HW 12-6

1. If both siblings jog, a student is more likely to jog. See justification.
2. Independent. See justification.
3. Not independent. See justification.
4. (3) 94%, The two events are not independent.

Name Key Alg 2 HW 12-6 (Updated)

1. Data Collected about jogging from students with two older siblings are shown in the table below.

	Neither Sibling Jogs	One Sibling Jogs (1)	Both Siblings Jog (2)	Total
Student Does Not Jog	1168	1823	1380	4371
Student Jogs (J)	188	416	400	1004
Total	1356	2239	1780	5375

Using these data, determine whether a student with two older siblings is more likely to jog if one sibling jogs or if both siblings jog. Justify your answer. (June 2017) #32

$P(J|1) = \frac{416}{2239} \approx .1858$ $P(J|2) = \frac{400}{1780} \approx .2247$

The probability a student jogs is more likely if both both siblings jog because the probability of jogging given both siblings jog is higher at .2247.

2. Use probabilities from the completed frequency table below to determine whether the two events *uses a computer at least 3 times a week for school work* and *is taking a computer class* are independent or not independent. Explain your answer.

	Uses a Computer at Least 3 Times a Week for Schoolwork (≥3)	Does Not Use a Computer at Least 3 Times a Week for Schoolwork (not ≥3)	Total
In a Computer Class (C)	520	130	650
Not In a Computer Class (not C)	280	70	350
Total	800	200	1,000

$P(C) = \frac{650}{1,000} = .65$

$P(C \mid \geq 3) = \frac{520}{800} = .65$

$P(C \mid \text{not} \geq 3) = \frac{130}{200} = .65$

OR could have used

$P(\geq 3) = \frac{800}{1000} = .8$

$P(\geq 3 \mid C) = \frac{520}{650} = .8$

$P(\geq 3 \mid \text{not } C) = \frac{280}{350} = .8$

The probabilities are the same, so the events 'In a computer class' and 'uses a computer at least 3 times a week' are independent.

3. The results of a survey of the student body at Central High School about television viewing preferences are shown below.

R

	Comedy Series	Drama Series	Reality Series	Total
M Males	95	65	70	230
Females	80	70	110	260
Total	175	135	180	490

Are the events "student is a male" and "student prefers reality series" independent of each other? Justify your answer. (January 2017)

$P(m) = \frac{230}{490} \approx .469$ (or could have used $P(R) = \frac{180}{490} \approx .367$)

$P(m|R) = \frac{70}{180} \approx .3\overline{8}$ $P(R|m) = \frac{70}{230} \approx .304$

The events 'student is a male' and 'student prefers a reality series' are not independent because the conditional probability of 'student is male' given 'student prefers reality series' is not equal to the probability of 'student is male'.

4. Jason is collecting data about his town. He is interested in where people live and their annual household income level. He collects the following data:
(Algebra 2 Topical Review Test 2 #19)

	Lives in District A	Lives in District B	Total
Income below $50,000	10,957	647	11,604
Income $50,000 - $80,000	3,045	8,754	11,799
Income $80,000 and above	527	2,340	2,867
Total	14,529	11,741	26,270

Jason calculates the probability that a family lives in District A given that they have a household income level below $50,000. He also wants to use the information in the table to determine if these two events, living in District A and income below $50,000, are independent. Which of the following gives the correct answer to his problem?

$P(A|<50,000) = \frac{10,957}{11,604} = .944 \sim 94\%$

(1) 94%, The two events are independent

(2) 75%, The two events are independent

$P(A) = \frac{14,529}{26,270} = .553 \sim 55\%$

(3) 94%, The two events are not independent

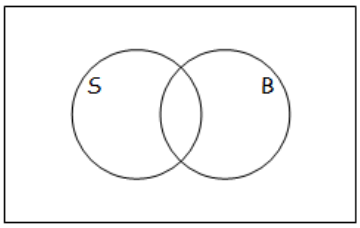
(4) 75%, The two events are dependent

Probabilities are not equal, so they're not independent.

Day 7 Events and Venn Diagrams

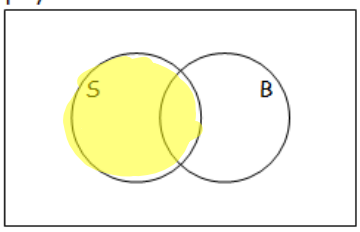
Shading regions

1. At a high school, some students play soccer and some do not. Also, some students play basketball and some do not. This scenario can be represented by a Venn diagram, as shown. The circle labeled S represents the students who play soccer, the circle labeled B represents the students who play basketball, and the rectangle represents all the students at the school.

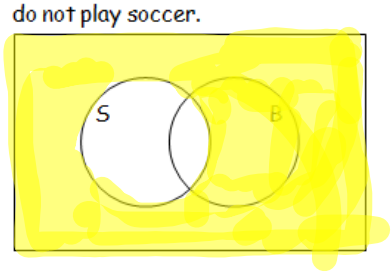


On the Venn diagrams provided, shade the region representing the students who

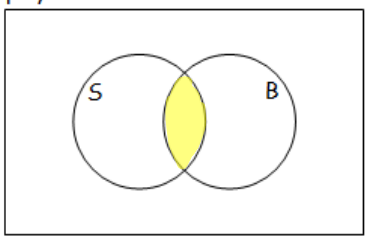
a. play soccer.



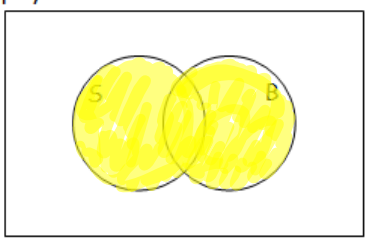
b. do not play soccer.



c. play soccer and basketball.

