kind of center or spread requested.

Practice 1: For the data set $3, 5, 7, 7, 8$, find the mean, median, mode, and range. **Answer:** mean 6; med 7; mode 7; range 5

At the beginning of the practice, order the data when needed, then choose the statistic named in the question.

Practice 15: The data set $6, 8, 9, 10$ gains one new value, 5. Find the new mean. **Answer:** 7.6

For the second model problem, order the data when needed, then choose the statistic named in the question.

Word-problem notes:

16. Answer: Mean $= 20.875$; median $= 20.5$; mode $= 22$; range $= 16$. With 0: mean drops to 18.6; median $= 19$; mode unchanged; range $= 30$. Mean most affected.

First order the scores: $14, 15, 18, 19, 22, 22, 27, 30$. The mean is $167 \div 8 = 20.875$. The median is the average of the two middle values, 19 and 22, so it is 20.5. The mode is 22 because it appears twice, and the range is $30 - 14 = 16$. When a score of 0 is added, the mean drops noticeably because the mean uses every value directly. The median moves down to 19, the mode stays 22, and the range grows to 30. The mean is most affected because one extreme value pulls it down.

17. Answer: Mean $\approx \$24.57$; median $= \$15$; median is more typical. Without outlier: mean $= \$14.50$; change: $\approx \$10.07$.

Add the seven allowances and divide by 7 to get the mean, which is about \$24.57. The median is the middle value in the ordered list, so it is \$15. Because one friend gets \$85, the mean is pulled far above what most of the group gets. That makes the median a better description of a typical allowance. If the \$85 outlier is removed, the new mean becomes \$14.50, so the mean decreases by about \$10.07.

18. Answer: 12 students total; mean $= \frac{24}{12} = 2$; median $= 2$; mode $= 2$; range $= 4 - 0 = 4$.

Read the dot-stack heights: $1, 3, 4, 3, 1$ for 12 total students. Multiply each value by its frequency: $0(1) + 1(3) + 2(4) + 3(3) + 4(1) = 0 + 3 + 8 + 9 + 4 = 24$. The mean is $\frac{24}{12} = 2$. With 12 data points, the median is the average of the 6th and 7th values; both fall in the "2" stack, so the median is 2. The tallest stack is at 2, so the mode is 2. The range is $4 - 0 = 4$.