Name:

MATH 2220
HOMEWORK ON SETS AND SUBSETS

1. [SSB921] Define the following sets:

   - $A = \{x \in Z : x \text{ is an integer multiple of } 3\}$
   - $B = \{x \in Z : x \text{ is a perfect square}\}$
   - $C = \{4, 5, 9, 10\}$
   - $D = \{2, 4, 11, 14\}$
   - $E = \{3, 6, 9\}$
   - $F = \{4, 9, 16\}$

   Indicate which of the following statements are true:

   (a) $D \subseteq C$ false
   (b) $27 \in A$ true
   (c) $27 \in B$ false
   (d) $E \in A$ true
   (e) $A \in E$ false
   (f) $100 \in B$ true
   (g) $144 \in A$ true
   (h) $15 \subset A$ false

2. [SSB535] What is the power set of $\{1\}$?

   P({1}) = { Ø, {1} } = 2

3. [SSB532] Let $X = \{1, \{1\}, \{1, 2\}, 2\}$.

   (a) What is $|X|$? |X| = 4

   (b) Which of the following are true?

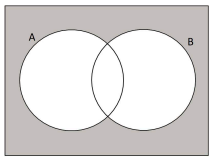
   i. $2 \in X$ true
   ii. $\{2\} \subseteq X$ true
   iii. $\{2\} \in X$ false
   iv. $1 \in X$ true
   v. $\{1, 2\} \in X$ true
   vi. $\{1, 2\} \subseteq X$ true

4. [SSB228] What is the cardinality of $P(\{1, 2, 3, 4, 5\})$?

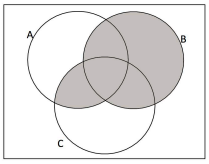
   2^5 = 32

5. [OPS641] Draw a Venn diagram illustrating the following sets:

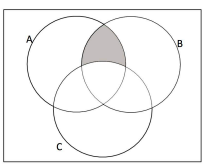
   (a) $\overline{A \cup B}$



   (b) $(A \cap C) \cup B$

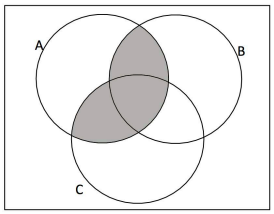


   (c) $A \cap (B - C)$

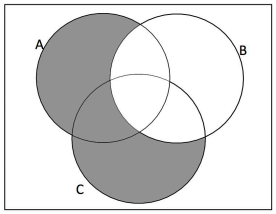


6. [OPS636] Draw Venn diagrams for the following set expressions:

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



   (b) $\overline{B} \cap (A \cup C)$



7. [OPS207] Define the following sets as:

   - $A = \{x \in Z : x \text{ is an integer multiple of } 3\}$
   - $B = \{x \in Z : x \text{ is a perfect square}\}$
   - $C = (4, 5, 9, 10\}$
   - $D = \{2, 4, 11, 14\}$
   - $E = \{3, 6, 9\}$
   - $F = \{4, 9, 16\}$

   What are the following sets? Express your answer by listing the elements in curly braces. You can assume the universe set is $\mathbb{Z}$.

   (a) $E \cap F$ = { 6 }
   (b) $(C \cap F) \cup E$ = { 4, 9, 36 }
   (c) $C - B$ = { 5, 10 }
   (d) $E - A$ = { Ø }
   (e) $\overline{B} \cap D$ = { 2, 11, 19 }
   (f) $\overline{A} \cap (C \cup D)$ = { 9 }

8. [OPS195] Define the following sets:

   - $A = \{x \in Z : x \text{ is even}\}$
   - $B = \{x \in R : x \geq 1\}$
   - $C = \{-3, 1, 2, 6, 7, 9\}$
   - $D = \{2, 3, 5, 9, 10, 17\}$

   Indicate whether the following statements are true or false:

   (a) $\pi \in B$ — a - true
   (b) $A \subseteq B$ — b - true
   (c) $C \subseteq B$ — c - false
   (d) $8 \in A \cap B$ — d - true
   (e) $A \cap C \subseteq B$ — e - true
   (f) $C \subseteq A \cup B$ — f - false
   (g) $A \cap C \cap D = \emptyset$ — g - false
   (h) $|C| = |D|$ — h - true
   (i) $|C \cap D| = 3$ — i - false