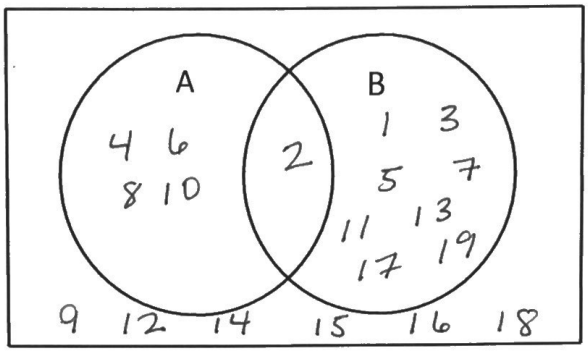
Skills Practice: Sets

1. Set A = (2, 4, 6, 8, 10) and Set B is the set of all prime numbers less than 20. Complete the Venn diagram. The universe, the set of all possible outcomes, is the set of numbers 1 through 19.

sample set

1 2 3 4 5 6 7
8 9 10 11 12 13 14
15 16 17 18 19



Using the Venn diagram above, list the elements in each of the following sets:

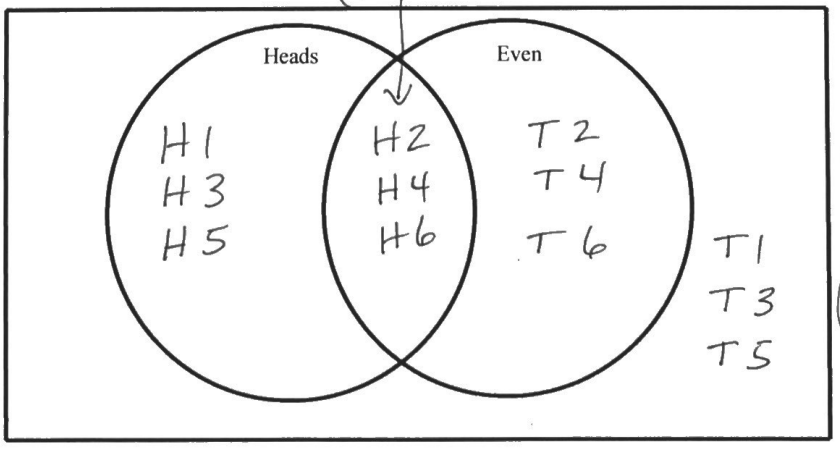
a. B {1, 2, 3, 5, 7, 11, 13, 17, 19}

b. $A \cup B$ {1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 13, 17, 19}

c. $A \cap B$ {2}

2. Create a Venn Diagram to describe the following event: Rolling a die and flipping a coin (H1, T1, H2, T2, etc.)

(Heads, even) 1, 2, 3, 4, 5, 6



H, T
Sample Space

H1	T1
~~H2~~	T2
H3	T3
~~H4~~	T4
H5	T5
~~H6~~	T6

Based on the Venn diagram, find the following probabilities:

a. P(H) = $\frac{6}{12} = \frac{1}{2}$ = .5 **b.** P(E) = $\frac{6}{12} = \frac{1}{2}$ = .5 **c.** P(H∩E) = $\frac{3}{12} = \frac{1}{4}$ = .25 **d.** P(H∪E) = $\frac{9}{12} = \frac{3}{4}$ = .75 **e.** P($\overline{H \cup E}$) = $\frac{3}{12} = \frac{1}{4}$ = .25

3. Suppose P(A) = 0.15 and P(B) = 0.64, find the following:

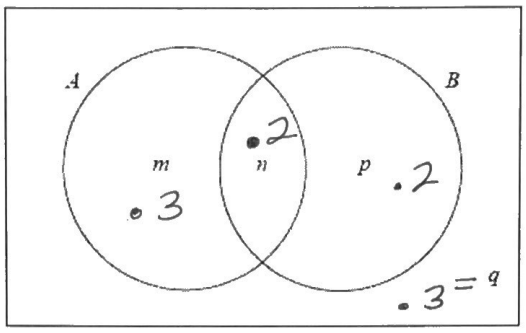
$P(A) = .15$ $P(B) = .64$ not B $1 - .64 = .36$

a. $P(\bar{A}) =$ not A $1 - P(A)$ $1 - .15 = .85$

b. $P(\bar{A} - \bar{B}) =$ $.85 - .36 = .49$

c. $P(B') + P(A) =$ $.36 + .15 = .51$

4. The Venn diagram below shows events *A* and *B* where P(*A*) = 0.5, $P(\overline{A \cup B}) = 0.3$ and $P(A \cap B) = 0.2$. The values *m*, *n*, *p* and *q* are probabilities. not union = q



