

14.3 With and Without Replacement

You have a jar of gumballs: 4 red, 9 green, 8 blue, 6 yellow, and 3 white. One gumball is drawn randomly. Find the following probabilities and write as a reduced fraction and as a percent.

1. P(white) $\frac{3}{30} = \frac{1}{10} = 10\%$ 2. P(green) $\frac{9}{30} = \frac{3}{10} = 30\%$ 3. P(blue U yellow) $\frac{8}{30} + \frac{6}{30} = \frac{14}{30} = \frac{7}{15} = 46.7\%$ 4. P(complement of red) $\frac{13}{15} = 86.7\%$

You roll a 6 sided die one time. Find the following probabilities. Write as a reduced fraction and as a percent.

5. P(7) 0% 6. P(1 U 2) $\frac{1}{6} + \frac{1}{6} = \frac{1}{3} = 33\%$ 7. P(odd number) $\frac{1}{2} = 50\%$ 8. P(complement of 6) $\frac{5}{6} = 83\%$

In your math class there are whiteboard markers at the board: 2 green, 2 blue, 2 red, 1 purple, and 1 black. One student randomly chooses a marker and then replaces it. The second student then chooses a marker. What is the probability of the student randomly choosing the colors listed below? Write the probability as a reduced fraction and percent.

9. P(green, blue) $\frac{2}{8} \cdot \frac{2}{8} = \frac{4}{64} = \frac{1}{16} = 6\%$ 10. P(red, purple) $\frac{2}{8} \cdot \frac{1}{8} = \frac{2}{64} = \frac{1}{32} = 3.1\%$
 11. P(black, black) $\frac{1}{8} \cdot \frac{1}{8} = \frac{1}{64} = 1.6\%$ 12. P(purple, green) $\frac{1}{8} \cdot \frac{1}{4} = \frac{1}{32} = 3.1\%$

In your sock drawer you have 10 pairs of white socks, 4 pairs of black, and 2 pairs of brown. You randomly choose a pair of socks each day. Sometimes you don't replace them because they are dirty. You choose another pair of socks the next day. Find the probability of the following situations. Write the probability as a reduced fraction and a percent.

13. P(white, white) with replacement $\frac{10}{16} \cdot \frac{10}{16} = \frac{100}{256} = \frac{25}{64} = 39\%$ 14. P(white, black) without replacement $\frac{10}{16} \cdot \frac{4}{15} = \frac{40}{240} = \frac{1}{6} = 17\%$
 15. P(black, brown) without replacement $\frac{4}{16} \cdot \frac{2}{15} \cdot \frac{8}{240} = \frac{1}{30} = 3.3\%$ 16. P(brown, brown) without replacement $\frac{2}{16} \cdot \frac{1}{15} = \frac{2}{240} = \frac{1}{120} = 0.83\%$
 17. P(white, white, white) with replacement $\frac{10}{16} \cdot \frac{10}{16} \cdot \frac{10}{16} = \frac{125}{512} = 24\%$ 18. P(white, black, brown) with replacement $\frac{10}{16} \cdot \frac{4}{16} \cdot \frac{2}{16} = \frac{5}{256} = 2\%$
 19. P(black, white, white) without replacement $\frac{4}{16} \cdot \frac{10}{15} \cdot \frac{9}{14} = \frac{90}{840} = \frac{3}{28} = 10.7\%$ 20. P(brown, brown, brown) with replacement $\frac{2}{16} \cdot \frac{2}{16} \cdot \frac{2}{16} = \frac{1}{512} = 0.2\%$

Determine if the following events are dependent or independent. Then calculate the probability of each.

21. Selecting a glazed donut from an assortment of twelve donuts, 4 glazed, 4 maple bars, and 4 cake donuts. Then eating it, and then selecting a maple bar from the same box.

Dependent

$$\frac{4}{12} \cdot \frac{4}{11} = \frac{16}{132}$$

$$\frac{4}{33} \text{ or } 12.1\%$$

22. Given a bag of marbles with 2 red, 3 green and 2 blue. What is the probability of choosing a red marble keeping it, then choosing another red marble?

Dep.

$$\frac{2}{7} \cdot \frac{1}{6} = \frac{2}{42}$$

$$\frac{1}{21} \text{ or } 4.8\%$$

23. Rolling a 3 on a dice and then drawing a red card from a deck of cards.

Ind.

$$\frac{1}{6} \cdot \frac{1}{2} = \frac{1}{12} \text{ or } 8.3\%$$

24. You are choosing two cards from a deck. The first card is a queen, if you keep that card what is the probability that the second card is a face card?

Dep.

$$\frac{4}{52} \cdot \frac{11}{51} = \frac{44}{2652}$$

$$\frac{11}{663} \text{ or } 1.66\%$$

25. Flipping a coin, and getting tails both times.

Ind.

$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4} \text{ or } 25\%$$