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 CC ALGEBRA 2

Date: 5/15/18
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LESSON #3: VENN DIAGRAMS

Do Now: In a school of 90 students, 40 play lacrosse, 25 play tennis and 5 play both lacrosse and tennis.

a) How many students play lacrosse or tennis? ($L \cup T$)

$$40 + 25 = \frac{65}{90}$$

b) What is the probability a randomly selected student plays lacrosse or tennis $P(L \cup T)$?

$$\frac{65}{90}$$

c) What percent of students play lacrosse to the nearest tenth?

$$\frac{40}{90}$$

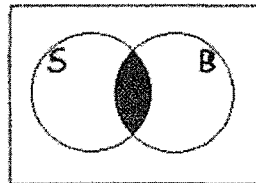
A **Venn Diagram** is an illustration of the relationships between and among groups of objects that share something in common.

1. At a high school, some students play soccer, some students play baseball, and some play both.

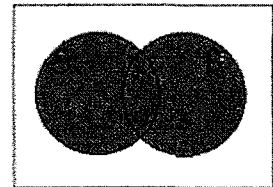
This scenario can be represented by a Venn diagram, as shown below. The circle labeled **S** represents students who play soccer, while the circle labeled **B** represents students who play baseball, and the rectangle represents all the students in the school. Match each situation with the appropriate Venn diagram.

(a) play soccer (3)

(1)



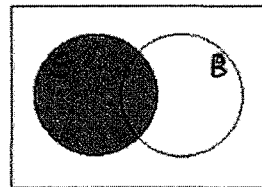
(2)



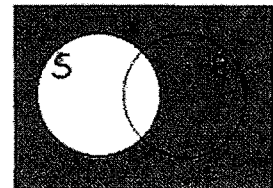
(b) do not play soccer (4)

(c) play soccer and baseball ($S \cap B$) (1)

(3)



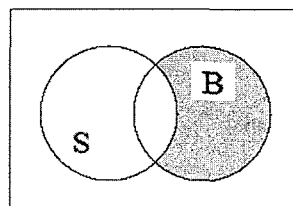
(4)



(d) play soccer or baseball ($S \cup B$) (2)

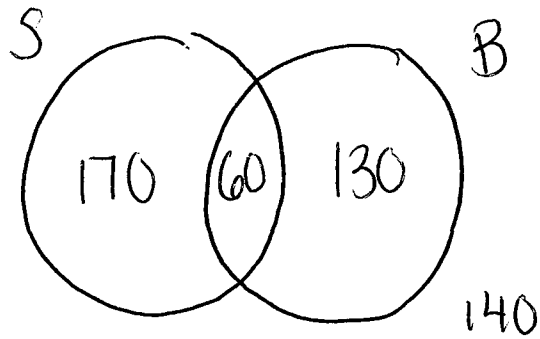
(e) just baseball and nothing else (5)

(5)



2. Suppose 230 students play soccer, 190 students play baseball, and 60 students play both sports. There are a total of 500 students at the school.

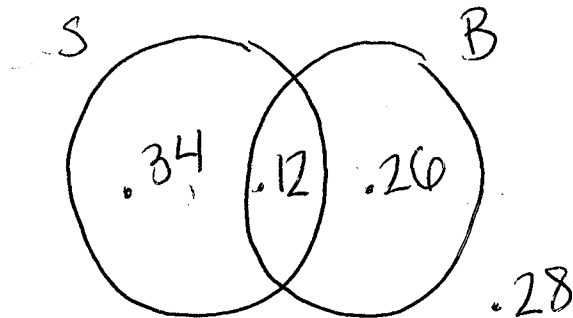
a) Draw a Venn Diagram below that illustrates this situation.



b) How many students play soccer or baseball?

$$170 + 60 + 130 = \boxed{360}$$

c) Draw a new Venn Diagram illustrating the PROBABILITIES of each section of the diagram.



d) Suppose a student is selected at random from the school, what is $P(S \cap B)$, the probability that the student selected plays both sports?

