

Fall 2026 COT 3100 Homework #2

- 1) Let $A = \{1, 4, 6\}$ and $B = \{1, 2, 4, 8, 9\}$. Explicitly list the members of the following sets:

$$A \cup B, A \cap B, A - B, B - A, A \times B, \wp(A)$$

- 2) Use the Laws of Set Theory to show that the following for any sets A and B:

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

- 3) Use the Laws of Set Theory to show the following for any sets A, B and C:

$$B - ((B \cap C) \cup (A \cap B \cap C)) = B - C$$

For questions 4 – 6, do not use the Set Table or Set Laws. Write them out using one of the four methods shown in class: (1) direct proof, (2) direct proof of contrapositive, (3) proof by contradiction or (4) disproof via counter-example.

- 4) Prove or disprove the following assertion about finite sets A, B and C:

$$\text{If } C - A \subseteq C - B, \text{ then } B \subseteq A.$$

- 5) Prove or disprove the following assertion about finite sets A, B and C:

$$\wp(A) \cap \wp(B) = \wp(A \cap B).$$

- 6) Prove the following assertion about finite sets A, B, C and D:

$$(A \cap B) \times (C \cap D) = (A \times C) \cap (A \times D) \cap (B \times C) \cap (B \times D)$$

Note: This question is lengthy because it requires two directions of proof, showing that the left is a subset of the right AND that the right is a subset of the left.

- 7) Determine, the number of integers in between 1 and 1,234,567 that are divisible by 10, 14 or 35?

- 8) Consider finite sets A, B and C where we know the following cardinalities of sets:

$$\begin{aligned} |A \cap C| &= 0 \\ |A \cup B| &= 27 \\ |B \cap C| &= 7 \\ |A \cup B \cup C| &= 31 \end{aligned}$$

Determine $|C|$.

9) (Optional) Write a Python or C program that asks the user to enter two sets of integers, A and B, and prints out the members of each of the following sets:

$$A \cup B, A \cap B, A - B, B - A, A \times B, \wp(A), \wp(B)$$

Note: This is much easier in Python. Also, the last two items have a natural tie in to bitwise operators, if you want practice with those.