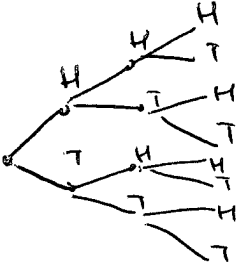


1) How many outcomes are possible for a family to have three children?

$$2 \cdot 2 \cdot 2 = 8$$

2) Consider tossing a fair coin three times.

a) Construct a tree diagram showing all possible results when a fair coin is tossed.



b) What are the ways where a toss does not have 2 consecutive heads?

- HTH THT  
HTT TTT

c) What are the ways where a toss has at least 1 head?

- HHH HHT TTH  
HHT THH  
HTH THT

3) Employees at Tacos Tacos Tacos are given a 4-character ID that begins with the letter T and the remaining characters can be letters or numbers that do not repeat. How many such IDs can be created?

$$\frac{1}{T} \cdot \frac{35}{26+10-1} \cdot \frac{34}{26+10-2} \cdot \frac{33}{26+10-3} = 39,270$$

4) How many words, real or imaginary, can be made by rearranging all of the letters in the word WILLESSNESS?

$$\frac{12!}{1! 1! 3! 2! 4! 1!} = 1,663,200$$

W I L L E S S N E S S

5) What property do permutations and combinations have in common?

they like pancakes

6) What is the main difference between permutations and combinations?

2 shaker of a rug

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- 7) Determine if the following scenarios are permutations, combinations, or neither. Explain why. Then, solve the problem.
- a) Specialty license plates will have one of 15 logos and then it will be followed by 3 letters and 3 numbers. How many plates can be made?

Neither -

Non distinct objects

$$15 \cdot 26 \cdot 26 \cdot 26 \cdot 10 \cdot 10 \cdot 10 = 263640000$$

- b) At a student council meeting, a vote will be cast to elect a president, vice president, and treasurer. If there are 16 students at the meeting, how many ways can the positions be filled?

Permutation

distinct objects  
order matters

$$P(16, 3) = \underline{3360}$$

- c) In a class of 20 students, a teacher selects 5 students to stay after and clean the blackboard. How many ways can the students be selected?

Combination

distinct objects  
order does not matter

$$C(20, 5) = \underline{15504}$$

- 8) Consider a bag that has one marble of each color: red, blue, yellow, green, purple, and orange. A three color pattern will be made by selecting three colors in order. How many patterns can be made if...

- a) The colors can repeat?

$$6 \cdot 6 \cdot 6$$

$$= \underline{216}$$

- b) The colors cannot repeat?

$$6 \cdot 5 \cdot 4 \text{ or } P(6, 3)$$

$$= \underline{120}$$

- 9) A room is full of 10 artists, 8 financial advisors, 6 authors, and 3 tight-rope walkers. A committee is to be formed that contains 3 people from each group to rid the world of morning eye goop. How many ways can these committees be formed?

$$C(10, 3) \cdot C(8, 3) \cdot C(6, 3) \cdot C(3, 3)$$

$$= \underline{134,400}$$

$\frac{24}{3}$

10) A room has 6 men and 5 women. A committee of 5 will be formed to determine the best way to whip or possibly nae nae. How many such committees will ...

a) Consist of only males?

$$C(6,5) = 6$$

b) Have exactly three males?

$$C(6,3) \cdot C(5,2) = 200$$

11) Consider the event of picking a card from standard deck of cards. How many ways can you pick...

a) A Jack or a Queen Card?

$$4 + 4 = 8$$

b) A Heart or a Face Card?

$$12 + 13 - 3 = 22$$

c) A Jack and a Queen?

$$0$$

d) A Heart and a Face Card?

$$3$$

e) A card that is not a 4?

$$52 - 4 = 48$$

f) A card that is neither a Heart nor a Face Card?

$$52 - 22 = 30$$

12) Consider being dealt 5 cards from a standard deck.

a) How many ways can you receive your 5 cards?

$$C(52,5) = 2,598,960$$

b) How many ways have all Hearts?

$$C(13,5) = 1287$$

c) How many ways have at most 4 Hearts?

$$2,598,960 - 1,287 = 2,597,673$$

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