Lesson 55 – Probability of Compound Events and Venn Diagrams

(A) Lesson Objectives

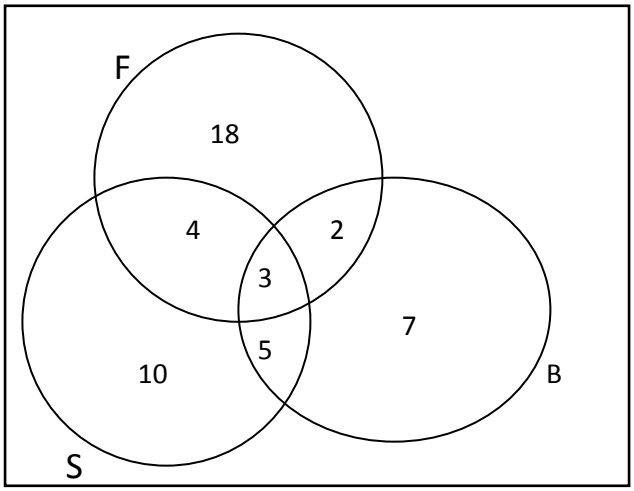
a. Work through compound events using Venn diagrams as our problem solving strategy
b. Introduce the concept of conditional probability through the use of Venn diagrams

1. A group of 60 students were asked if they played field hockey (F), basketball (B) or soccer (S). The diagram below displays the results.

How probable is it that a randomly chosen student plays::

i. field hockey & basketball?
ii. field hockey or basketball?
iii. field hockey & soccer?
iv. neither of the three sports?
v. only 1 sport?

vi. Basketball given that they play soccer?
vii. Soccer given that they play field hockey?

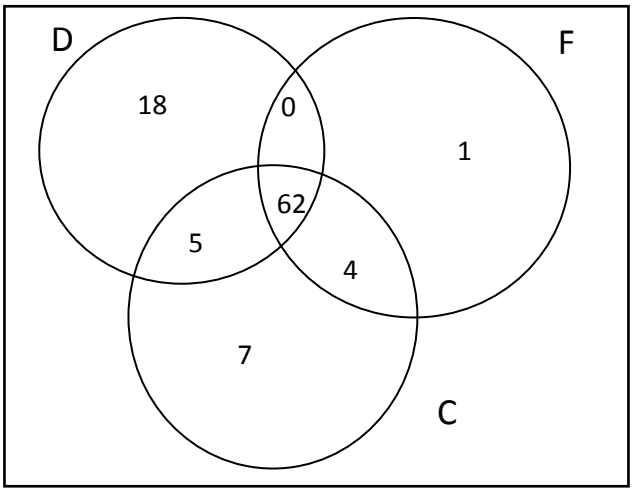


2. The Venn diagram displays the results of a survey of 100 families regarding technology in their homes. Computer (C), DVD player (D) and fax machine (F)

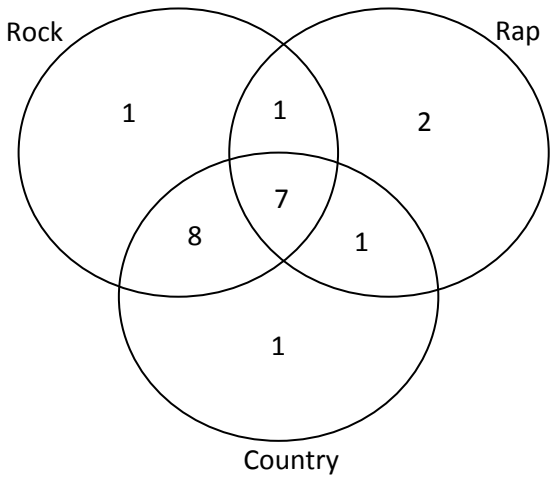
How probable is it that a family has:

i. a computer at home?
ii. all three machines?
iii. none of the machines in their home?
iv. no fax machine?
v. a computer and a VCR?
vi. a VCR or a computer?

vii. A computer given that they have a fax machine?
viii. A DVD players given that they have a computer?



