Compound Probability

- A compound event combines two or more events using the word AND or the word OR(+).
- Compound events can be mutually exclusive or they can be overlapping.

Mutually Exclusive

- Two or more events that cannot happen at the same.
- They have NO common outcomes.
- Formula: $P(A \text{ or } B) = P(A) + P(B)$

simple light switch ON or OFF

$P(A \cup B) = P(A) + P(B)$

Overlapping

- Two or more events that CAN happen at the same time.
- They have at least one common outcome.
- Formula: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

ex. 10th Grade students with cats

subtract the overlap!

Example 1: When rolling two dice find the probability that the dice will add up to 4 or to 5.

- P(sum 4 or sum 5)

mutually exclusive

$P(4) + P(5) = \frac{3}{36} + \frac{4}{36} = \boxed{\frac{7}{36}}$

Example 2: Using the chart

- Find the probability that a girl from this survey has responded that either **Macy's** or **Nordstrom** is her favorite store.

$P(M \cup N) = .25 + .20 = \boxed{.45}$

- Find the probability that a girl from this survey has responded that her favorite store is **not** JC Penny's.

complement "NOT"

$P(J)' = P(\bar{J}) = 1 - .10 = \boxed{.90}$

Macy's	**0.25**
Saks	**0.20**
Nordstrom	**0.20**
JC Penny's	**0.10**
Bloomingdale's	**0.25**

Example 3: Deck of cards

- Find the probability of drawing a Queen or an Ace. **P(Queen or Ace)**

$P(Q \cup A) = \frac{4}{52} + \frac{4}{52} = \frac{8}{52} = \frac{2}{13}$

mutually exclusive

$\frac{2}{13}$

Example 4: Using the Venn Diagram

- A are coffee drinkers and B are soda drinkers, find the probability that a person from the survey will drink coffee or soda.

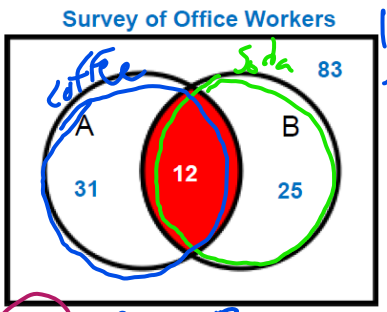
overlapping

$P(A \cup B) = P(A) + P(B) - P(A \cap B) = \frac{43}{151} + \frac{37}{151} - \frac{12}{151} = \frac{68}{151}$

What is the total sample space? How many people drink coffee? 151 total 43 coffee

How many drink soda? How many drink both?

37 soda 12 both



151 total

$12 + 31 = \frac{43}{151}$

$12 + 25 = \frac{37}{151}$

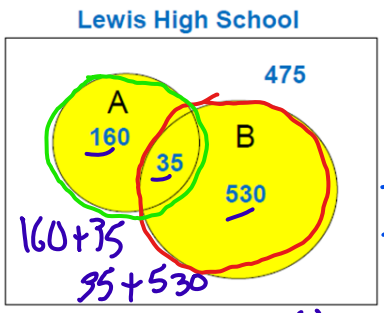
Example 5: Using the Venn Diagram and Probability Notation

- Find the P(AuB) $= P(A)+P(B)-P(A \cap B)$

$\frac{195}{1200} + \frac{565}{1200} - \frac{35}{1200} = \frac{725}{1200} = \frac{29}{48}$

- If A is band members and B is club members, what does the above answer mean?

There is a probability of $\frac{29}{48}$ of randomly choosing a student from Lewis HS who is in Band, a club, or both.



160 + 35 + 530 + 475 = 1200

160 + 35 + 530 = 725 / 1200

Example 6: Deck of Cards

- Find the P(King or Club)

$P(K \cup C) = P(K) + P(C) - P(K \cap C) = \frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13}$

Example 7: From a frequency table

- Find the P(picking a **Female** or a person from **Florida**)

Total the columns and rows first!

$\frac{21}{31} + \frac{12}{31} - \frac{2}{31}$

$\frac{25}{31}$ or .81 or 81%

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

Example 8: Rolling two dice

- Find the P(an **even sum** or a sum **greater than ~~10~~**)

$\frac{18}{36} + \frac{3}{36} - \frac{1}{36} = \frac{20}{36} = \frac{5}{9}$

Example 9: Using the Lewis High school chart from example 5

- Find $P(A \cup B)'$. (not in A OR B)

$P(A \cup B)$

$\frac{475}{1200} = \frac{19}{48} \approx .395 \approx .40$ Probability 40% Percent

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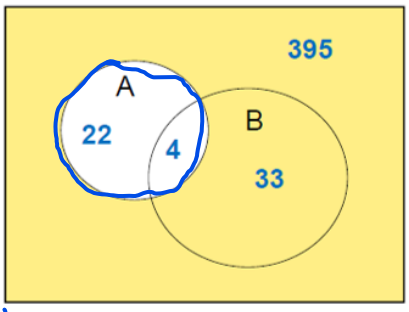
Example 10: Complementary events

- What is the probability that a female does not play volleyball?
- Group A represents volleyball players and Group B represents softball players.

