

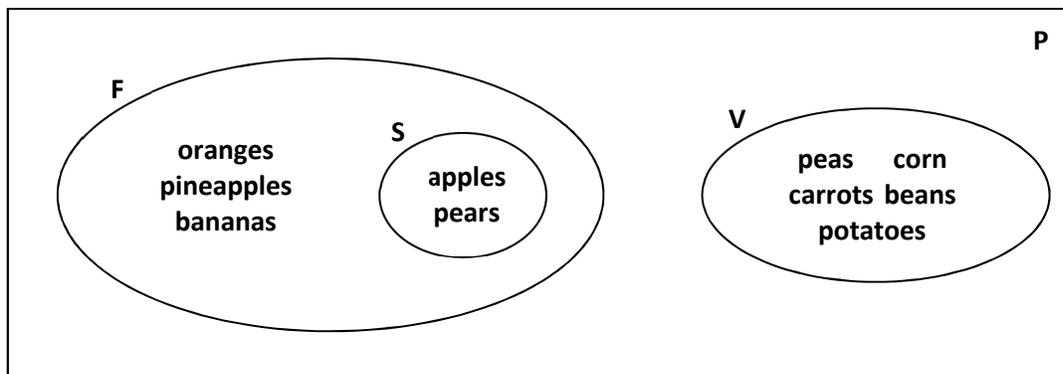
# Applied Math 40S

Name \_\_\_\_\_

## Set Theory Hand-In Assignment

Complete the following questions in the spaces provided. Show all work where applicable. Hand in this assignment when finished.

1. Imelda drew the Venn diagram shown below:



She described the sets as follows:

$P = \{\text{produce}\}$ ,  $F = \{\text{fruit}\}$ ,  $S = \{\text{fruit you can eat without peeling}\}$ ,  $V = \{\text{vegetables}\}$

a) What does  $S \subset F$  mean? Is this true?

b) Circle each of the following statements that are true.

$F \subset S$        $S \subset P$        $V \subset F$        $P \subset S$        $V \subset P$

c) List all pairs of disjoint sets, if there are any.

(question continues on next page...)

(question 1 continues...)

d) Is  $F'$  equal to  $V$ ? Explain.

e) Write a mathematical expression to determine  $n(V)$  using  $n(P)$  and  $n(F)$ .

f) List the elements in  $S'$ . Be sure to use proper set notation

g) Find a **different** way that Imelda could have defined the sets in this situation. Keep  $P$  as the universal set. Come up with at least 3 different subsets that contain all of the elements in the original Venn diagram. List your sets below and draw a Venn diagram showing the relationship between your new sets. Make sure to draw an enclosing box to indicate the universal set.

2. Nunavut (N) and the Northwest Territories (T) have the following fish species:
- $N = \{\text{walleye, pike, trout, char, grayling, whitefish}\}$
  - $T = \{\text{walleye, pike, trout, char, grayling, whitefish, inconnu}\}$
- a) Illustrate the sets of fish in these two territories using a Venn diagram. (You don't need to list the individual elements of each set.)
- b) Explain what the following statement means:  $N \subset T$ , but  $T \not\subset N$ .
3. a) Create a Venn diagram that represents the sets shown below. Write every element of each set in its proper location in the Venn diagram.
- $U = \{\text{integers from } -10 \text{ to } 10\}$
  - $A = \{\text{positive integers from } 1 \text{ to } 10 \text{ inclusive}\}$
  - $B = \{\text{negative integers from } -10 \text{ to } -1 \text{ inclusive}\}$
- b) List the disjoint subsets, if there are any.
- c) Circle each of the following statements that are true. If a statement is false, provide a brief reason why it is false.

$$A \subset B$$

$$B \subset A$$

$$A' = B$$

$$n(A) = n(B)$$

4. There are 38 students in a class. The number of students in the drama club and the band are illustrated in the Venn diagram below. Use the diagram to answer the following questions.

