

6.1 – Sets and Set Operations

Venn Diagram notation:

- A rectangle represents the universal set
- Circles are sets in the universal set.

Example

Given a set A and a universal set U , the elements that are in U and are **not** in A is called the **complement** of A or A^c .

Example

From the last example, A is the set of even integers, what is A^c ?

$$U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16\}$$

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

Example: Let

$$U = \{x|x \text{ is a card in a standard deck of 52 playing cards}\}$$

$$R = \{x|x \text{ is a red card}\}$$

What is R^c ?

Those elements that belong to both A and B are in the **intersection** of A and B , $A \cap B$.

Example

Let $U = \{x|x \text{ is a card in a standard deck of 52 playing cards}\}$

$$R = \{x|x \text{ is a red card}\}$$

$$Q = \{x|x \text{ is a queen}\}$$

Then $R \cap Q =$

If two sets have no elements in common, that is $A \cap B = \emptyset$, then the sets are disjoint.

Let $K = \{x|x \text{ is a king}\}$ then $K \cap Q = ?$

Those elements that belong to A or B are in the **union**, $A \cup B$.

$A \cup B =$

Note: this is the INCLUSIVE or, not the exclusive or

Example

Let $U = \{x|x \text{ is a card in a standard deck of 52 playing cards}\}$

$H = \{x|x \text{ is a heart card}\}$

$Q = \{x|x \text{ is a queen}\}$

$H \cup Q =$

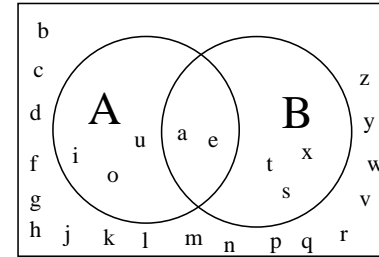
Example

Let $U = \{x|x \text{ is a letter in the English alphabet}\} = \{a, b, c, \dots, z\}$

$A = \{x|x \text{ is a vowel}\} = \{a, e, i, o, u\}$

$B = \{x|x \text{ is a letter in the word texas}\} = \{t, e, x, a, s\}$

Find the following sets and express your answer in a Venn diagram



a) What is $A \cap B$?

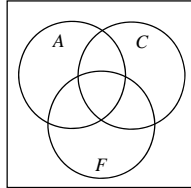
b) What is $A^c \cap B$?

c) What is $A \cup B^c$?

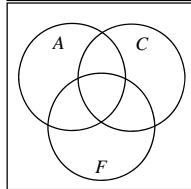
Example

People at a home show were surveyed to see if they planned on replacing their kitchen countertops (C), their kitchen floor (F) or their kitchen appliances (A). Shade the following regions on the Venn diagram and express the region in set notation.

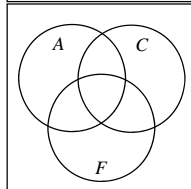
people who planned to replace their countertops and floor



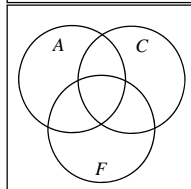
people who planned to remodel all three features



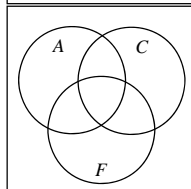
people who planned to replace their appliances or countertops



people who planned to replace exactly one of these features



people who planned to replace their kitchen appliances or floor, but not their countertops.

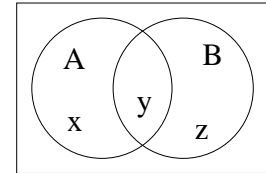


6.2 - The Number of Elements in a Finite Set

The number of elements in set A is $n(A)$.

if $A = \{x|x \text{ is a letter in the English alphabet}\}$, then $n(A)=26$.

If $A = \emptyset$ then $n(A) = 0$.



$n(A \cup B) =$

Example

A store has 150 clocks in stock. 100 of these clocks have AM or FM radios. 70 clocks had FM circuitry and 90 had AM circuitry. How many had both AM and FM? How many were AM only? How many were FM only?

Answer

Example

Harvesting Fruit - We are given the following data about the contents of some delivery trucks,

- 34 trucks carried early peaches
- 61 trucks carried late peaches
- 50 trucks carried extra late peaches
- 25 trucks carried early and late peaches
- 30 trucks carried late and extra late peaches
- 8 trucks carried early and extra late peaches
- 6 trucks carried all three kinds of peaches
- 9 trucks carried no peaches

How many carried only late peaches?

How many carried only one kind of peaches?

How many trucks went out?

Fifty-two people at a home show were surveyed to see if they planned on replacing their kitchen countertops (C), their kitchen floor (F) or their kitchen appliances (A). The following results were found:

- 22 people planned to replace exactly one of these features
- 18 people were planning to replace their kitchen appliances or floor, but not their countertops.
- 6 people planned to only replace their kitchen countertops
- 2 people planned to remodel all three features.
- 25 people planned to replace their countertops.
- 36 people planned to replace their appliances or countertops
- 9 people planned to replace their countertops and floor.

Fill in the Venn diagram with the appropriate information.