typo in HW 12-8 #3: should start 'Using the probability information given in #2', not #3.

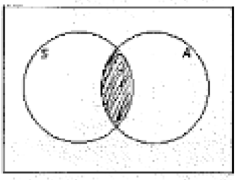
HW 12-7

1. See diagrams on work slide.
2. a) .53: I used the probability a player was right-handed (.79) minus the probability the player was right-handed and a pitcher (.26)
   b) .09: I used the probability that a player was a pitcher (.35) minus the probability the player was a pitcher and right -handed.
   c) .12: I subtracted the probabilities of only pitcher (.09) and only right-handed (.53) and both (.26) from 1.
3. a) 140 b) 164 c) left to right: .06, .35, .57, .02
4. a) .34 b) See table on work slide.

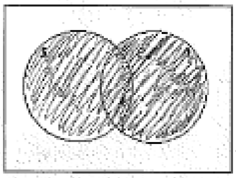
Name Key Alg 2 HW 12-7

1. Let S be the set of students who take Spanish and A be the set of students who take an arts subject. On the Venn diagrams given, shade the region representing the students who

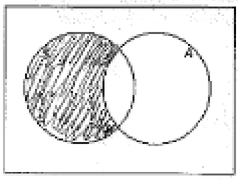
a. take Spanish and an arts subject.



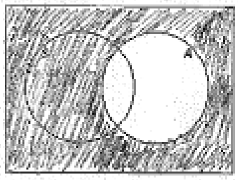
b. take Spanish or an arts subject.



c. take Spanish but do not take an arts subject.

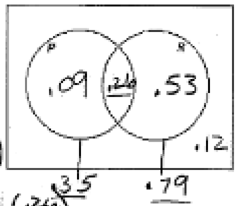


d. do not take an arts subject.



2. When a player is selected at random from a high school boys' baseball team, the probability that he is a pitcher is 0.35 the probability that he is right-handed is 0.79 and the probability that he is a right-handed pitcher is 0.26. Let P be the event that a player is a pitcher, and let R be the event that a player is right-handed.

Use the Venn diagram to calculate the probability that a randomly selected player is each of the following. Explain how you used the Venn diagram to get your answer.



a. right-handed but not a pitcher

.79 − .26 = .53

I used the probability that the player was right handed (.79) and subtracted the probability the player was also a pitcher (.26)

b. a pitcher but not right-handed

.35 − .26 = .09

I used the probability that the player was a pitcher (.35) and subtracted the probability the player was also right-handed (.26)

c. neither right-handed nor a pitcher

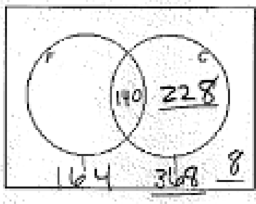
1 − .09 − .26 − .53 = .12

I subtracted the probabilities of only pitcher (.09) and only right-handed (.53) and both from 1.

3. On a flight, some passengers have frequent flier status and some do not. Some have checked baggage and some do not. Let the set of passengers who have frequent flier status be F and the set of passengers who have checked baggage be C. Suppose that of the 400 people on the flight, 368 have checked baggage, 228 have checked baggage but do not have frequent flier status, and 8 have neither frequent flier status nor checked baggage. Use the Venn diagram to calculate the number of people on the flight who

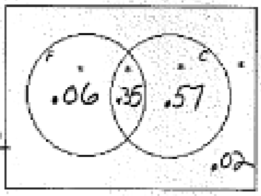
400 Total

a. have frequent flier status and have checked baggage. $368 - 228 = 140$



b. have frequent flier status. $400 - 8 - 228 = 164$

c. In the Venn diagram, write the probabilities of the events associated with the regions marked with a star (*).



$\frac{164-140}{400} = \frac{24}{400} = .06$ | $\frac{140}{400} = .35$ | $\frac{228}{400} = .57$ | $\frac{8}{400} = .02$

4. When an animal is selected at random from those at a zoo, the probability that it is North American (meaning that its natural habitat is in the North American continent) is 0.65 the probability that it is both North American (A) and a carnivore (C) is 0.16, and the probability that it is neither American nor a carnivore is 0.17.

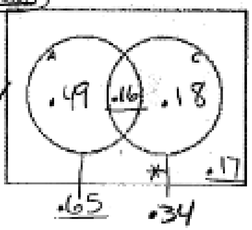
a. Use the Venn diagram to calculate the probability that a randomly selected animal is a carnivore.

① $.65 - .16 = .49$

② $1 - .17 - .49 = .34$

FYI $.34 - .16 = .18$

Chk $.16 + .18 = .34$



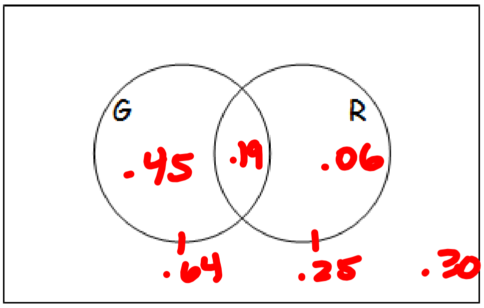
b. Complete the table below showing the probabilities of the events corresponding to the cells of the table.

	North American	Not North American	Total
Carnivore	.16	.18	.34
Not Carnivore	.49	.17	.66
Total	.65	.35	1

Day 8 More Venn Diagrams, Complement & Conditional Formula

1. When a fish is selected at random from a tank, the probability that it has a green tail is 0.64, the probability that it has red fins is 0.25, and the probability that it has both a green tail and red fins is 0.19.

a. Draw a Venn diagram to represent <u>this information</u> only.



b. Find the probability that the fish has

i. red fins but does not have a green tail.

