Bellwork: Grab a calculator 😊

If 30 people are running for class office, how many different ways can President, Vice-President, Secretary, and Treasurer be elected?

\[ 2,928,270 \]  

There are 12 girls nominated for prom royalty. You can select four finalists to move on to the next round of voting. How many ways can you choose finalists?

\[ 12C_4 = 495 \]

Review 9.1 Person A-Person B

Work with your partner on the following problems. Coach the other person (tell them what they did right, or what they can work on/fix.)

Partner - Coach

A. Your father is buying a sport coat, a pair of pants, and a tie. Sport coats come in 6 different colors. Pants come in 4 different colors. There are 25 different tie styles to choose from. How many different combinations are possible?

\[ 6 \cdot 4 \cdot 25 = 600 \]

B. The password for a computer must consist of two letters followed by three digits. How many passwords are possible?

See example 1 and 3 from 9.1 notes

Partner – Coach

A. In how many ways can four distinct positions for a relay race be assigned from a team of nine runners?

\[ 9 \cdot 8 \cdot 7 \cdot 6 = 3,024 \]

B. A coach has jerseys numbered 1-12. How many ways can he assign the jerseys to the 12 members of his basketball team?

\[ 12! = 12 \cdot 11 \cdot 10 \]

See example 4 and 5 from 9.1 notes

Partner - Coach

A. A paint store offers 15 different shades of blue. How many different ways could you purchase 3 shades of blue?

\[ 15C_3 = 455 \]

B. You draw the names of 5 raffle winners from a basket of 50 names. Each person wins the same prize. How many different groups of winners could you draw?

See example 8 and 11 from 9.1 notes

Probability and Statistics

Section 9.2: Probability

OBJ: Calculate the probability of an event.
### Probability Basics

**Definition:** The likelihood that an event will occur.

**Notation:**  
\[ P(A) = \text{probability that event } A \text{ will occur} \]

- \( 0 \leq P(A) \leq 1 \)
- Event will never occur
- Event is as equally likely to occur as not occur
- Event will absolutely occur

### Complement

**Definition:** Probability of an event NOT occurring.

**Notation:**  
\[ A' \quad (\text{"Complement of } A\text{" or "Not } A\text{"}) \]

To calculate:

\[ P(A') = 1 - P(A) \]

### Calculating Probability

\[ P(A) = \frac{\# \text{ of ways event } A \text{ can occur (favorable outcomes)}}{\# \text{ of total outcomes possible}} \]

**Types of probability:**
- Theoretical: sample space has equally likely outcomes
  - Ex: rolling a fair dice
- Experimental: gather data from observations
  - Ex: player makes 13 out of 20 free throws

### Geometric Probability

\[ P(\text{shaded region}) = \frac{\text{Shaded Area}}{\text{Total Area}} \]

**Area of a...**

- Square: \( A = l \times w \)
- Triangle: \( A = \frac{1}{2} b \times h \)
- Circle: \( A = \pi r^2 \)

### Experimental Probability

With your shoulder buddy...

1. Roll the die 10 times (no more, no less!).
2. Record the data on the sheet (line 3).
3. Calculate your experimental probability (line 4).
   - Total outcomes should be 10.
Think Ink Pair Share:

Generally, as the number of trials increases (more you roll the die), how will the experimental probability compare to theoretical probability?

A basketball player attempted 24 shots and made 13. Find the experimental probability that the player will make the next shot she attempts.

\[
\frac{13}{24} = 0.54 = 54\%
\]

1. A basketball player attempted to steal a base 70 times and was successful 47 times. Find the experimental probability that the player will be successful on his next attempt to steal a base.

\[
\frac{47}{70} = 0.67 = 67\%
\]

2. A jar contains 5 red marbles, 3 green marbles, 2 yellow marbles and 1 blue marble. Find the probability of randomly drawing the given type of marble.
   a) P(Yellow)
   b) P(Green or Yellow)

3. You tossed a coin 10 times and recorded a head 3 times, a tail 7 times.
   a) P(Head) = \[
   \frac{3}{10} = 0.3 = 30\%
   \]
   b) P(Tail) = \[
   \frac{7}{10} = 0.7 = 70\%
   \]

4. A card is drawn randomly from a standard 52-card deck. Find the probability of drawing the given card.
   a. P(Queen of Diamonds) = \[
   \frac{1}{52} = 0.01 = 1\%
   \]
   b. P(card that is not a five) = \[
   \frac{48}{52} = 0.92 = 92\%
   \]
5. A group of five cards are numbered 1–5. You choose one card at random. Find each theoretical probability.
   a. \( P(\text{card is a 2}) = \frac{1}{5} = 0.2 = 20\% \)
   b. \( P(\text{even number}) = \frac{2}{5} = 0.4 = 40\% \)

6. Calculate the probability of rolling 2 dice and getting a sum of 5 or 12?

   \[
   \begin{array}{cccc}
   1 & 2 & 3 & 4 & 5 & 6 \\
   2 & 3 & 4 & 5 & 6 & 7 & 8 \\
   3 & 4 & 5 & 6 & 7 & 8 & 9 \\
   4 & 5 & 6 & 7 & 8 & 9 & 10 \\
   5 & 6 & 7 & 8 & 9 & 10 & 11 \\
   6 & 7 & 8 & 9 & 10 & 11 & 12 \\
   \end{array}
   \]

   \[
   \frac{5}{36} = 0.14 = 14\% 
   \]

7. Five cards are drawn from a standard 52-card deck.
   a) What is the probability that all of the cards are diamonds?
      \[
      \frac{13}{52} = \frac{13C5}{52C5} = 0.0495
      \]
   b) What is the probability that two of the cards are red and three of the cards are black?

8. A bucket contains 15 blue pens, 35 black pens, and 40 red pens. You pick one pen at random. Find each theoretical probability.
   a. \( P(\text{black pen}) = \frac{35}{90} = 0.38 \)
   b. \( P(\text{blue pen or red pen}) = \frac{55}{90} = 0.61 \)

9. Find the probability that a baseball thrown at random within the batter’s strike zone (shown at right) will be a high-inside strike (in the shaded top right corner).

   \[
   \frac{4 \cdot 6}{17.22} = \frac{24}{37.4} = 0.064
   \]

Exit Ticket

A bucket contains 15 blue pens, 35 black pens, and 40 red pens. You pick one pen at random. Find each theoretical probability.

1. \( P(\text{a blue pen}) \)
2. \( P(\text{not a blue pen}) \)