$P(A) = .5$

$m = P(A) - P(A \cap B)$ $.5 - .2 = .3$

$p = 1 - (.3 + .2 + .3)$ $p = .2$

a. Write down the value of *n*. $= 0.2$

b. Find the value of *m*, of *p*, and of *q*.

$m = .3$, $p = .2$, $q = .3$

5. If you draw an M&M candy at random from a bag of M&M's, the candy you draw will have one of six colors. The probability of drawing each color depends on the proportion of each color among all candies made. Assume the table below gives the probability that a randomly chosen M&M has each color.

Color	Brown	Red	Yellow	Green	Orange	Blue
Probability	0.05	0.25	.25	0.15	0.20	.10

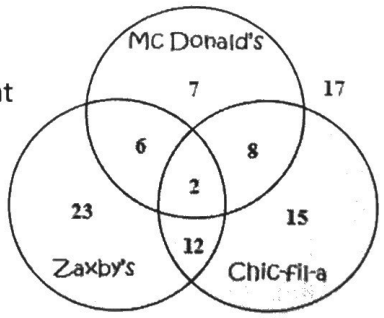
a. Determine the probability of drawing a yellow M&M. Justify your answer.

Total = 1 $1 - (.05 + .25 + .15 + .20 + .10) = .25$

b. Determine the complement of drawing a red or yellow M&M. Justify your answer.

not Red or Yellow 1 − Red or Yellow $1 - .25 - .25 = .50$

6. The following shows a VENN diagram with the results of a survey a teacher gave to all of her students. It represents where all of the students have gone to eat over the last month.



Total = 90

a. What is the probability of randomly selecting a person from this group and picking a student that has **NOT eaten at any of the restaurants** OR they ate at **McDonald's**?

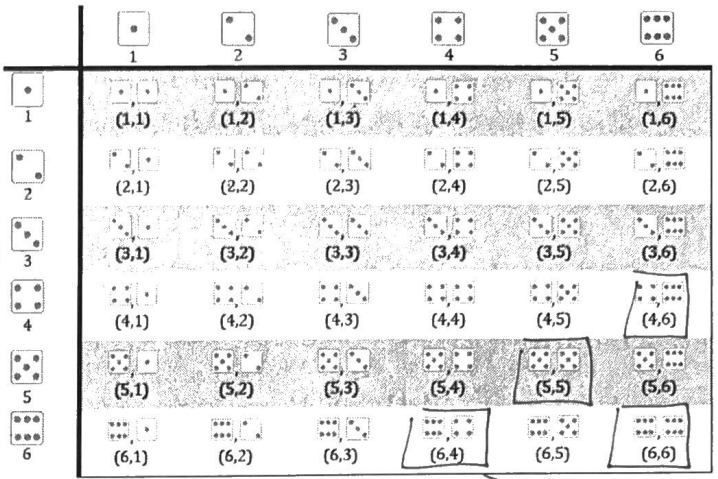
no overlap $7 + 6 + 8 + 2 = 23$ $P = \frac{17 + 23}{90} = 40/90 = .44$

b. What is the probability of randomly selecting a person from this group and picking a student that has eaten at **Mc Donald's** OR **Chick-fil-a**?

23 + $2 + 8 + 12 + 15$ = 37

These overlap $\frac{23 + 37 - 10}{90} = \frac{50}{90} = .56$

7. The table represents the set of outcomes when 2 dice are rolled. Use the table to answer the following questions. Be sure to check for mutually exclusive events.



a. What is the probability of rolling two dice and having getting a sum of 4 OR getting a sum greater than 10?

3 choices ↓ 3 choices

$\frac{6}{36} = \frac{1}{6} = .17$

b. What is the probability of rolling two standard number cubes to a sum that is even or a sum that is greater than 9?