$$P(S \cap B) = \boxed{.12}$$

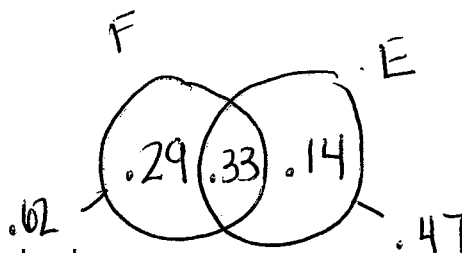
e) Suppose a student is selected at random from the school, what is $P(S \cup B)$, the probability that the student plays either soccer or baseball?

$$.34 + .12 + .20 = \boxed{.72}$$

3. An online book store offers a large selection of books. Some of the books are works of fiction or e-books. Let F represent the fiction books and E represent the e-books. Suppose 62% of the books are works of fiction, 47% are e-books, and 14% are e-books but not works of fiction. A book will be chosen at random. Find the following probabilities:

a) The book is a work of fiction and available as an e-book.

$\boxed{.33}$



b) The book is neither a work of fiction nor available as an e-book.

$$.29 + .33 + .14 = .76$$

$$1 - .76 = \boxed{.24}$$

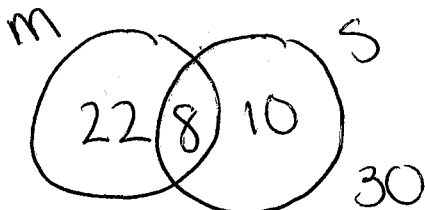
c) Based on the percentages in the Venn diagram above, fill in the values in the table below:

	Fiction	Not fiction	Total
E-book	.33	.14	.47
Not an e-book	.29	.24	.60 .53
Total	.62	.38	1000

Practice:

4. In a class of 70 students, 30 are on the math team, 18 are in the science club and 8 are on both the math team and the science club.

a) How many students are on the math team or in science club?



$$\cancel{22} + 8 + 10 = \boxed{40}$$

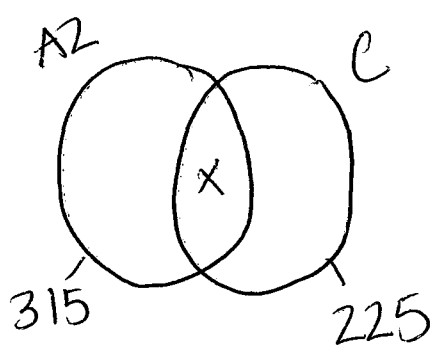
b) What is the probability a randomly selected student is on the math team or in science club $P(M \cup S)$?

$$\frac{40}{70} = \boxed{.5714}$$

c) What is the probability a randomly selected student is on the math team and in science club to the nearest tenth? $P(M \cap S)$

$$\frac{8}{70} = \boxed{.1}$$

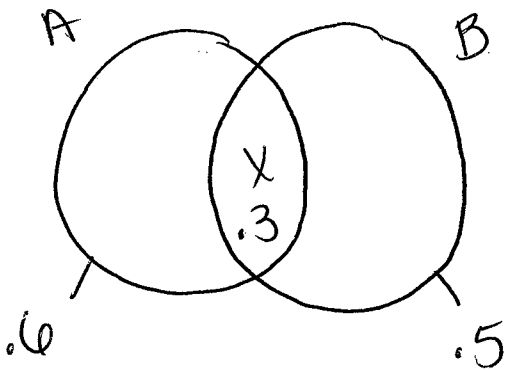
5. Calhoun has 400 eleventh graders. 315 students in eleventh grade take Algebra II, 225 take chemistry, and 393 take either Algebra 2 or chemistry. What is the probability that a randomly selected eleventh grader takes both Algebra 2 and chemistry to the nearest hundredth?



