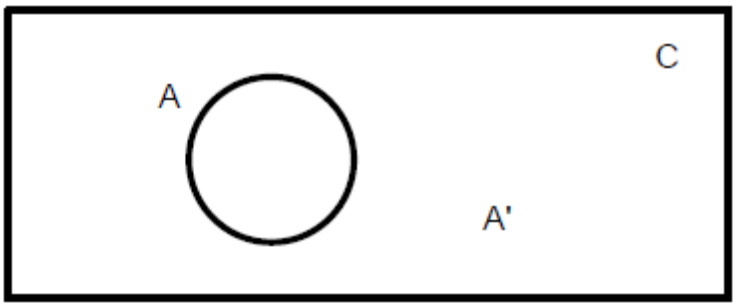
Math 3201 **Date:**_____

1.1B Introduction to Venn Diagrams

Venn Diagram: used to organize the various subsets of a universal set.

Recall our example from Lesson 1 in which we examined the number of Canadian provinces and territories (C), and the number of Atlantic provinces (A). We can represent this using a Venn Diagram.

Example 1



(A) What is the universal set?

C

(B) Where are the elements located for the universal set?

inside the rectangle

(C) What is the subset?

A

(D) Where are the elements located for the subset?

inside the circle

(E) What does A' represent?

the compliment of A.

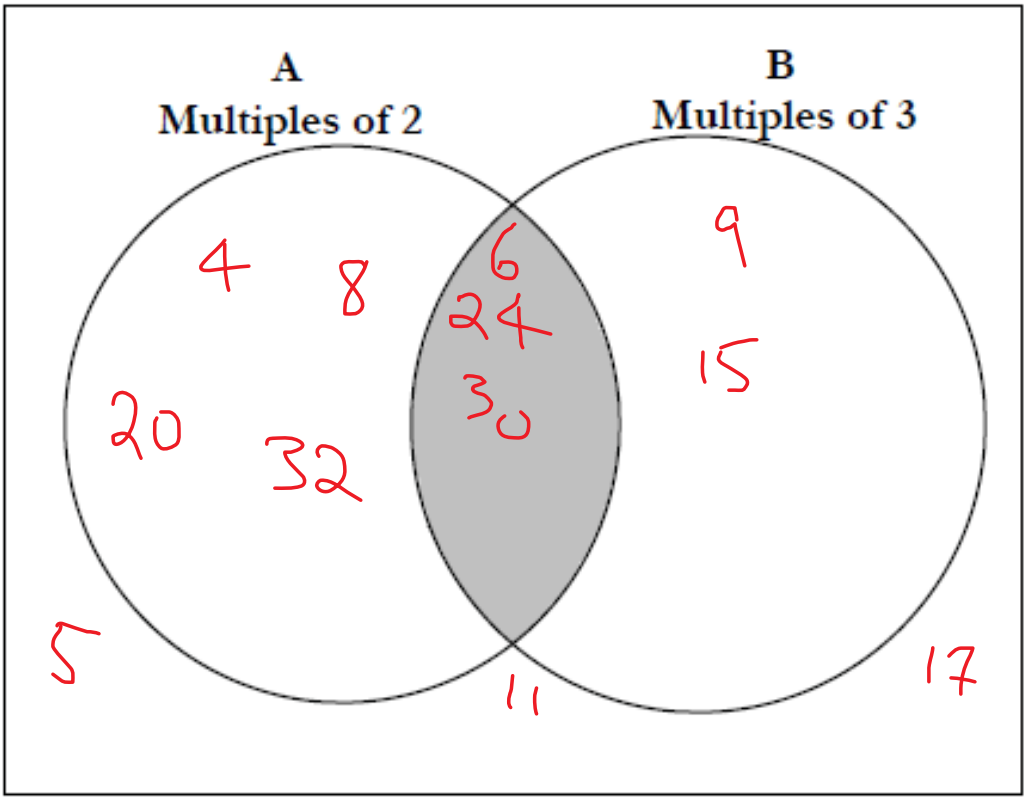
(F) Where are the elements located for A'?

Inside the rectangle, but out side the circle.

Example 2
Consider the set S consisting of the following elements:

$S = \{4,5,6,8,9,11,15,17,20,24,30,32\}$

Organize the elements into the following Venn Diagram.



(A) What is the universal set?

S

(B) What are the subsets?

A & B

(C) Write statements, using proper notation, showing the relation between the sets.

