CS1800
Fall 2025
Recitation 5 - Practice Questions for Homework 3
October 8 & 9, 2025

Recitations

CS1802 Recitations are dedicated time set aside to work on practice problems that specifically prepare you for the current homework or upcoming quiz.

Recitations are in-person and attendance is expected.

The solutions are published at the same time as the problems, so you can check your work. There is no need to submit anything.

Approaching the Problems

These practice problems are labelled according to which Homework or Quiz topic they will help you prepare for. You do not need to complete every practice question; we encourage you to do at least one per topic, and to prioritize the topics you would like to practice.

Instructors & Teaching Assistants

Your recitation is led by a Khoury College professor, assisted by a knowledgeable and wonderful Teaching Assistant. Professors and TAs are fantastic resources, and you have the opportunity in recitation to work with them in a smaller group -- I strongly recommend you take advantage of the time to review your solutions to these practice problems, ask for help on the homework, or review material from lecture.

Practice Problems for Set Equality (HW3, Question 1)

For each pair of set expressions below, determine whether the resulting sets are equal.

- **If yes...** Apply the laws of set equality to prove that they are the same. Take one step at a time and label each step with one law.
- **If no...** give example elements for *A, B, C*, and the universal set *U* if necessary, that would yield a counterexample. Plug in your choices for *A, B, C* and *U* to show the sets are not the same.

For full credit, both *yes* and *no* answers should be clear, precise, and walk through your solution one small step at a time.

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

$B \cup \overline{A}$

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

$\overline{B}$

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

$A \cap B$

Part D $(A \cap B) \cup (C - A) \cup (C - B)$

$(A - \overline{B}) \cup C$

Practice Problems for Set Builder Notation (HW3, Question 2)

Consider the subsets $A = \{6, 7, 9\}$ and $B = \{1, 3, 5, 7\}$ of the universal set $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$. Express each of the following sets in roster notation. This week's handout on sets defines all operators used below.

A $\{ x \in A \mid x \; is \; prime \}$

B $A - B$

C $\{x \mid 3x \in A\}$ (*hint*:a universal set *U* has been declared above, ensure each *x* is in *U*)

D $A \times B$

E $A \Delta B$

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

Practice Problems for Set Cardinality (HW3, Question 3)

Suppose you have sets A, B, C with the following cardinalities:

- $|A| = 12$
- $|B| = 18$
- $|C| = 7$
- $|A \cap B| = 8$
- $|A \cap C| = 3$
- $|B \cap C| = 2$
- $|A \cap B \cap C| = 1$

A What is $|A \cup B|$?

B What is $|B \cup C|$?

C What is $|A \cup B \cup C|$?

It's playoff season, and you're gathering your friends for some watch parties. You have asked a group of your friends and found that:

- 7 of your friends want to watch the WNBA playoffs (women's basketball).
- 5 of your friends want to watch the MLB playoffs (men's baseball).
- 3 of your friends want to watch both playoffs.
- 2 of your friends hate sports and don't want to watch either.

