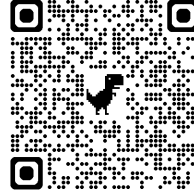


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CS10 Spring 2025

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**Discussion 3: Domain / Range, HOFs**

**Instructions:**

- If you're attending this section in-person, please log into iClicker!
- If you missed this discussion, fill out this entire worksheet, and upload it to the Gradescope assignment titled "Discussion 3" by next Discussion.
- Please open up [snap.berkeley.edu/run](https://snap.berkeley.edu/run) on your computer.
- For today's discussion during the Snap! Scavenger Hunt, you can either explain the process in words, show a screenshot, or draw the block/process.

**Group Activity / Question of the Day**

- Ask the person to you – in front / right / left / behind / – if they'd rather live in a house that's always a bit too hot, or a house that's always a bit too cold. Why? What's the average temperature in your hometown?

## Required (Pages 2 - 5):

### Assigned Reading

What is an example of abstraction in your daily life? Using this example, give one reason why abstraction is helpful and another reason how it can do more harm than good.

### Section I - Data-types, Domain, & Range

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1. Write down the following for the blocks below: 'type', domain, and range:

| <i>Block</i>                                                                        | <i>Type</i> | <i>Domain</i> | <i>Range</i> |
|-------------------------------------------------------------------------------------|-------------|---------------|--------------|
|  |             |               |              |
|  |             |               |              |
|  |             |               |              |
|  |             |               |              |

2. Now, suppose that  $f(g(f(g(f(g(x))))))$  does not error for any  $x$  that is part of  $g$ 's domain. Which of the following statements must be True? Circle your answer(s).

- A.  $g$ 's range is a subset of  $f$ 's domain.
- B.  $g$ 's range is a subset of  $f$ 's range.
- C.  $g$ 's domain is a subset of  $f$ 's range.
- D.  $g$ 's domain is a subset of  $f$ 's domain.
- E.  $g$ 's range is equal to  $f$ 's domain.
- F.  $g$ 's range is equal to  $f$ 's range.
- G.  $g$ 's domain is equal to  $f$ 's domain.
- H.  $g$ 's domain is equal to  $f$ 's range.
- I.  $f$ 's range is a subset of  $g$ 's domain.
- J.  $f$ 's range is a subset of  $g$ 's range.
- K.  $f$ 's domain is a subset of  $g$ 's range.
- L.  $f$ 's domain is a subset of  $g$ 's domain.

3. Consider the following expression. Determine the data types of each function's input and output. If the function does not have an output, enter: none



| Function Name | Domain | Range |
|---------------|--------|-------|
| foo           |        |       |
| sqrt          |        |       |
| function      |        |       |

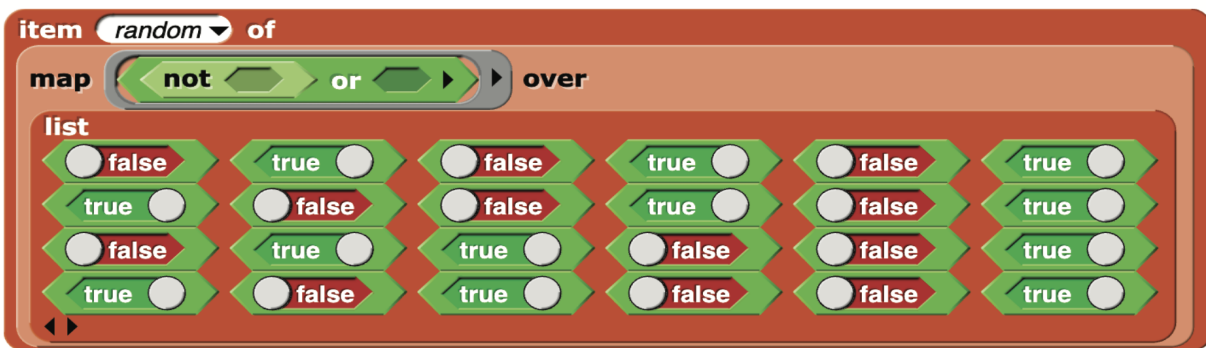


| Function Name    | Domain | Range |
|------------------|--------|-------|
| mystery          |        |       |
| all but first of |        |       |
| foo              |        |       |
| function         |        |       |

## Section II - Higher Order Functions (HOFs)

1. Using HOFs, find the square of each number in list [1, 2, 3, 4, 5] and then sum them all together.

2. What does the following block report?



- ☐ True
- ☐ False
- ☐ It errors, because we can't pass in predicates in map blocks
- ☐ It depends - the output could be True or False, since selection is random.

