BIG PICTURE of this UNIT:	• How can we visualize events and outcomes when considering probability events? • How can we count outcomes in probability events? • How can we calculate probabilities, given different types of events • Can we predict how likely it is that an event occurs? How can we use that knowledge?

This lesson will be based upon a STUDENT DIRECTED DISCUSSION model ….. in your groups, you should be having DISCUSSIONS about how to think and work through and then present the solutions to the following questions. The questions will involve basic ideas including (i) visualizing the outcomes of probability events/experiments, (ii) determining probabilities of single and compound probability events, (iii) counting outcomes, and (iv). EVERY PROBLEM SET will involve spiralling through these major concepts as you will be given the opportunity to deepen and extend your conceptual knowledge & skill set on these major themes as you see them multiple times in our lessons.

So, in your group, discuss & prepare solutions to the following questions. Record the key ideas of your discussions/solutions in your notebook. Then, once you have had your discussions, present your solutions on the board. Solutions do NOT necessarily NEED to be correct – they simply form the basis for DISCUSSIONS !!!! If your group has (i) multiple solutions that lead to the same answers OR (ii) same/different solutions that lead to different answers, present them ANYWAY!!

1. Environmentalists have accused a large company of dumping nuclear waste material in a local river. The probability that either the fish in the river or the animals that drink from the river will die is 11/21. The probability that a fish will die is 1/3 and the probability that an animal that drinks from the river will die is 2/7. What is the probability that both the fish and the animals will die?

2. At an athletic event, athletes are tested for steroids using two different tests. The first test has a 93.0% probability of giving accurate results, while the second test is accurate 87.0% of the time. For a sample that does contain steroids, what is the probability that
   i. neither test shows that steroids are present?
   ii. both tests show that steroids are present?
   iii. at least one of the tests detects the steroids?

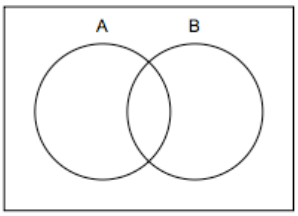
3. A small school has 24 boys graduating. Half of them are funny and 7 are good dancers. Eight of them are neither funny nor good dancers. One boy is selected at random. Translate the following into conditional probability notation, then determine.
   i. The probability he is a good dancer given that he is funny.
   ii. The probability he is funny given that he is a good dancer.
   iii. If he is a good dancer, what is the probability he is not funny?
   iv. If he is not a good dancer, what is the probability he is funny?

4. Isabel goes to school by one of two routes, A or B. The probability of going by route A is 30%. If she goes by route A, the probability of being late is 5% and if she goes by route B, the probability of being late is 10%
   i. Draw a tree diagram
   ii. Find the probability that Isabel is late for school.
   iii. Given that she is late for school, find the probability that she went to school using route A

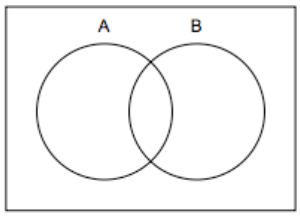
5. For the following Venn Diagrams, shade the defined areas or describe the shaded regions as required

SHADE

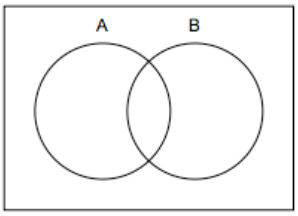
1) Shade $(A \cap B)'$



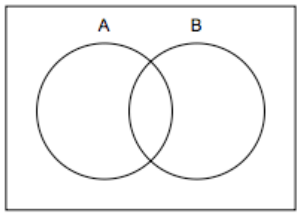
2) Shade B



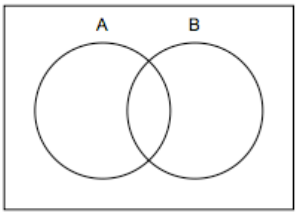
3) Shade $(A \cup B)'$



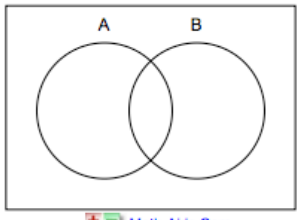
4) Shade $(B - A)'$



5) Shade $A' \cap B'$



6) Shade A'

