Problem 1. (2 points)
Let \( A = \{ x : x \in \mathbb{N} \text{ and } x \leq 150 \} \). Circle all that you think are correct:
(a) \( 150 \in A \)
(b) \( -13 \in A \)
(c) \( 1.64 \in A \)
(d) \( 1 \in A \)

Problem 2. (2 points)
Which other way(s) can we write the set \( B = \{ 1, 2, 3, 4, 5, 6 \} \)? Circle all that you think are correct:
(a) \( B = \{ x : x \in \mathbb{R} \text{ and } x \geq 1 \text{ and } x \leq 6 \} \)
(b) \( B = \{ x : x \in \mathbb{N} \text{ and } x < 7 \} \)
(c) \( B = \{ x : x \in \mathbb{Z} \text{ and } x \leq 6 \} \)
(d) \( B = \{ x : x \in \mathbb{N} \text{ and } x \leq 6 \} \)

Problem 3. (2 points)
Suppose that \( A = \{ 2, 3, 4 \}, B = \{ 4, 3, 2, 11 \}, \) and \( C = \{ 0, 7, 11, 8 \} \). Circle all that you think are correct:
(a) \( \emptyset \subset A \)
(b) \( A \subset B \)
(c) \( C \subset A \)
(d) \( B \subset C \)
Problem 4. \((2 + 2 = 4\) points\)
Let \(X = \{\text{lions, bearcats}\}\). What is \(|X|\)? Write down the power set of \(X\).

Problem 5. \((2 + 2 = 4\) points\)
Let universal set \(U = \{21, 22, 23, 24, 25\}\).
Let \(X = \{21, 22\}\), and \(Y = \{24\}\). Write down \(X'\) and \(Y'\).

Problem 6. \((2\) points\)
Represent the elements \(d, f, f, b, c, f, b\) as a multi-set.

Problem 7. (Boolean Algebra) \((5\) points\)
If Boolean variable \(A = T\), \(B = F\), and the value of \(C\) is unknown,

(a) What is the value of \(\sim (\sim A)\)?
(b) What is the value of \(A.T\)?
(c) What is the value of \(C.F\)?
(d) What is the value of \(B + B\)?
(e) What is the value of \(C + \sim C\)?

Problem 8. (Boolean Algebra) \((2 + 2 = 4\) points\)
Suppose Yahoo! comes to the PSU campus for internship interviews. Let us say, that for any PSU student, a Boolean variable \(A\) implies “GPA > 3.0”, \(B\) implies “Major is IST”, and \(C\) implies “Eats, drinks, and thinks Yahoo!”.
Example: \(A + B\) implies “Either has a GPA > 3.0 or is an IST Major”.

(a) What does the expression \(A.\sim C\) imply?

(b) If Yahoo! wishes to interview all students who either have a GPA of \text{less than or equal to} 3.0 or those IST majors who eat, drink, and think Yahoo!, what Boolean expression is appropriate?