$A \subset S$, $B \subset S$

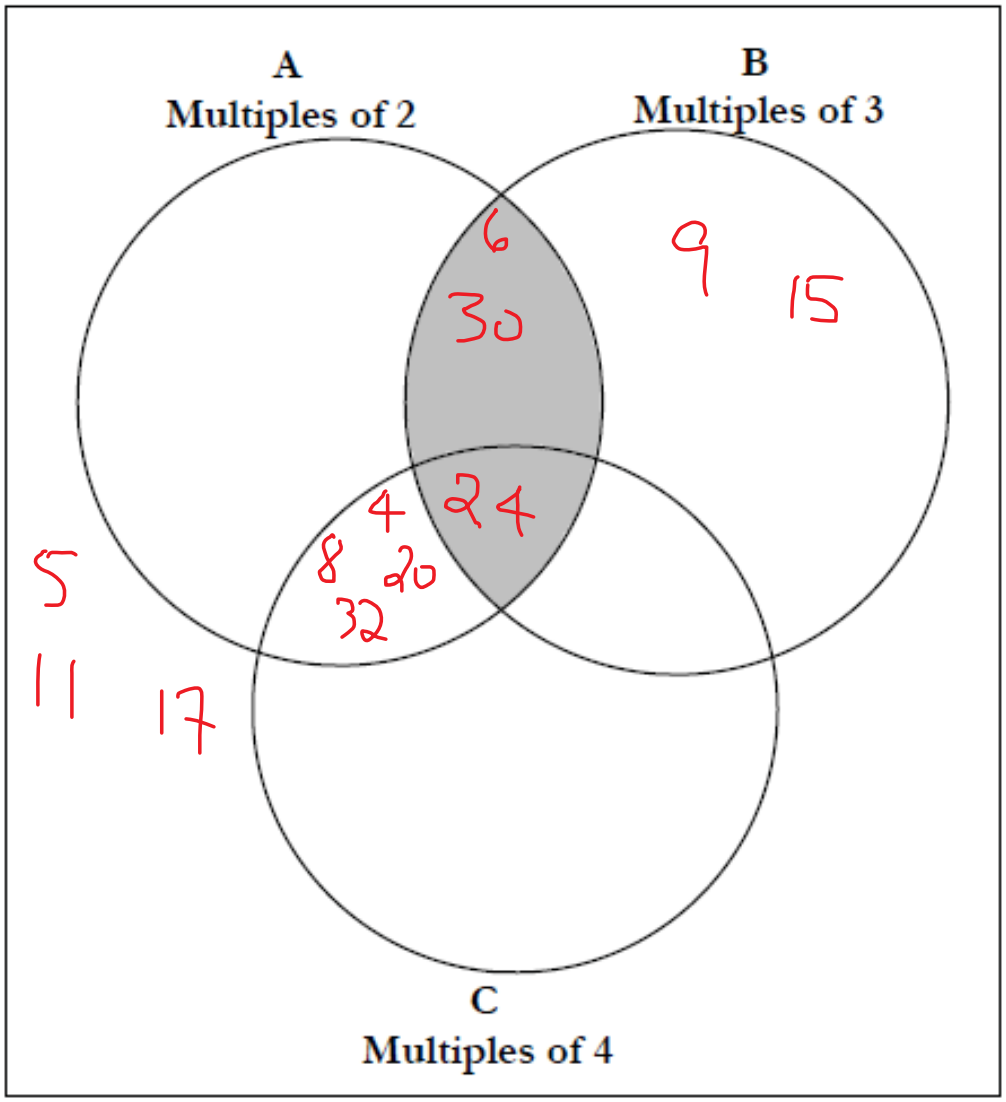
(D) Why do the circles overlap?

There are common elements between A and B.

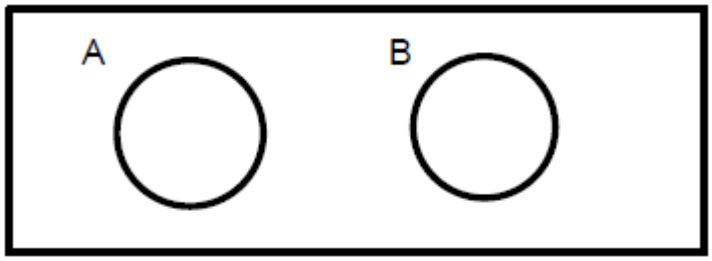
(E) Why are some numbers not placed in either of the circles?

Not part of A or B.

Example 2:
Redraw the Venn Diagram from Example 1, adding a third subset C, which consists of multiples of 4. Place the elements of the universal set S into the new Venn Diagram. Describe what each of the overlap regions represent.



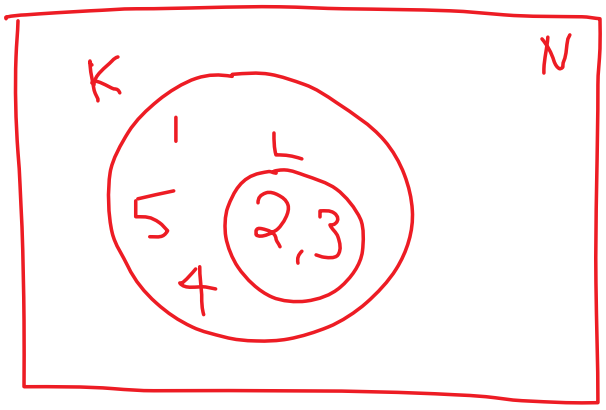
Disjoint Sets
Sets with no common elements. These sets are also said to be **mutually exclusive**. An example would be set A consisting of positive numbers and set B consisting of negative numbers.



Notice there is **no** overlap between the circles in the Venn Diagram.

Sometimes we may get a circle within a circle on a Venn Diagram.