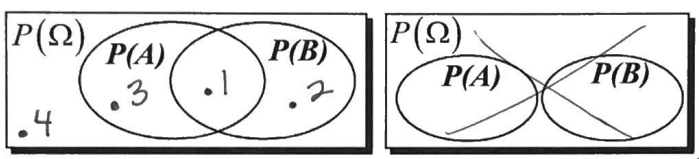
6 choices 18 choices

But 4 choices overlap

$\frac{18+6-4}{36} = \frac{20}{36} = \frac{5}{9} = .56$

sum is even and greater than 9.

8. Given, **P(A) = 0.4, P(B) = 0.3, P(A and B) = 0.1** , determine the probability of **P(A or B)** if the two events are **inclusive** (use either of the diagrams below to help you).

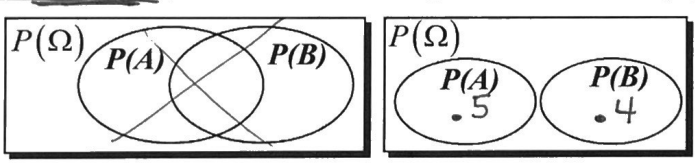


$P(A \cup B) = .3 + .1 + .2 = .6$

$P(A \text{ or } B) = P(A) + P(B) - P(A \cap B)$

$.4 + .3 - .1 = .6$

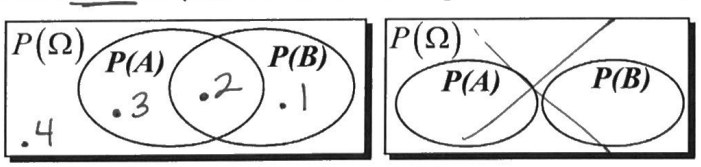
9. Given, **P(A) = 0.5, P(B) = 0.4** , determine the probability of **P(A and B)** if the two events are **mutually exclusive** (use either of the diagrams below to help you).



$P(A \cap B) = \{\}, \emptyset$

no overlap!

10. Given, **P(A) = 0.5, P(B) = 0.3, P(A or B) = 0.6**, determine the probability of **P(A and B)** if the two events are **inclusive** (use either of the diagrams below to help you)?



$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$.6 = .5 + .3 - x$

$.6 = .8 - x$

$-.8 \quad -.8$

$-.2 = -x$

$x = .2 = P(A \cap B)$

11. In the state of Oregon, all of the area codes start with a number greater than 4 and end in an odd number (e.g. 50[redacted]-232-1235, 97[redacted]-923-5648). **Let A represent the set of all area codes that start with an even number. Let B represent the set of all area codes that could be used in Oregon by the requirements stated earlier.**

A (start w/ even #) B (start >4, end odd)

Multiple Choice:

- **Which might be an area code that belongs to the set $(A \cap B)$?**

  A. 403 **B. 792** **C. 892** **D. 631**

  even → odd

- **Which might be an area code that belongs to the set $(A \cap B')$?**

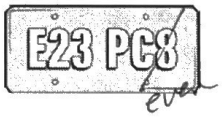
  A. 403 **B. 792** **C. 892** **D. 631**

  even, greater than 4, doesn't matter — does not end in odd

12. In a particular state, the first character on a license plate is always a letter. The last character is always a digit from 0 to 9. Let V represents the set of all license plates beginning with a vowel, and O represents the set of all license plates that end with an odd number.

V (Begin with Vowel) O (end w/ odd #)

Which might be a license plate that belongs to the set $(V \cap O)$?

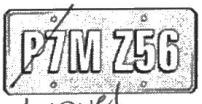
A. 

even

B. 

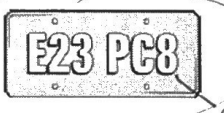
not vowel

C. 

D. 

not vowel

Which might be a license plate that belongs to the set $(V \cap O')$? not odd

A. 

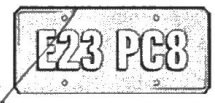
even

B. 

C. 

D. 

Which might be a license plate that belongs to the set $(V' \cap O')$? not a vowel ∩ not odd

A. 

B. 

C. 

D.