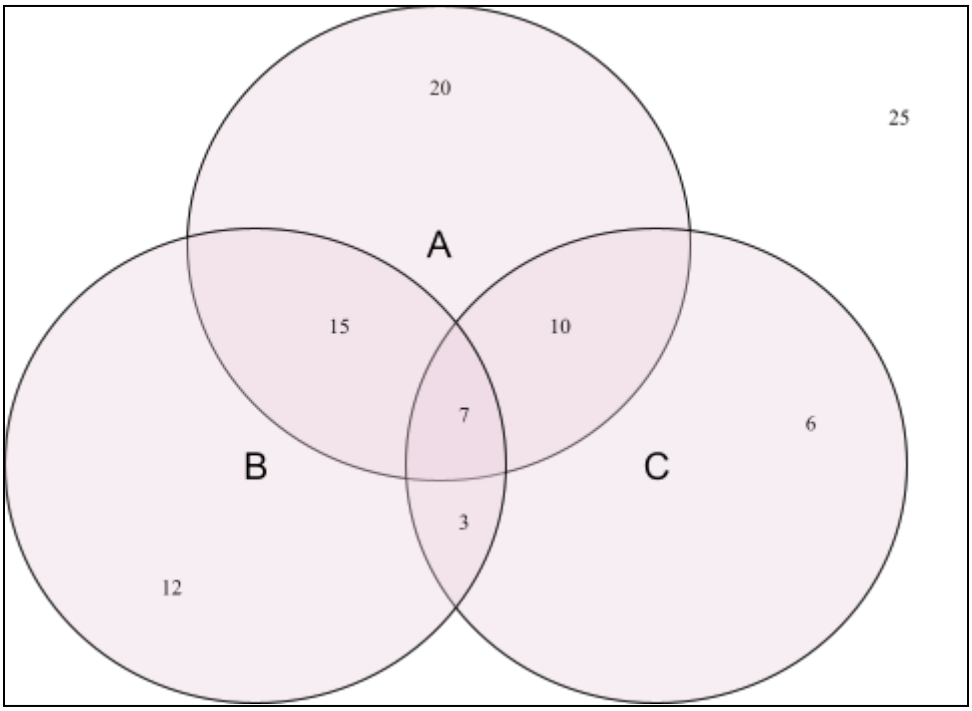
D How many friends did you ask?

E How many friends like the WNBA and not the MLB?

F How many friends want to watch exactly one sport?

G How many friends want to watch at least one sport?

Answer the following questions based on the Venn Diagram below.



H What is the cardinality of the universal set, $|U|$?

I What is $|A|$?

J What is $|A - B|$?

K What is $|A \cup B|$?

L What is $|A \cup B \cup C|$?

M What is $|(A \Delta B) \cup C|$?

Practice Problems for Set Functions (HW3, Question 4)

For any two sets *A* and *B*, define *foo(A, B)* as the set $\{b \mid \exists a \in A \ \exists b \in B \ (b = 3a)\}$. In the subparts below, you are given *A* and *B*, and you are asked for the set *foo(A,B)*. Give your answer in roster notation.

A If $A = \{2\}$ and $B = \{6\}$, what is *foo(A,B)*?

B f $A = \{2\}$ and $B = \{5, 6, 7, 8, 9\}$, what is *foo(A,B)*?

C If $A = \{2, 3\}$ and $B = \{5, 6, 7, 8, 9\}$, what is *foo(A,B)*?

D If $A = \{2, 3\}$ and $B = \{5, 7, 10, 11, 12\}$, what is *foo(A,B)*?

For any two sets *A* and *B*, define *bar(A, B)* as the set $\{c \mid \forall a \in A \ \exists b \in B \ (c = a + b)\}$. In the subparts below, you are given *A* and *B*, and you are asked for the set *bar(A,B)*. Give your answer in roster notation.

E If $A = \{2, 3\}$ and $B = \{1, 2\}$, what is *bar(A,B)*?

F If $A = \{2, 3\}$ and $B = \{0, 1, 2, 4, 5, 6\}$, what is *bar(A,B)*?

Each of the collections listed below is either (1) a powerset of a set *A,* or (2) could not possibly be the powerset of anything. Your solution should: define *A* in roster notation, or declare that the collection could not be the powerset of anything.

G $\{\{\},\{a\},\{b\},\{c\}\}$

H $\{\{\},\{1\}, \{2\}, \{3\}, \{1, 2\}, \{1, 3\}, \{2, 3\}, \{1, 2, 3\}\}$

I $\{\{\}, \{1, 2\}, \{1, 3\}, \{2, 3\}, \{1, 2, 3\}\}$

Practice Problems for Counting (HW3, Question 5)

A Your running wardrobe consists of 5 singlets, 3 pairs of shorts, and 17 sports bras. How many different outfits can you make which have one singlet, one pair of shorts and one sports bra?

B Suppose you have two sets, A and B with $|A| = 10,\ |B| = 5.$ What is: the largest possible value for $|A \cap B|,$ the smallest possible value for $|A \cap B|$, and the possible values for $|A \cup B|$?

C If there are n Khoury faculty members in Boston, how many ways are there to form a faculty committee of any size?

D How many three-letter initials (such as RBG) contain exactly two As? (Assume all letters are capital.)