Let N represent the set of natural numbers
K = {1,2,3,4,5}
L = {2,3}



Your Turn:

1. Consider the following sets:
   - U is the universal set of playing cards in a standard 52card deck,
   - S is the set of all 13 spades,
   - B is the set of all 26 black cards (spades and clubs),
   - D is the set of all 13 diamonds.

Answer the following:

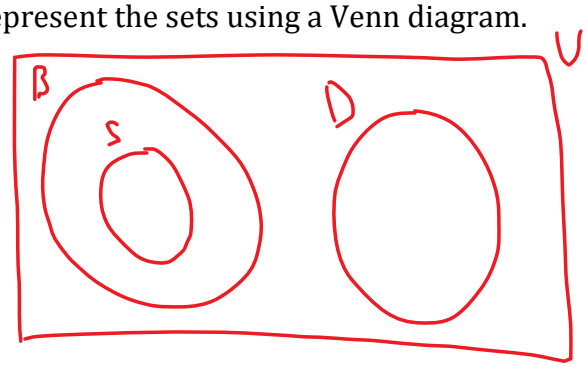
(i) Which of these sets are subsets of other sets?

$S \subset U$ $D \subset U$
$B \subset U$ $S \subset B$

(ii) List the disjoint sets, if there are any.

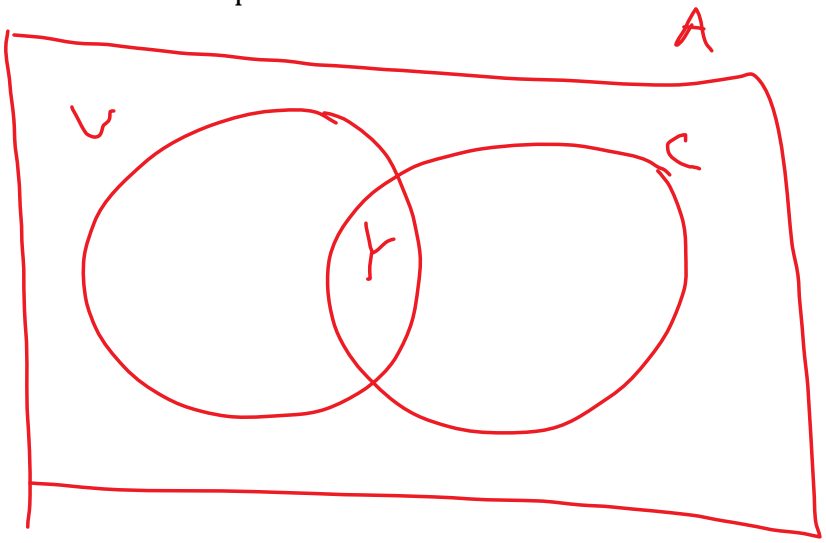
$B \neq D$ $S \neq D$

(iii) Represent the sets using a Venn diagram.

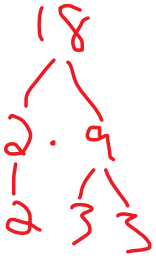


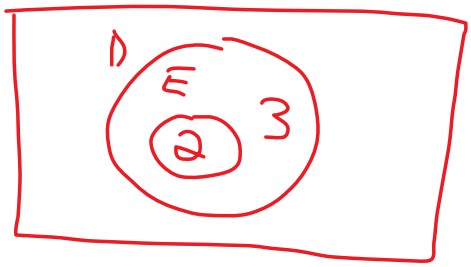
2. Draw a Venn diagram for each situation.

(i) A = set of letters in the alphabet
C = set of consonants in the alphabet
V = set of vowels in the alphabet

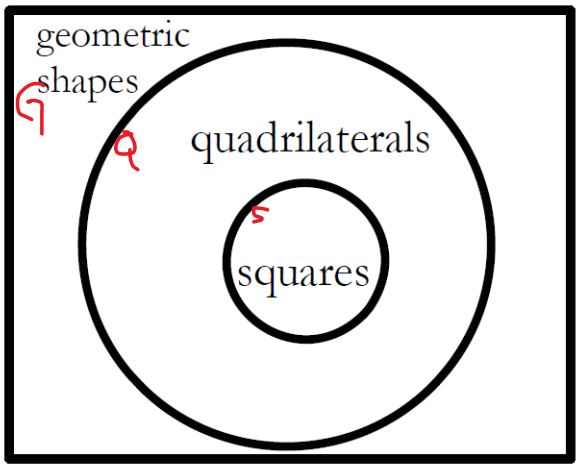


(ii) N = set of natural numbers
D = the set of prime factors of 18
E = {2}





3. Consider the following Venn Diagram:



(A) Write statements, using proper notation, showing relationships between sets and subsets.

$S \subset Q$, $S \subset G$
$Q \subset G$

(B) Why is the set of squares a subset of the set of quadrilaterals?

Squares are quadrilaterals.

(C) What does the region outside of the quadrilateral circle represent.

All other shapes.

Textbook Questions: page 15 - 18, #2, 4, 9, 11, 14, 17

Homework