

Homework 2: Due Friday, February 3

Problem 1:

- Determine the set $\{1, 2\} \times \{1, 2, 3\}$, i.e. write out the set of elements explicitly.
- Determine the set $\{1, 2, 3\} \times \{4, 5, 6\}$.
- In light of the previous two examples (and the examples from class), make a conjecture about the value of $|A \times B|$ is in terms of $|A|$ and $|B|$.

Problem 2: Given three sets A , B , and C , we let $A \times B \times C = \{(a, b, c) : a \in A, b \in B, c \in C\}$ be the set of all ordered triples whose first coordinate comes from A , whose second coordinate comes from B , and whose third coordinate comes from C . Explain the difference between $A \times B \times C$ and $A \times (B \times C)$.

Note: It might help to example some concrete examples of sets A , B , and C .

Problem 3: Does $|A - B| = |A| - |B|$ in general? Either explain why this is true, or give a concrete example where it fails.

Problem 4: Give an example of three finite sets A_1, A_2, A_3 such that $A_1 \cap A_2 \cap A_3 = \emptyset$ but

$$|A_1 \cup A_2 \cup A_3| \neq |A_1| + |A_2| + |A_3|.$$

Problem 5: (Exercise 1.11.4) Write a function `divideAll` that takes two ints and returns the result of dividing the first by the second. Specifically, it should return a tuple with components: The (integer) quotient, the (integer) remainder, and the (real) quotient. For example, `divideAll(13, 4)` should return `(3, 1, 3.25)`. If the divisor is 0, it should return `(0, 0, 0.0)`.

Problem 6: (Exercise 1.12.2) Write a function `reverse` that takes a string and reverses it. For example `reverse("hello")` should return `"olleh"`.

Problem 7: (Exercise 1.12.7) A series in the form $\sum_{i=0}^n ar^i$ is called a *geometric series*. That is, given a value r and a coefficient a , find the sum of $a + ar + ar^2 + ar^3 + \dots + ar^n$. Write a function that computes a geometric series, taking n , a , and r as parameters.

Note: a and r should be real numbers, but n should be an integer (which is assumed to be greater than or equal to 0).