Math 101 Fall 2022 Exam 1

NAME:

- 1. 10 pts. each Express each set in roster form. (Note: \mathbb{N} is the set of natural numbers.)
 - (a) The set of integers between 0 and 8.
 - (b) $A = \{x \mid x \in \mathbb{N} \text{ and } 3 \leq x < 10\}$
 - (c) $B = \{x \mid 3 2x = 1\}$
- 2. 10 pts. each Express each set in set-builder notation.
 - (a) $C = \{4, 5, 6, 7, 8, 9, 10, 11, 12\}.$
 - (b) D is the set of natural numbers that are divisible by 3.
- 3. 5 pts. each State whether each statement is true or false. If false, give the reason.
 (a) {#} ∈ {\$, &, %, @, #, =}
 (b) {ζ, α} ⊂ {α, β, γ, δ, ε, ζ}
 - $(c) \ \Box \subset \{ \odot, \Box, \Box, \Box, \boxdot, \bigstar \}$
- 4. 10 pts. List all the proper subsets of the set $\{a, b, c\}$.
- 5. 10 pts. each Determine each set, given that

$$U = \{0, 1, 2, 3, 4, 5, 6, 7, 8\}$$
$$A = \{1, 2, 4, 5, 8\}$$
$$B = \{3, 4, 7\}$$

- (a) $(A \cup B)'$
- (b) $A' \cup (A \cap B)$
- (c) A B'
- 6. 10 pts. each Determine each set, given that

$$U = \{x \mid x \in \mathbb{N} \text{ and } x < 10\}$$

$$A = \{x \mid x \in \mathbb{N}, x \text{ is odd, and } x < 10\}$$

$$B = \{x \mid x \in \mathbb{N}, x \text{ is even, and } x < 10\}$$

$$C = \{x \mid x \in \mathbb{N} \text{ and } 6 < x < 10\}$$

(a) $(C' \cup A) \cap B$

(b) (A - B)' - C

- 7. Is pts. For $A = \{s, t\}$ and $B = \{4, 6, 8\}$, determine $A \times B$. Also, determine n(A), n(B), and $n(A \times B)$.
- 8. 10 pts. Use the Venn diagram below to determine the sets $A \cap (B \cup C)$ and $(A' \cup B) \cap C$.



- 9. 10 pts. each Using the textbook's method, determine whether the following expressions are equal for all sets A, B, and C.
 - (a) $(A' \cap B)'$, $A \cup B'$
 - (b) $A \cup (B \cap C)'$, $A' \cap (B \cup C)$
- 10. Three grain crops raised in the world are wheat, quinoa, and rice. A survey of 47 countries that raise grain yielded the following results:
 - 18 countries raised wheat16 countries raised quinoa12 countries raised rice9 raised wheat and quinoa3 raised quinoa and rice3 raised wheat and rice2 raised all three crops
 - (a) 8 pts. Draw a Venn diagram illustrating the information given above.
 - (b) 3 pts. How many countries raised none of the three crops?
 - (c) 3 pts. How many countries raised exactly two of the crops?
 - (d) 3 pts. How many raised wheat and quinoa, but not rice?
 - (e) 3 pts. How many raised quinoa or rice, but not wheat?
- 11. 10 pts. Show the set $\{-2, 4, 10, 16, ...\}$ is infinite by placing it in a one-to-one correspondence with a proper subset of itself. Show the pairing of the general terms of the sets.