

Study Sheet for Unit 1

• Permutation: order matters

$${}_n P_r = \frac{n!}{(n-r)!}$$

Hit **PRB** to get ${}_n P_r$ calculator

• Combination: order does not matter

$${}_n C_r = \frac{n!}{r!(n-r)!}$$

Ex For the school picture you can choose 4 backgrounds from a list of 10. How many different combinations are possible?

$${}_{10} C_4 = 210$$

ex APRIL

How many ways can you arrange all the letters?

$${}_5 P_5 = 120$$

3 of the letters? ${}_5 P_3 = 60$

* Multiplication Counting Principle

If a choice can be made "m" ways + another choice "n" ways, there are mn ways of making the 1st choice followed by the 2nd.

* Addition Counting Principle:

If 2 events have m+n outcomes with no common outcomes m+

ex Soup + Salad Lunch:

6 soups + 4 salads

How many choices do you have

$$6+4=10$$

ex 5 chicken + 3 beef entrees

How many different dinner options?

$$5+3=8$$

* Probability = $\frac{\text{favorable}}{\text{total}}$

ex There are 10 players

• Independent Events:

Two events in which 1 event has no effect on the 2nd event

$$P(A \text{ and } B) = P(A) \cdot P(B)$$

(with replacement)

• Dependent Event:

Two events in which 1 event effects the outcome of the other event.
(w/o replacement)

ex. 7 red peppers
5 yellow peppers
4 green peppers

Select red, then green + not replace.

$$\frac{7}{16} \cdot \frac{4}{15} = \frac{7}{60}$$

Compound Events: An event that combines 2 or more events using the word AND + OR

• Mutually Exclusive: Events that have no common outcomes

• Overlapping Events:

Events that have at least 1 common outcome

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

AND = multiply
OR = ADD

ex A heart or spade

$$\frac{13}{52} + \frac{13}{52} = \frac{26}{52} = \frac{1}{2}$$

ex Even or heart

$$\frac{20}{52} + \frac{13}{52} - \frac{5}{52} = \frac{28}{52} = \frac{7}{13}$$

• Expected Value: The sum of the products of the events probabilities + their values

ex Raffle Tickets:

2500 sold @ \$5 each for 3 prizes (\$1000, \$500, +\$100)

What is the expected value?

Outcomes	Win \$1000	\$500	\$100	Loss
Prob.	$\frac{1}{2500}$	$\frac{1}{2500}$	$\frac{1}{2500}$	$\frac{2497}{2500}$
	995	495	95	-5

$$995\left(\frac{1}{2500}\right) + 495\left(\frac{1}{2500}\right) + 95\left(\frac{1}{2500}\right) - 5\left(\frac{2497}{2500}\right)$$

$$= -\$4.36$$