$$\begin{aligned}
 315 + 225 - x &= 393 \\
 540 - x &= 393 \\
 -540 & \quad -540 \\
 \hline
 -x &= -147 \\
 x &= 147
 \end{aligned}$$

$$\boxed{\frac{147}{400}}$$

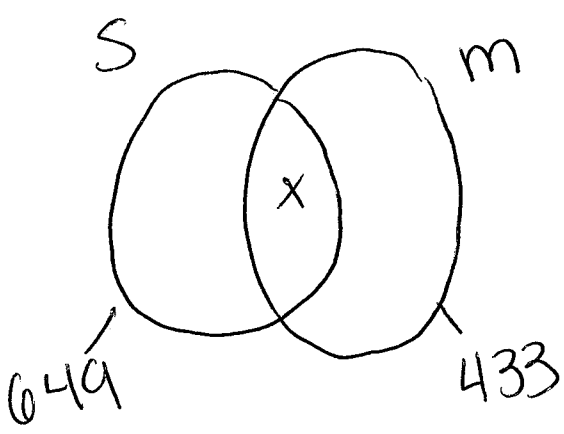
6. Given events A and B, such that $P(A) = 0.6$, $P(B) = 0.5$, and $P(A \cup B) = 0.8$, determine whether A and B are independent or dependent.



$$\begin{aligned}
 .6 + .5 - x &= .8 \\
 1.1 - x &= .8 \\
 -x &= -.3 \\
 x &= .3
 \end{aligned}$$

OR
 $P(A \cap B) = P(A) \cdot P(B)$
 $.3 = (.6)(.5)$
 $.3 = .3$
 Yes, A + B are independent

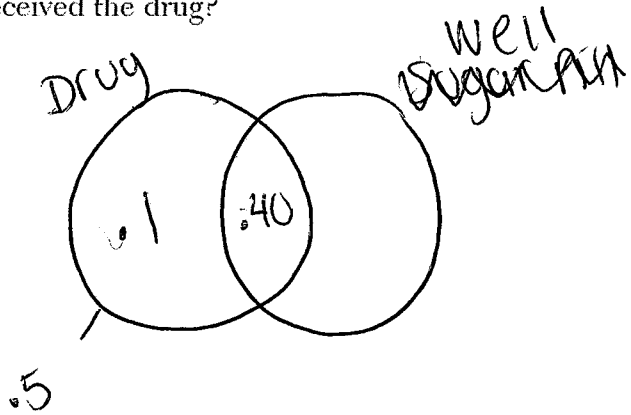
7. A suburban high school has a population of 1376 students. The number of students who participate in sports is 649. The number of students who participate in music is 433. If the probability that a student participates in either sports or music is $\frac{974}{1376}$, what is the probability that a student participates in both sports and music?



$$\begin{aligned}
 649 + 433 - x &= 974 \\
 1082 - x &= 974 \\
 -x &= -108 \\
 x &= 108
 \end{aligned}$$

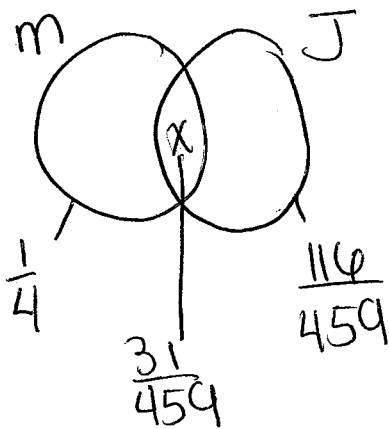
$$\boxed{\frac{108}{1376}}$$

9. A study was designed to test the effectiveness of a new drug. Half of the volunteers received the drug. The other half received a sugar pill. The probability of a volunteer receiving the drug and getting well was 40%. What is the probability of a volunteer getting well, given that the volunteer received the drug?



$$P(W|D) = \frac{0.4}{0.5} = \boxed{\frac{4}{5}}$$

10. A student is chosen at random from the student body at a given high school. The probability that the student selects Math as the favorite subject is $\frac{1}{4}$. The probability that the student chosen is a junior is $\frac{116}{459}$. If the probability that the student selected is a junior or that the student chooses Math as the favorite subject is $\frac{47}{108}$, what is the exact probability that the student selected is a junior whose favorite subject is Math?



$$\frac{1}{4} + \frac{116}{459} - x = \frac{47}{108}$$

$$\frac{923}{1836} - x = \frac{47}{108}$$

$$-x = -\frac{31}{459}$$

$$x = \frac{31}{459}$$

$$\boxed{\frac{31}{459}}$$

Are the events "the student is a junior" and "the student's favorite subject is Math" independent of each other? Explain your answer.

