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1:00 PM



Probability

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Probability

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- the chance that some event will happen

$$\frac{\text{\# of favorable outcomes}}{\text{total \# of outcomes (sample space)}}$$

To determine the number of outcomes, use one of the following:

-Tree Diagram

-Fundamental Counting Principle

-Permutation

-Combination

Permutation

- an arrangement or listing in which order is important. (PERM)

Key terms to look for:

- Arrange people or items
- Place items or people
- Order items or people
- 1st, 2nd, 3rd place
- LINE UP
- Specifics given such as, President, Vice President, Secretary
Or English, science, math

Combination

- an arrangement or listing in which order is NOT important.

(Combo Meal)

Key terms to look for:

- Choose a group
- Pick finalists
- Choose a certain number out of a group
- Specifics not given

The expression "n!" is read n factorial. This is the product of all counting numbers beginning with n and counting backwards to 1.

Ex: $6! = 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 720$

Your Turn: A) $4! = 4 \cdot 3 \cdot 2 \cdot 1 = 24$ B) $\frac{8!}{6!} = \frac{8 \cdot 7 \cdot \cancel{6} \cdot \cancel{5} \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot 1}{\cancel{6} \cdot \cancel{5} \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot 1} = \frac{40320}{720} = 56$

Permutations and Combinations

Examples: Use permutations or combinations to determine the number of possible outcomes.

1) $P(5, 4) = {}_5P_4 =$ Permutation of 5 taken 4 at a time.

$\underbrace{\hspace{1.5cm}}_{\text{Total \# of choices}}$ \swarrow \searrow $\underbrace{\hspace{1.5cm}}_{\text{How many you are choosing}}$ Take the 1st 4 of 5!
 $\hspace{1.5cm}$ $\hspace{1.5cm}$ $\hspace{1.5cm}$ $\hspace{1.5cm}$ $5 \cdot 4 \cdot 3 \cdot 2 = 120$

2) How many ways can I arrange 6 students in 3 seats? Key word: arrange - P

$${}_6P_3 = 6 \cdot 5 \cdot 4 = 120$$

3) $C(6, 2) = {}_6C_2 =$ Combination of 6 taken 2 at a time.

$$C = \frac{P}{2nd\#!} \quad {}_6C_2 = \frac{{}_6P_2}{2!} = \frac{6 \cdot 5}{2 \cdot 1} = \frac{30}{2} = 15$$

4) I have 20 students. How many ways can I choose 3 class representatives?

Key Word: No specifics - C

$${}_{20}C_3 = \frac{{}_{20}P_3}{3!} = \frac{20 \cdot 19 \cdot 18}{3 \cdot 2 \cdot 1} = \frac{6840}{6} = 1,140$$

5) Determine if the following situations are permutations (P) or combinations (C).

- a) Arranging books on a shelf - P
- a) Choosing 6 starters for a volleyball game - C
- b) Choosing positions of 6 starters for a volleyball game - P
- c) Picking batting order - P
- d) Top 12 American Idol finalists - C
- e) Choosing Queen and 1st Maid - P
- f) Choosing a group of 4 students - C
- g) Assigning seats to 4 students - P
- h) Lining up students - P
- i) Creating a playlist - C
- j) Ordering my playlist according to songs I listen to most - P