3. What does the following block report?

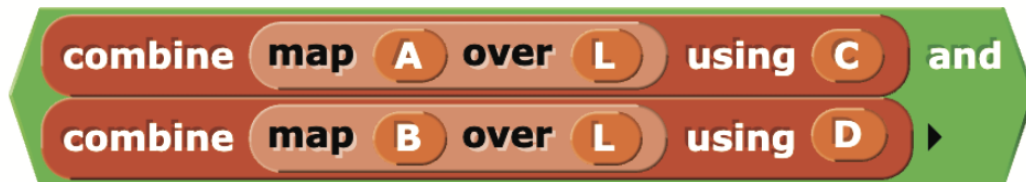


4. Answer the following questions based on the prompt below. This is a challenging, past exam question!

$L$  is a list of numbers. I want to verify that the minimum value in  $L$  is larger than  $s$ , and smaller than  $b$ , where  $s$  and  $b$  are numbers. Basically, we're reporting whether  $s < \min(L) < b$ .

For example: suppose  $L$  is the list  $[50, 0, 20, -10]$ . The minimum value is  $-10$ . If  $s = -20$  and  $b = 20$ , then we report `True` since  $-20 < -10 < 20$ . But if  $s = -20$  and  $b = -15$ , then we'd report `False` since  $-20 < -10$  but  $-10 > -15$ .

We'll do this in Snap! using higher-order functions, with the following block:



Note: In the following problems, you may **not** use the following blocks:

`max`, `min`, `length of __`, `item __ of __`

- [4pts]** 1. What should we place in the spot labeled 'A'? Write the block and any needed arguments.

- [4pts]** 2. What should we place in the spot labeled 'B'? Write the block and any needed arguments.

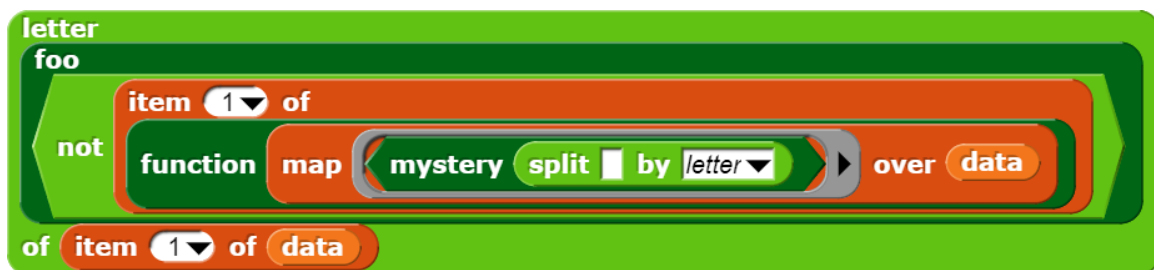
- [4pts]** 3. What should we place in the spot labeled 'C'? Write the block and any needed arguments.

- [4pts]** 4. What should we place in the spot labeled 'D'? Write the block and any needed arguments.

## Optional Section (Extra Practice):

### Optional Section I - Data-types, Domain, & Range

- Suppose that  $f$  and  $g$  are two *monadic* blocks. The expression  $f(g(x))$  does not error for any value  $x$  that's within the domain of  $g$ . This implies that the \_\_\_\_a\_\_\_\_ of \_\_\_\_b\_\_\_\_ is a subset of the \_\_\_\_c\_\_\_\_ of \_\_\_\_d\_\_\_\_. What should  $a, b, c, d$  be?
- Consider the following expression. Determine the data types of each function's input and output. If the function does not have an output, enter: none



| Function Name | Domain | Range |
|---------------|--------|-------|
| Split _ by _  |        |       |
| mystery       |        |       |
| map           |        |       |
| function      |        |       |
| foo           |        |       |
| Letter _ of _ |        |       |

### Optional Section II - Higher Order Functions (HOFs)

- What does the following block



report?

2. What does the following block report?



3. Suppose we have a list of names and grades. Write a function that converts the “Exam” for each person into a “Pass” or “No Pass”. Passing is a 70 or higher.



| 5 | A        | B       |
|---|----------|---------|
| 1 | Name     | Exam    |
| 2 | Victoria | No Pass |
| 3 | Andrew   | No Pass |
| 4 | Naveen   | Pass    |
| 5 | Stacey   | Pass    |

4. Using one **map** block, and without defining any other helper procedures, write a block that takes in a list like [1, 2, 0, 2, 3], and shifts every element one place to the right, replacing the left-most element with “Oops”, i.e. it would return: [“Oops”, 1, 2, 0, 2].