

This relatively short homework is due in class on Wednesday, October 8, but there will also be a programming assignment this week that you will be due sometime after the 8-th. Class on Friday, October 3, will be in the Math/CS computer lab, Lansing 310, and you will get started on the programming assignment then.

1. Let A be the set of prime numbers. Let B be the set of positive even integers. Let C be the set $C = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. Let D be the set $D = \{3, 6, 9, 12, 15, 18, 21\}$. Find each of the following sets:

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|---------------|--------------------|--------------------|---------------|
| a) $A \cap B$ | b) $C \setminus B$ | c) $B \setminus C$ | d) $C \cup D$ |
| e) $A \cap C$ | f) $A \cap D$ | g) $C \setminus D$ | h) $C \cap D$ |

2. Let S be the set $S = \{\emptyset, r, \{r\}\}$. Find the powerset, $\mathcal{P}(S)$. (Note that S has three elements.)
3. Consider the two 32-bit integers n and m shown below. Compute the three 32-bit integers $\sim n$, and $n \& m$, and $n \mid m$. What subset of $\{0, 1, 2, \dots, 31\}$ does each of the integers n , m , $\sim n$, $n \& m$, and $n \mid m$ correspond to?

$n = 0011\ 0111\ 1000\ 0010\ 1001\ 1101\ 1111\ 0101$
 $m = 0111\ 0001\ 0011\ 1100\ 0111\ 1001\ 1100\ 0111$

4. (Exercise 2.1.7 from the textbook.) In the English sentence, “She likes men who are tall, dark, and handsome,” does she like an intersection or a union of sets of men? How about in the sentence, “She likes men who are tall, men who are dark, and men who are handsome”? Explain.
5. Suppose that A and B are subsets of some universal set U . Identify the set

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

Explain your answer. You do not need to provide a rigorous proof, but you can do so if you prefer.

6. Prove that for any sets A and B , $A \cup (A \cap B) = A$.