$.25 - .19 = .06$

ii. a green tail but not red fins.

$.64 - .19 = .45$

iii. neither a green tail nor red fins.

$.45 + .19 + .06 = .70$

$1 - .70 = .30$

c. Complete the table below showing the probabilities of the events corresponding to the cells of the table.

	Green tail	Not green tail	Total
Red fins	.19	.06	.25
Not Red Fins	.45	.30	.75
Total	.64	.36	1.00

Remember:

*ON TEST!

Symbol	Called	Means
$A \cap B$	A intersect B	elements that are in both sets A and B
$A \cup B$	A union B	elements that are in either sets A or B or both
A^c, A'	A complement	Elements not in set A

2. It is estimated that approximately 20% of the people in the United States have asthma and severe allergies. What is the probability that a randomly selected person does not have asthma ~~or~~ and a severe allergy? Explain how you determined your result.

80%: I subtracted 100% minus 20% to get 80%.

In this problem, we are finding the probability of a complement.

If P(A) = 20%, then P(not A) = P(A^c) = P(A') = $1 - P(A) = 1 - .20 = .80$.

P(A) + P(A') = 1 or 100%

The Complement Rule: P(not A) = $1 - P(A)$

Remember the complement of an event is all outcomes that are not the event.
A compliment is an expression of respect or admiration.

3. Suppose that the probability that a particular flight is on time is 0.78. What is the probability that the flight is not on time?

$P(\text{Not on Time}) = 1 - P(\text{on Time}) = 1 - .78 = .22$

Formula for Conditional Probability

4. When a room is randomly selected in a downtown hotel, the probability that the room has a king-sized bed is 0.62, the probability that the room has a view of the town square is 0.43, and the probability that it has a king-sized bed and a view of the town square is 0.38. Let **K** be the event that the room has a king-sized bed, and let **T** be the event that the room has a view of the town square.

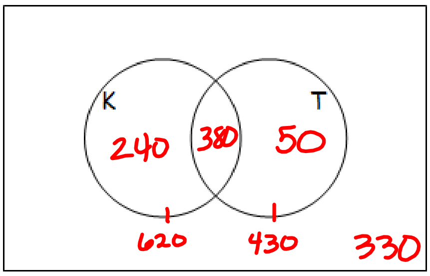
The meaning of "P(K given T)" in this context is the probability that a room known to have a view of the town square also has a king-sized bed.

a. Use a hypothetical 1000 table to calculate P(K given T).

	K (room has a king-sized bed)	Not K (room does not have king-sized bed)	Total
T (room has a view of the town square)	380	50	430
Not T (room does not have view of the town square)	240	330	570
Total	620	380	1000

P(K given T) = $P(K|T) = \frac{380}{430} = .884$

b. Draw a Venn diagram to justify your result.



$K \cap T$

P(K given T) = $\frac{380}{430} = .884$

T

c. The formula for calculating a conditional probability is:

$$P(A \text{ given } B) = \frac{P(A \text{ and } B)}{P(B)} \quad \text{or} \quad P(A \mid B) = \frac{P(A \cap B)}{P(B)}$$

Use this formula to calculate P(K given T), where the events K and T are as defined in the original example (decimal)

$$P(K \mid T) = \frac{P(K \cap T)}{P(T)} = \frac{.38}{.43} = .884$$

From beginning given info.

d. How does the probability you calculated using the formula compare to the probability you calculated using the hypothetical 1000 table?

The probabilities are the same.

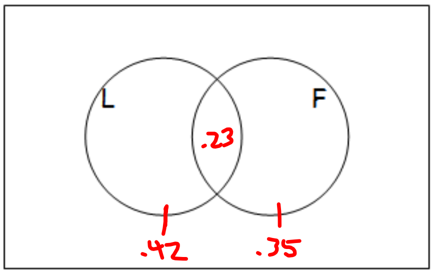
Conditional Probability is the probability of event(A), given that another Event (B), has already occurred.

5. A credit card company states that 42% of its customers are classified as long-term cardholders, 35% pay their bills in full each month, and 23% are long-term cardholders who also pay their bills in full each month. Let the event that a randomly selected customer is a long-term cardholder be L, and the event that a randomly selected customer pays his or her bill in full each month be F.

a. What are the values of P(L), P(F), and P(L and F)?

$P(L) = .42 \quad P(F) = .35 \quad P(L \cap F) = .23$

b. Draw a Venn diagram, and
label it with **only** the probabilities from part (a).



c. Use the conditional probability formula to calculate P(L given F). (Round your answer to the nearest thousandth.)

$$P(L|F) = \frac{P(L \cap F)}{P(F)} = \frac{.23}{.35} = .657$$

d. Use the conditional probability formula to calculate P(F given L). (Round your answer to the nearest thousandth.)

$$P(F|L) = \frac{P(F \cap L)}{P(L)} = \frac{.23}{.42} = .548$$

e. Which is greater, P(F given L) or P(F)? Explain what this means.

$P(F|L) = .548 \leftarrow$ greater
$P(F) = .35$

Long-term card holders are more likely to pay in full each month

f. Remember that two events A and B are said to be independent if P(A given B) = P(A). Are the events F and L independent? Explain.

$P(F) \neq P(F|L)$ therefore these events are not independent.

or $P(L) \neq P(L|F)$