a) How many students are in both drama club and band?  
\_\_\_\_\_

b) How many students are only in drama club? \_\_\_\_\_

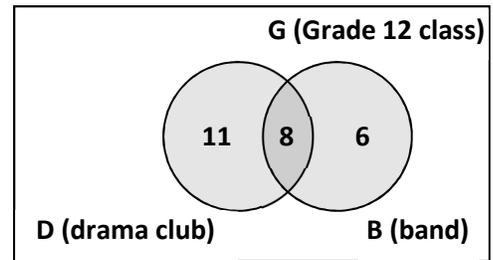
c) How many students are only in band? \_\_\_\_\_

d) How many students are in drama club? \_\_\_\_\_

e) How many are in the band? \_\_\_\_\_

f) How many students are in at least one of the drama club or the band? \_\_\_\_\_

g) How many students (out of the class of 38) are in neither the drama club nor the band? \_\_\_\_\_



5. Consider the following two sets:

- $A = \{-10, -8, -6, -4, -2, 0, 2, 4, 6, 8, 10\}$

- $C = \{2, 4, 6, 8, 10, 12, 14, 16\}$

a) Determine the following:

i)  $A \cup C$

ii)  $n(A \cup C)$

iii)  $A \cap C$

iv)  $n(A \cap C)$

b) Draw a Venn diagram to show these two sets. Write the elements of the sets in their proper regions.

6. Merie Ann asked 25 people at a science fiction convention if they like *Star Wars* or *Star Trek*. The results of her survey were as follows:

- 4 people did not like either choice
- 16 people liked *Star Wars*
- 11 people liked *Star Trek*

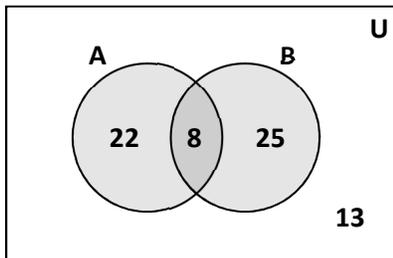
Determine:

a) Determine the number of people who liked both *Star Wars* and *Star Trek*.

b) Determine the number of people who liked *Star Wars* only.

c) Determine the number of people who liked *Star Trek* only.

7. Given the following Venn diagram:



Find the value of each of the following:

a)  $n(A \cap B) =$  \_\_\_\_\_

b)  $n(A \setminus B) =$  \_\_\_\_\_

c)  $n(B \setminus A) =$  \_\_\_\_\_

d)  $n(A \cup B) =$  \_\_\_\_\_

e)  $n((A \cup B)') =$  \_\_\_\_\_

f)  $n(U) =$  \_\_\_\_\_

8. Ravi surveyed 100 people at a Tim Horton's. He found the following:

- 65 people ordered coffee.
- 45 people ordered a doughnut.
- 10 people ordered something else.

Ravi wants to determine how many people ordered coffee and a doughnut.

a) Model this situation with sets. Identify the universal set, and explain which subsets you will use. Be sure to use proper set notation.

b) Draw a Venn diagram to model this situation. Put the correct numbers of people in the appropriate regions in your diagram.

c) Determine the number of people who ordered both coffee and a doughnut.

d) Determine the value of  $n(\text{Coffee} \cup \text{Doughnut})$

e) Determine the value of  $n(\text{Doughnut} \setminus \text{Coffee})$ .

9. 500 people were surveyed about movies that they have enjoyed. They were asked if they enjoyed each of the following movies: District 9, Napoleon Dynamite, and Cloudy With a Chance of Meatballs. The responses were as follows:
- 240 people enjoyed District 9.
  - 55 people enjoyed only District 9 and Napoleon Dynamite.
  - 80 people enjoyed Napoleon Dynamite and Cloudy With a Chance of Meatballs.
  - 40 people enjoyed District 9 and Cloudy With a Chance of Meatballs, but not Napoleon Dynamite.
  - 45 people enjoyed all three movies.
  - 365 people enjoyed District 9 or Napoleon Dynamite.
  - 60 people enjoyed Cloudy With a Chance of Meatballs only.
- a) Represent this situation with a Venn diagram. Fill in the Venn diagram with the appropriate number of people in each region of the diagram (including people who did not enjoy any of the three movies).

b) How many people liked only one of the three movies?

c) What **percent** of respondents did not like any of the three movies?