Analytic Geometry Unit 7: Probability Notes

Mutually Exclusive Events

If two or more events cannot occur at the same time, they are considered **mutually exclusive.** This means they have no common outcomes

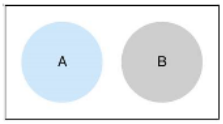
Example:

a. Rolling a 1 and rolling at 2 on the same roll with a die cannot occur at the same time.

b. Flipping a coin and getting heads and tails cannot occur at the same time.

If two events are considered **mutually exclusive,** the probability that the events will occur is found by adding the individual probabilities of the events:

P(A or B) = P(A) + P(B)



Example 1: A drink company applies one label to each bottle cap: "free drink," "free meal," or "try again." A bottle cap has a $\frac{1}{10}$ probability of being labeled "free drink" and a $\frac{1}{25}$ probability of being labeled a "free meal."

a. Explain why the events "free drink" and "free meal" are mutually exclusive.

Bottle caps only have 1 phrase on top.

b. What is the probability that a bottle cap is labeled "free drink" or "free meal."

$P(A)+P(B)=\frac{1}{10}+\frac{1}{25}=\frac{5}{50}+\frac{2}{50}=\frac{7}{50}=.14$

Example 2: The table below describes the probability of the following stores being classified as a girl's favorite department store. Using the table below, find the following probabilities:

a. P(Macy's or Nordstrom):

$P(M)+P(N)=.25+.20=.45$

Macy's	0.25
Saks	0.20
Nordstrom	0.20
JC Pennys	0.10
Bloomingdale's	0.25

b. P(not JC Penney's):

$.25+.20+.2+.25=.9$

OR

$1-.10=.9$

Example 3: Using the table below that represents the sum of rolling two dice,

a. What is the probability of rolling a sum of 11?

$\frac{2}{36} = \frac{1}{18}$

b. What is the probability that your sum will be a 4 or 5?

$\frac{7}{36}$

Overlapping Events

If two or more events have at least one outcome in common, they are called **overlapping events.**

Example:

a. Rolling a prime number on a die or rolling an even number on a die would have an overlapping event of rolling a 2 (2 is prime and even)

Prime Numbers {2, 3, 5}

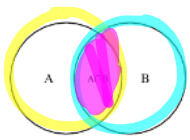
Even Numbers {2, 4, 6}

Explanation: Therefore I have 6 different outcomes out of 36 possible outcomes, but I don't want to include "2" twice since it is the same number, therefore, I am going to add the probability of rolling a prime + probability of rolling an even – probability of rolling a 2

$$P(\text{rolling a prime or even}) = \frac{3}{6} + \frac{3}{6} - \frac{1}{6} = \frac{5}{6}$$

If two events are considered **overlapping events,** the probability that the events will occur is found by adding the individual probabilities of the events minus the probability of both occurring:

P(A or B) = P(A) + P(B) – P(A ∩ B)



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Example 1: Find the probability:
a. Rolling a 5 or an odd number:

$\frac{1}{6} + \frac{3}{6} - \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$

	1	2	3	4	5	6
1	2	3	4	5	6	7
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

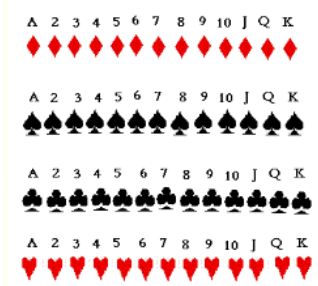
b. Rolling at least one 4 four when rolling two dice:

$\frac{11}{36}$

$\frac{6}{36} + \frac{6}{36} - \frac{1}{36}$

Example 2: Using the deck of cards below, find the following probabilities:
a. Drawing a king or heart:

$\frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13}$



b. Drawing a red card or a face card:

$\frac{26}{52} + \frac{12}{52} - \frac{6}{52} = \frac{32}{52} = \frac{8}{13}$

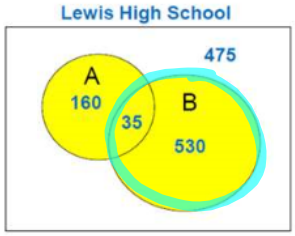
Example 3: Using the Venn diagram below, let A = band members and B = club members at Lewis High School.

a. P(B) $\frac{565}{1200}$

b. P(A ∩ B) $\frac{35}{1200}$

c. P(A ∪ B) $\frac{725}{1200}$

d. Find P(A ∪ B)' $\frac{475}{1200}$



Example 4: Using the table below, find the probability of picking a female or a person from Florida.

	Female	Male	
FL	8	4	12
AL	6	3	9
GA	7	3	10
	21	10	31

$P(F) + P(FL) - P(F \cap FL)$

$\frac{21}{31} + \frac{12}{31} - \frac{8}{31} = \frac{25}{31}$