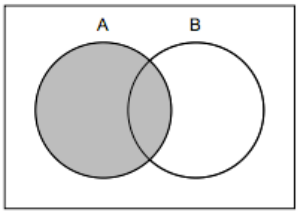


Math-Aids.Com
Venn Diagrams

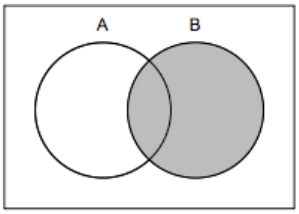
NAME/DESCRIBE

Name the Shaded Regions for the Venn Diagrams

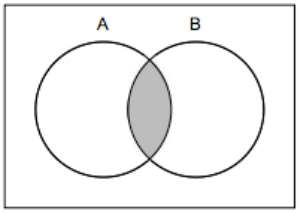
1) Region _____



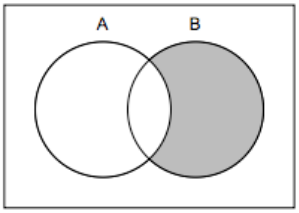
2) Region _____



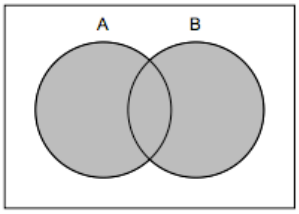
3) Region _____



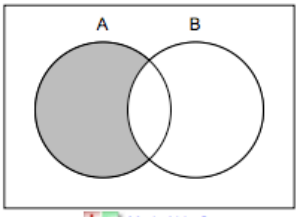
4) Region _____



5) Region _____



6) Region _____



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Venn Diagrams

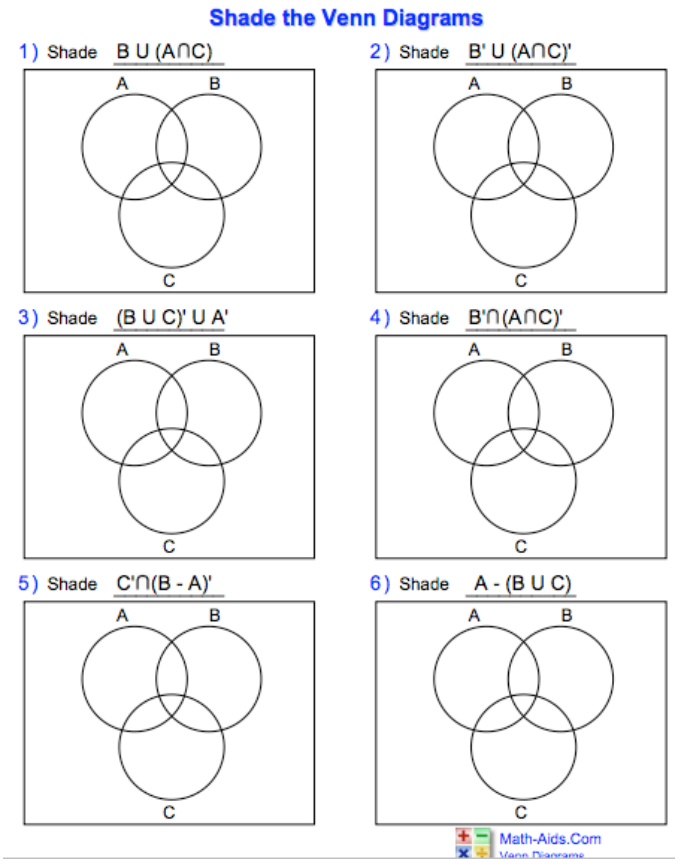
6. Of the 28 students in a class, 12 have a part time job, 22 have a part time job or do regular volunteer work, and 4 of the students have a part time job and do regular volunteer work.
   a. Display the data in a Venn diagram.
   b. How many of the students do not have a part time job or do not volunteer regularly?
   c. How probable is it that a student does volunteer work given that they have a part time job?