$P(A)' = \frac{33}{454} + \frac{395}{454} = \frac{428}{454}$

$\frac{428}{454} = \frac{214}{227} \approx .943$ 94.3%



454 total

GSE Geometry Unit 6 - Probability

Name: _____ Date: _____

Mutually Exclusive Practice

OR → Add

1. Determine if the following events are mutually exclusive or overlapping.
   - **a. The experiment is rolling a die.**
     The 1st event: the number is greater than 3
     The 2nd event: the number is even.
     4 5 6 / 2 4 6 overlapping
   - **b. The experiment is year in school.**
     The 1st event: the person is a senior.
     The 2nd event: the person is a junior.
     Senior Junior Mutually exclusive
   - **c. The experiment is answering multiple choice questions.**
     The 1st event: the correct answer is chosen
     The 2nd event: the answer A is chosen.
     A B C D / A overlapping
   - **d. The experiment is selecting a chocolate bar.**
     The 1st event: the bar has nuts
     The 2nd event: the bar has caramel.

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2. One card is randomly drawn from a deck of 52 cards. The card is face down on the table. What is the probability of getting a Jack or a Spade?

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3. **Dice**. Use the general addition rule to compute the probability that if you roll two six-sided dice.

   a) you get doubles or a sum of 4

   b) you get doubles or a sum of 7

   c) you get a 5 on the first die or you get a 5 on the second die.

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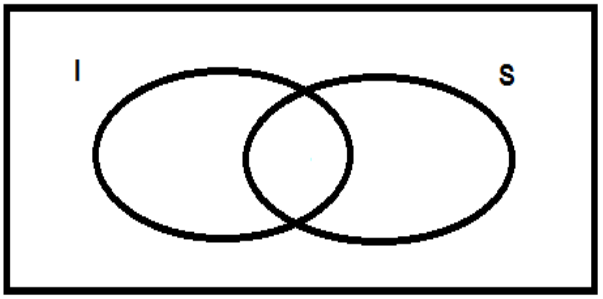
4. When you arrive home today, you find 27 cupcakes in a large circular plate. There are 13 that have icing, 11 have sprinkles, and 4 have both.

   a) P(I) _____ b) P(S) _____

   c) $P(I \cup S)$_____ d) $P(I \cap S)$_____



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5. **Swim and whistle**. Suppose 80% of people can swim. Suppose 70% of people can whistle. Suppose 55% of people can do both. What percentage of people can swim or whistle?

6. Use the data below to find each of the following probabilities.

Coolest Deals Sold at Ike's

Topping choice	Ice cream choice			
	Vanilla	Chocolate	Cookie dough	Mint chip
Sprinkles	9	12	16	14
Hot fudge	11	4	16	15
Caramel	10	12	18	15

a) P(Chocolate) _____ b) P(Chocolate)' _____

c) P(Sprinkles ∩ Cookie Dough) _____ d) P(Caramel ∪ Vanilla) _____

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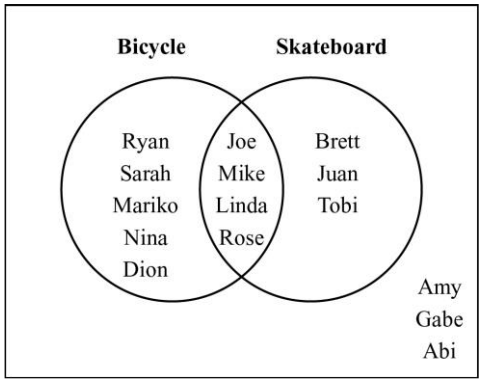
7. Mr. Leary's Class. Use the Venn Diagram showing the number of kids owning bicycles (A) and skateboards (B) to find the following probabilities.



a) $P(A \cap B)$. What does this probability represent?

b) $P(A \cup B)$. What does this probability represent?

c) $P(A \cup B)'$. What does this probability represent?

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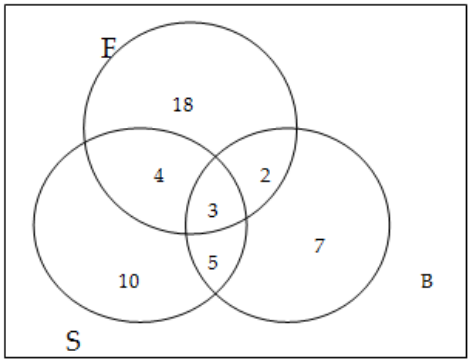
8. Sports Teams. A group of 60 students were asked if they played field hockey (F), basketball (B) or soccer (S). The diagram below displays the results. Use the information given to find the following probabilities.



a) $P(B \cap S)$ b) $P(F \cup B)$

c) $P(F)'$ d) $P(F \cup B \cup S)$

e) $P(F \cup B \cup S)'$

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9. Backpack and wallets. At Harrison, 60% of the students carry a backpack or a wallet. 40% carry only a backpack, and 30% carry only a wallet. If a student is selected at random, find the probability that the student carries both a backpack and a wallet.