3. Use the Venn Diagram below to answer question (a) – (f).



   a. How many total people are represented in the diagram?
   b. How many people like country?
   c. If one person is chosen at random, what is the probability that:
      i. they will like rap music?
      ii. They will like rap or country music?
      iii. They will not like rock nor country?

      iv. They will like rock given that they like country?
      v. They will not like country given that they like rock?
      vi. They will not like rap given that they do not like country?

   BONUS:

   d. If one person is chosen at random, what are the odds for picking a person who likes country?
   e. If one person is chosen at random, what are the odds against picking a person who likes all three types of music?
   f. Odds against all three = ?

4. 100 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. How probable is it that:

   a. they like Math only?
   b. they like Science only?
   c. they like Social Studies only?
   d. They like social studies and Science?
   e. They like math or science?

   f. They like science given that they like math?
   g. They like social sciences given that they do not like math

5. A survey was done to see how many people visit the beach, go camping or go to the waterslides during the summer months. It was found that 35% went camping, 57% went to the beach and 20% went to the waterslides. 15% went camping & to the beach, 8% went to the beach & to the waterslides, 5% went camping & to the waterslides and 3% went to all three. Draw a Venn diagram to display the information and find the probability that a randomly selected person:

    a. went to the beach or went to the slides.
    b. went camping or went to the beach.
    c. only went to one of the three locations.
    d. did none of the three activities.

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. Of 400 college students, 120 are enrolled in math, 220 are enrolled in English, and 55 are enrolled in both. If a student is selected at random, find the probability that
    a. the student is enrolled in mathematics.
    b. the student is enrolled in mathematics or English.
    c. the student is enrolled in either mathematics or English, but not both.

8. Three of the top Canadian paid-circulation magazines are Reader's Digest, Chatelaine, and MacLean's. A market survey has estimated the probability of a household subscribing to these magazines:

a. Subscription	**b. Probability**
c. Reader's Digest	d. 0.6
e. Chatelaine	f. 0.5
g. MacLean's	h. 0.4
i. Reader's Digest & Chatelaine	j. 0.2
k. Reader's Digest & MacLean's	l. 0.25
m. Chatelaine & MacLean's	n. 0.15
o. All three	p. 0.05

    a. What is the probability that a household chosen at random
        i. subscribes to only Reader's Digest?
        ii. subscribes to neither Chatelaine nor MacLean's?
        iii. subscribes to one magazine only?
        iv. Subscribes to Readers Digest given that they subscribe to MacLeans?

9. In a survey of 2140 teachers in a certain metropolitan area conducted by a nonprofit organization regarding teacher attitudes, the following data were obtained:

    a. 900 said that lack of parental support is a problem.
    b. 890 said that abused or neglected children are problems.
    c. 680 said that malnutrition or students in poor health is a problem.
    d. 120 said that lack of parental support and abused or neglected children are problems.
    e. 110 said that lack of parental support and malnutrition or poor health are problems.
    f. 140 said that abused or neglected children and malnutrition or poor health are problems.
    g. 40 said that all three issues are problems.

    Draw a Venn diagram and then find the probability that a teacher selected at random from this group said that lack of parental support is the only problem hampering a student's schooling?

10. In a group of 35 children, 10 have blonde hair, 14 have brown eyes, and 4 have both blonde hair and brown eyes. If a child is selected at random, find the probability that the child has blonde hair or brown eyes.

11. Amber, a college senior, interviews with Acme Corp. and Mills, Inc. The probability of receiving an offer from Acme is 0.35, from Mills is 0.48, and from both is 0.15. Find the probability of receiving an offer from either Acme Corp. or Mills, Inc., but not both.

12. A survey of couples in a city found the following probabilities:

    a. The probability that the husband is employed is 0.85.
    b. The probability that the wife is employed is 0.60.
    c. The probability that both are employed is 0.55.

    A couple is selected at random. Find the probability that:
    (i) at least one of them is employed.
    (ii) neither is employed.

13. Each member of a sports club plays at least one of soccer, rugby or tennis. The following is known: 43 members play tennis, 11 play tennis & rugby, 7 play tennis & soccer, 6 play soccer & rugby, 84 play rugby or tennis, 68 play soccer or rugby and 4 play all three sports.

    a. How many members does the club have?
    b. Two members are chosen at random. How probable is it that both play rugby?
    c. Two members are chosen at random. How probable is it that both play rugby, given that neither plays tennis?