7. One hundred people were asked if they liked Math, Science, or Social Studies. Everyone answered that they liked at least one. The results where that 56 like Math, 43 like Science, 35 like Social Studies, 18 like Math and Science, 10 like Science and Social Studies, 12 like Math and Social Studies and finally 6 like all three subjects. A student is chosen at random. Complete a Venn Diagram and then use it to determine how probable is it that:

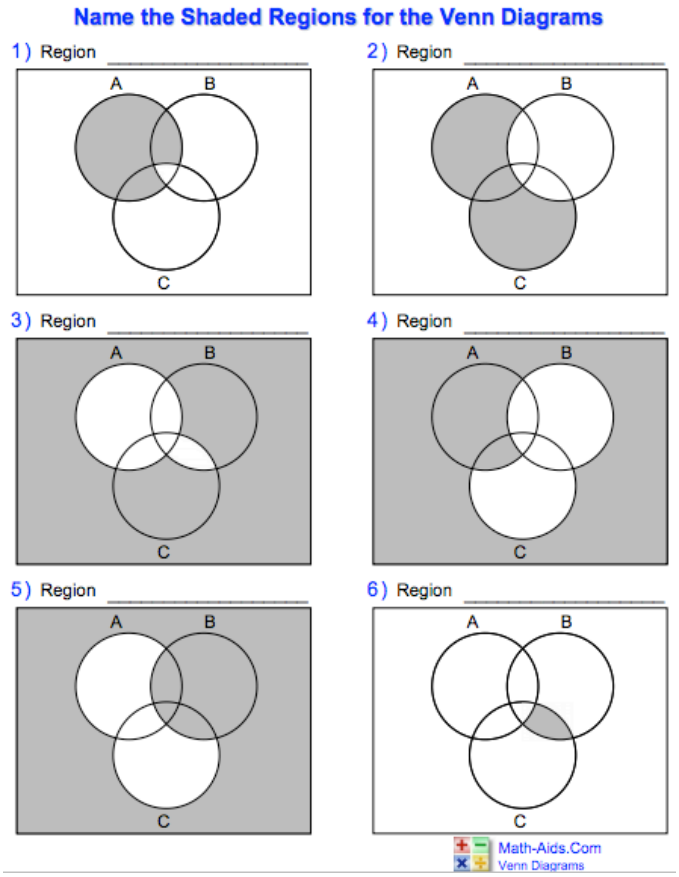
   i. they like Math only?
   ii. they like Science only?
   iii. they like Social Studies only?
   iv. They like social studies and Science?
   v. They like math or science?
   vi. They like science given that they like math?
   vii. They like social studies given that they do not like math

8. For the following Venn Diagrams, shade the defined areas or describe the shaded regions as required

SHADE



NAME/DESCRIBE



Higher Level Questions for More Complex Concepts in Probability. Determine the probability of the event described in each exercise. Unless stated otherwise, assume all items of chance (dice, coins, cards, spinners, etc.) are fair.

Probability vs. Odds

The *probability of an event* is defined as the number of ways the event can happen successfully divided by the number of ways it can possibly happen (successes + failures).

The *odds in favor of an event* are defined as the number of ways the event can happen successfully divided by the number of ways it can fail to happen.

If the *odds in favor of an event* are a/b, or a to b, then the *probability* of the event is $a/a+b$, and the *odds against an event* are b/a, or b to a,

A single die is tossed.

1. What is the *probability* that the number of spots showing is:

   a. 6 b. even c. odd d. less than 3?

2. What are the *odds* that the number of spots showing is:

   a. 6 b. even c. Odd d. less than 3?

3. One letter is selected at random from the first 10 letters of the alphabet. What is the *probability* that the letter is:

   a. a vowel b. a consonant c. before E in the alphabet d. in the word SIDEWALK

4. What are the *odds* in favor of each event in #3?

   a. a vowel b. a consonant c. before E in the alphabet d. in the word SIDEWALK

5. Two dice are thrown. Refer to the 2 die roll chart to the right to decide the ***probability*** of each of the following events.

(a) The sum of the numbers showing is 7.

(b) Both dice show the same number.

(c) The dice show different numbers.

(d) The sum of the numbers showing is 4 or 6.

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

6. What are the ***odds*** in favor of each event in #5?

(a) The sum of the numbers showing is 7.

(b) Both dice show the same number.

(c) The dice show different numbers.

(d) The sum of the numbers showing is 4 or 6.