

1. [3] Suppose $A = \{2, 6, 8\}$, $B = \emptyset$, $C = \{2x | x \in \mathbb{Z}\}$, and $D = \{4, 6, 8\}$. Determine which of these sets are subset of which other of these sets.
2. [2] Determine whether the following statement is true or false.
 - (a) $\emptyset \in \{\emptyset\}$
 - (b) $\{\emptyset\} \in \{\emptyset\}$
3. [3] Let A and B be two sets. If the power set of A is equal to the power set of B , is $A = B$? Justify your answer.
4. [2] Let A , B , C , and D be sets. Is $(A \times B) \times (C \times D) = A \times (B \times C) \times D$? Justify your answer.

1. [2] If A and B are sets such that $A \setminus B = \{2, 5, 6, 8\}$, $B \setminus A = \{1, 10\}$, and $A \cap B = \{3, 7, 9\}$, find the sets A and B .
2. [3] Let A , B , and C be sets, prove $(A \setminus B) \setminus C \subseteq A \setminus C$.
3. [3] Let A , B , and C be sets, prove the (second) associative law. That is, prove:
 $A \cap (B \cap C) = (A \cap B) \cap C$.
4. [2] Let A , B , C , and D be sets. Draw the Venn diagram for $\overline{A} \cup \overline{B} \cup \overline{C} \cup \overline{D}$

1. [3] Determine whether each of these sets is finite, countably infinite, or uncountable.
 - (a) integers greater than 100
 - (b) the set $A \times \mathbb{Z}$, where $A = \{-4, \text{Apple}\}$.
 - (c) the real numbers between 0 and 2
2. [2] Give an example of two uncountable sets A and B such that $A \setminus B$ is countably infinite.
3. [2] Give an example of two uncountable sets A and B such that $A \cap B$ is finite.
4. [3] Suppose that Hilbert's Grand Hotel is fully booked. The hotel, however needs to close all the odd numbered rooms for maintenance. Can the hotel accommodate all its current guests and still complete the maintenance? If possible, describe the algorithm.

1. [3] Describe and algorithm that takes as input a list of n distinct integers and finds the location of the largest even integer in the list or returns -1 if there is no even integers in the list.
2. [2] Use sage to code the above algorithm and run the algorithm on the lists below. Attach the code and the outputs when given the below lists to this assignment.
 - (a) $\{-10, 5, -2, 23, -12\}$
 - (b) $\{-13, 3, 5, -71, 91, 33\}$
3. [5] A palindrome is a string that reads the same forwards as it does backwards. Create and describe and algorithm for determining whether a string of n characters is a palindrome.