

## WEEK 6 REVIEW: SETS and MULTIPLICATION PRINCIPLE

### Example

Let  $U = \{x \mid x \text{ is a positive integer less than } 8\}$ ,  $A = \{1, 2, 3, 4\}$ ,  $B = \{3, 4, 5\}$ , and  $C = \{5, 6, 7\}$

- Write  $U$  in roster notation
- $A^c =$
- $A \cap B =$
- $A \cup B =$
- List all the subsets of  $C$

Determine if the statements below are true or false

- $A$  and  $C$  are disjoint sets
- $\emptyset \in A$
- $\{5, 6, 7\} \subset C$

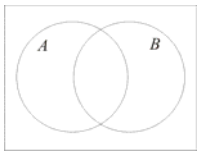
### Example

Use Venn diagrams to indicate

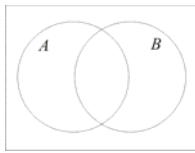
- $A \subset U, B \subset U, A \subset B^c$
- $A \subset U, B \subset U, C \subset U, C \subset A \cap B$

### Example

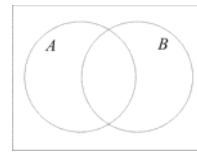
Shade the indicated regions on the Venn diagram



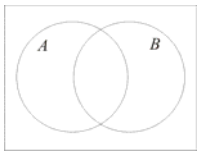
a.  $A \cap B^c$



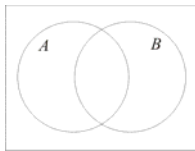
b.  $A \cup B^c$



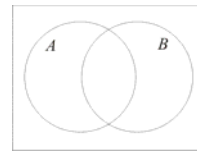
c.  $(A \cap B)^c$



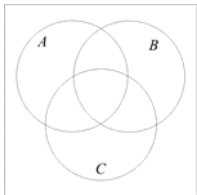
d.  $A^c \cup B^c$



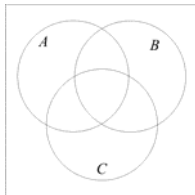
e.  $A^c \cap B^c$



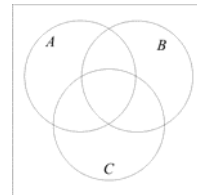
f.  $(A \cup B)^c$



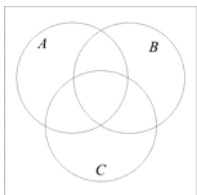
g.  $A^c \cap B \cap C$



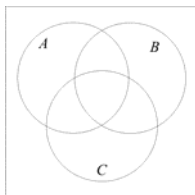
h.  $(A \cup B) \cap C^c$



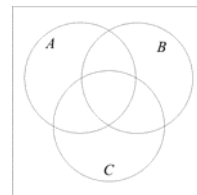
i.  $(A^c \cap B)^c \cup C$



j.  $A^c \cup B \cup C$



k.  $(A \cup B)^c \cap C$



l.  $(A^c \cap B)^c \cap C$

*Example*

Let  $U$  be the set of all staff at Texas A&M University and let

$$A = \{x|x \text{ owns an automobile}\}$$

$$H = \{x|x \text{ owns a house}\}$$

$$P = \{x|x \text{ owns a piano}\}$$

Describe the following sets in words

a.  $A^c$

b.  $A \cap H^c$

c.  $A^c \cup P^c$

d.  $A^c \cap H^c \cap P^c$

*Example*

If  $n(A) = 100$ ,  $n(A \cap B) = 20$ , and  $n(A \cup B) = 150$ , what is  $n(B)$ ?

*Example*

Given  $n(U) = 100$ ,  $n(A) = 40$ ,  $n(B) = 37$ ,  $n(C) = 35$ ,  $n(A \cap B) = 25$ ,  $n(A \cap C) = 22$ ,  $n(B \cap C) = 24$ , and  $n(A \cap B \cap C) = 10$ , find  $n(A^c \cap B \cap C)$ .

*Example*

In a survey of 120 adults, 55 said they had an egg for breakfast that morning, 40 said they had juice for breakfast, and 70 said they had an egg or juice for breakfast. How many had an egg but no juice for breakfast? How many had neither an egg nor juice for breakfast?

*Example*

Determine how many pizzas were sold if

- 3 pizzas had mushrooms, pepperoni, and sausage
- 7 pizzas had pepperoni and sausage
- 6 pizzas had mushrooms and sausage but not pepperoni
- 15 pizzas had two or more of these toppings
- 11 pizzas had mushrooms
- 8 pizzas had only pepperoni
- 24 pizzas had sausage or pepperoni
- 17 pizzas did not have sausage

*Example*

Six hundred people were surveyed and it was found that during the past year, 330 did not travel by bus, 100 traveled by plane but not by train, 150 traveled by train but not by plane, 120 traveled by bus but not by train or plane, 100 traveled by both bus and plane, 40 traveled by all three, and 220 traveled by plane. How many did not travel by any of these three modes of transportation?

*Example*

At a pasta diner there is a choice of 4 different pastas and 3 different sauces. How many dinners can be made?

*Example*

How many different 4-digit access codes can be made if

- a. there are no restrictions?
- b. there are no repeats?
- c. the first digit cannot be a 0 or a 1 and no repeats are allowed?
- d. four of the same digit is not allowed?

*Example*

A minivan can hold 7 passengers. An adult must sit in one of the two front seats and anyone can sit in the rear 5 seats. A group of 4 adults and 3 children are to be seated in the van. How many different seating arrangements are possible?

*Example*

You have a class of 12 children, 6 boys and 6 girls. How many ways can the children be seated in a row

- a. if boys and girls must alternate?
- b. if a girl must be seated at each end?

*Example*

You take a multiple choice test with 3 questions and each question has 5 possible answers. How many ways can the test be answered?

*Example*

Matthew and Jennifer go to the movies with four of their friends. How many ways can these six children be seated if

- a. there are no restrictions?
- b. Matthew and Jennifer are seated next to each other?
- c. Matthew and Jennifer are not next to each other?

*Example*

Four couples are going to the movie together. How many ways can these eight people be seated if couples sit together?