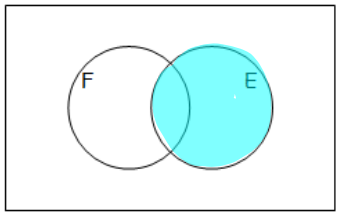


d. play soccer or basketball.

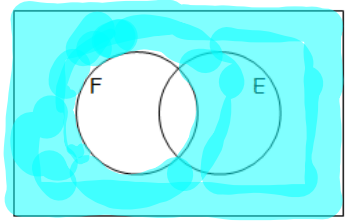


2. An online bookstore offers a large selection of books. Some of the books are works of fiction, and some are not. Also, some of the books are available as e-books, and some are not. Let F be the set of books that are works of fiction, and let E be the set of books that are available as e-books. On the Venn diagrams provided, shade the regions representing books that are

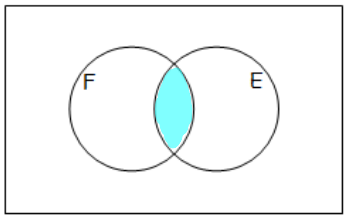
a. available as e-books.



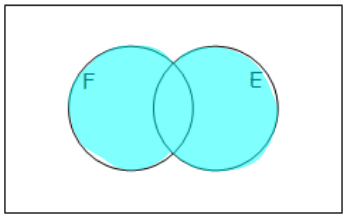
b. not works of fiction.



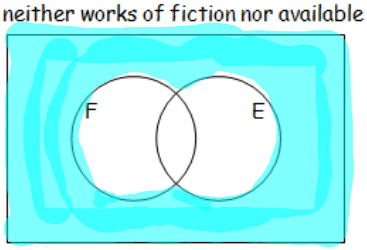
c. works of fiction and available as e-books.



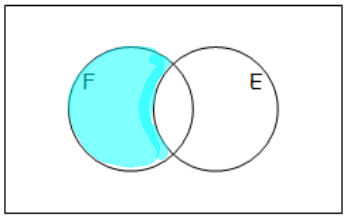
d. works of fiction or available as e-books.



e. neither works of fiction nor available as e-books.



f. works of fiction that are not available as e-books.

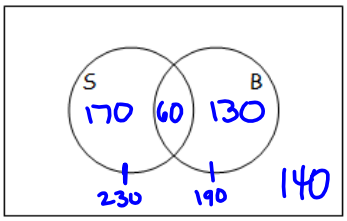


Showing Numbers and Probabilities of Possible Outcomes

3. Think again about the school introduced in Example 1. Suppose that 230 students play soccer, 190 students play basketball, and 60 students play both sports. There are a total of 500 students at the school.

a. Complete the Venn diagram below by writing the numbers of students in the various regions of the diagram.

S only = 230 − 60 = 170
B only = 190 − 60 = 130
S or B = 170 + 60 + 130 = 360
Neither = 500 − 360 = 140



b. How many students play basketball but not soccer?

130

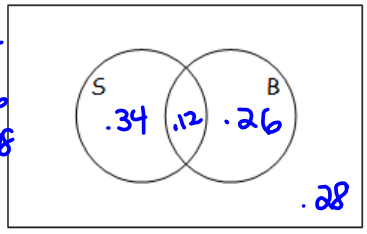
c. Suppose that a student will be selected at random from the school.

i. What is the probability that the selected student plays both sports?

$P(S \cap B) = 60/500 = .12$

ii. Complete the Venn diagram below by writing the probabilities associated with the various regions of the diagram.

$P(S \text{ only}) = 170/500 = .34$
$P(B \text{ only}) = 130/500 = .26$
$P(\text{Neither}) = 140/500 = .28$



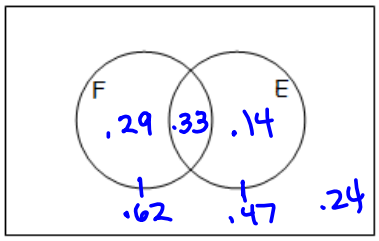
Check: $.34 + .12 + .26 + .28 \stackrel{?}{=} 1$
$1 = 1$ ✓

$P(S) = .34 + .12 = .46$
$P(B) = .12 + .26 = .38$

Adding and Subtracting Probabilities

4. Think again about the online bookstore introduced in Example 2, and suppose that 62% of the books are works of fiction, 47% are available as e-books, and 14% are available as e-books but are not works of fiction. A book will be selected at random.

a. Complete the Venn diagram by writing the probabilities associated with the various regions of the diagram.



b. Find the probability that the book will be

i. a work of fiction and available as an e-book.

$P(F \cap E) = .33$

ii. neither a work of fiction nor available as an e-book.

$P(\text{Neither}) = .24$

$1 - (.29 + .33 + .14) = .24$

$.76$

c. At the beginning of this question: 62% of the books are works of fiction, 47% are available as e-books, and 14% are available as e-books but are not works of fiction.

i. Show this information as a hypothetical 1000 table. Do not use the Venn diagram.

	Fiction	Not Fiction	Total
Available as E-Book	330	140	470
Not available as E-Book	290	240	530
Total	620	380	1,000

ii. Complete the table below showing the probabilities of the events represented by the cells in the table above.

	Fiction	Not Fiction	Total
Available as E-Book	.33	.14	.47
Not available as E-Book	.29	.24	.53
Total	.62	.38	1

iii. How do the probabilities in your table relate to the probabilities you calculated in part a?

The probabilities are the same. Therefore we can represent these probabilities as a Venn Diagram or a 2-way table. Which do you prefer?