

Name: _____

MATH 307

Spring 2023

HW 1: Due 02/13 (14)

*"In learning you will teach, and in
teaching you will learn."*

–Phil Collins

Problem 1. (10pt) Let $\mathcal{U} = \{-10, -9, \dots, 9, 10\}$. Define the following subsets of \mathcal{U} :

$$A = \{-2, 0, 5, 10\}$$

$$B = \text{even numbers in } \mathcal{U}$$

$$C = \{-9, -7, -5, -3, -1, 1, 3, 5, 7, 9\}$$

$$D = \text{positive prime numbers in } \mathcal{U}$$

$$E = \{-5, -4, \dots, 4, 5\}$$

Using the sets defined above, answer the following:

(a) $A \cap B$

(b) $B \cup E$

(c) $E - A$

(d) B^c

(e) $|D|$

Problem 2. (10pt) Define the following sets:

A = set of multiples of 3

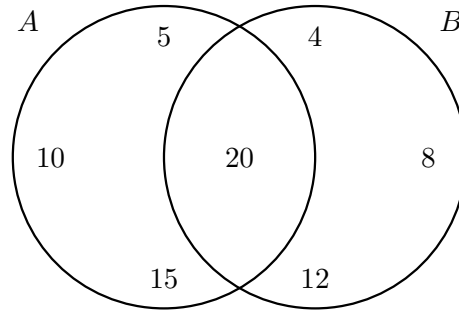
B = set of divisors of 30

C = set of even numbers less than 10

Using the sets defined above, answer the following:

- (a) List the elements of B .
- (b) Give the largest element of A less than 50 and the largest negative element of A .
- (c) What are the elements of $B - A$?
- (d) What are the elements of $A \cap B$?
- (e) Are B and C disjoint? Explain.

Problem 3. (10pt) Look at the Venn diagram given below:



Use this diagram to answer the following:

- (a) Assuming only a few of the elements of A and B are given in the diagram above, describe what the sets A and B likely represent.
- (b) Place the numbers 25, 16, and 40 in appropriate places in the given Venn diagram.
- (c) Using words, explain what numbers go in the same region of the Venn diagram in which 20 is found.
- (d) Using words, explain what numbers go in the same region of the Venn diagram in which 4, 8, and 12 are found.
- (e) What numbers would be placed outside of both the regions A and B ? Give an example.

Problem 4. (10pt) You are working with a student named Lucy. You give her the following sets: $A = \{a, b, c, d, a\}$ and $B = \{c, d, e, f\}$.

- (a) Lucy states that the cardinality of A is 5. Explain why Lucy is wrong. How might you correct her?
- (b) You ask Lucy to find $A \cup B$ and she states that this is $\{c, d\}$. What has Lucy done wrong?
- (c) Cameron overhears Lucy's answer in (b) and shouts that the answer is $\{a, b, e, f\}$. How has Cameron misunderstood the mathematical word *or* in this context?
- (d) Both Lucy and Cameron state that you cannot find $A - B$ because they are filled with letters and you cannot subtract letters. Explain what they have misunderstood about sets.