$$P(A \cap B) = P(A) \cdot P(B)$$

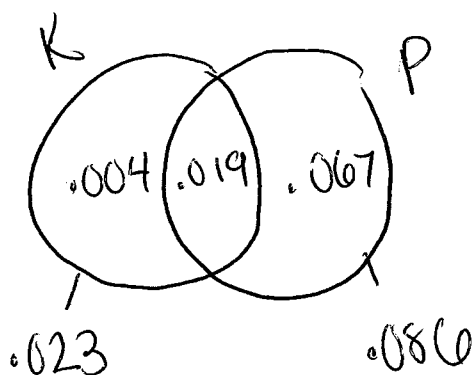
$$\frac{31}{459} = \frac{116}{459} \times \frac{1}{4}$$

$$\frac{31}{459} \neq \frac{29}{459}$$

NO! dependent

11. The guidance department has reported that of the senior class, 2.3% are members of key club, K , 8.6% are enrolled in AP Physics, P , and 1.9% are in both.

Determine the probability of P given K , to the nearest tenth of a percent.



$$P(P|K) = \frac{.019}{.023} = .826 \\ = \boxed{.8}$$

The principal would like a basic interpretation of these results. Write a statement relating your calculated probabilities to student enrollment in the given situation.

80% of the members of Key Club are also enrolled in AP physics

Name: _____

Date: _____

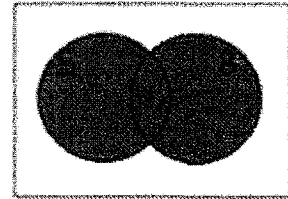
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LESSON #3: EXIT TICKET

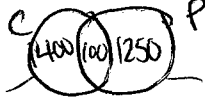
1. The shaded part of the Venn Diagram illustrates the probability of which scenario?

- 1) $P(S \cap B)$
- 2) $P(S \cup B)$
- 3) $P(B)$
- 4) $P(S)$



2. There are 5000 students at a new university. 1500 are chemistry majors, 1350 students are pre-med majors and 100 students major in both chemistry and pre-med. How many students major in chemistry OR pre-med?

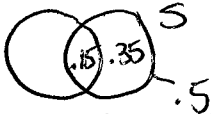
- 1) 100
- 2) 1850
- 3) 2750
- 4) 2950



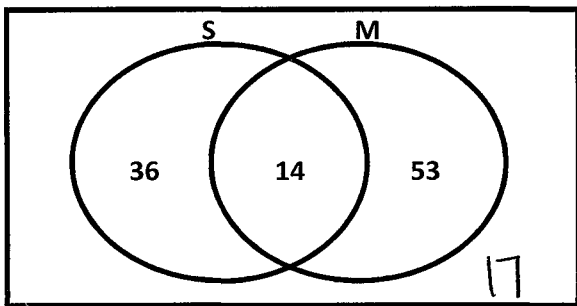
$1400 + 100 + 1250$

3. At a local college, the probability that a student takes English and plays a sport is .15. The probability the student plays a sport is .5. What is the probability that the student takes English given that he plays a sport?

- 1) .15
- 2) .3
- 3) .5
- 4) .65



4. Below is a Venn diagram displaying the results of a survey in which 120 boat owners participated in. "S" represents boat owners who prefer a sail and "M" represents boat owners who prefer a motor.



Find the probability that:

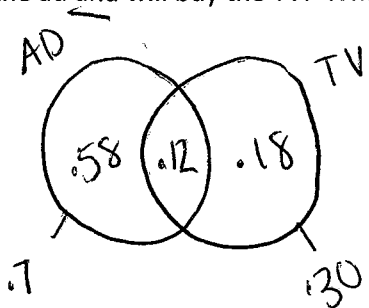
a. the owner prefers a sail and motor boat

$$\frac{14}{120}$$

b. the owner did not prefer either a sail or a motor boat

$$\frac{17}{120}$$

5. In a newspaper, there is an ad for a TV on sale at a store. In a marketing survey concerning the ad, 70% percent of the people surveyed said they read the ad, 30% said they would buy the TV, and 12% said they read the ad and will buy the TV. What percent of the people read the ad or are buying the TV?



$.88$

