UNIVERSITY OF CALIFORNIA, BERKELEY
Department of Electrical Engineering and Computer Sciences
Computer Science Division

CS10 Spring 2026 **TA: Nahee Jeong**





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 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

---

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

Block	***Type***	***Domain***	***Range***
	command	number	None – since it is a command and commands don't have outputs
	reporter	numbers	number
	predicate	Number And drop down menu	boolean
	predicate	List (on the left) Anything (on the right)	boolean

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.

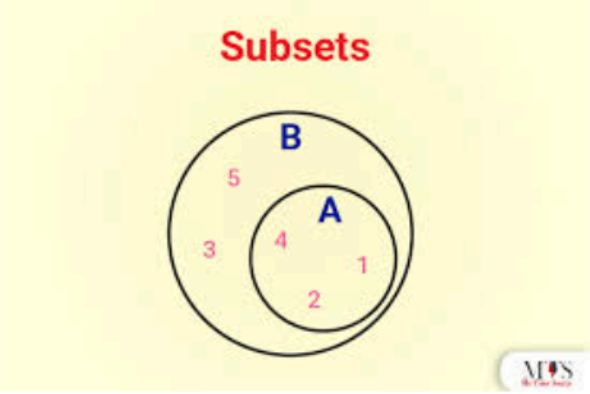
K. f's domain is a subset of g's range.

L. f's domain is a subset of g's domain.

What are subsets?

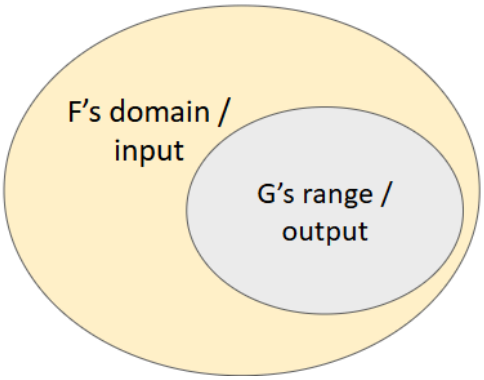
- A is a subset of B
- B is **NOT** a subset of A though
- {4, 2, 1} is a subset of A
- {4, 2, 1} is a subset of B
- {3, 5} is a subset of B

Example:
All cats are animals. But not all animals are cats! **So cats are a subset of animals.**



Subsets + Domain / Range

- 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).



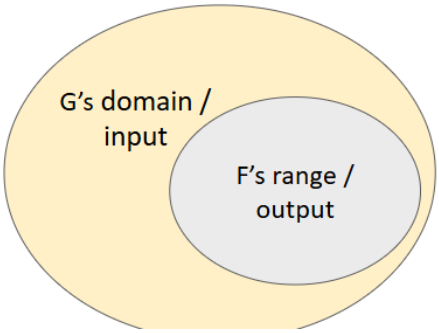
f(g(x))

x could be anything

F might also be able to accept other inputs though!

Subsets + Domain / Range

- 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).



g(f(x))

x could be anything

G might also be able to accept other inputs though!

Correct Answers:

A. g's range is a subset of f's domain.

I. f's range 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	boolean	number
sqrt	number	number
function	number	Could be anything!

To figure out what the domains are, we have to see what is being passed into the function. We know a boolean value (true) is being passed into foo. Therefore, foo accepts booleans.

To figure out what the range is, we have to see where the functions is being passed into. Since foo is being passed into “sqrt of” and “sqrt of” only accepts numbers as an input, then we know that foo must report numbers as it’s output



Function Name	*Domain*	*Range*
mystery	number	list
all but first of	list	list
foo	list	predicate
function	predicate	None

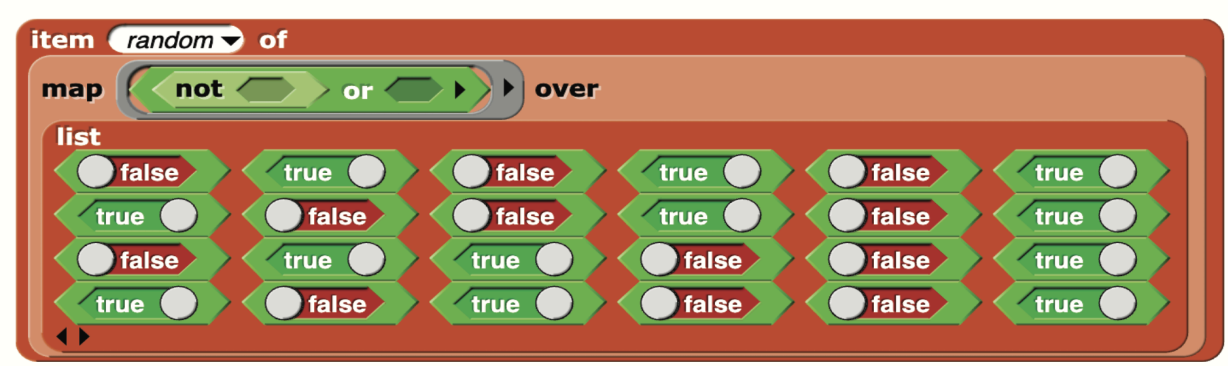
Section II - Higher Order Functions (HOFs)

---

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.

The answer is True.
Since the list is a list of boolean values (either True or False), then we apply the map function: (not _) or _
We are either going to be (not True) or True which simplifies to False or True which evaluates to True
Or, we are going to get (not False) or False which simplifies to True or False which also evaluates to True.
So either way, the (not _) or _ is going to report True. When we grab a random item for the list – since all the items are True, we will always report True

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.

Answer:



For a more detailed explanation, please refer to these slides!

Optional Section (Extra Practice):

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

---

1. 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?

2. 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 _		

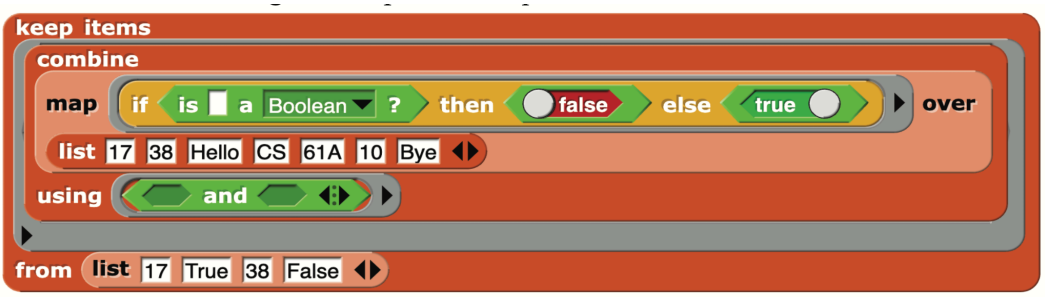
Optional Section II - Higher Order Functions (HOFs)

---

1. 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].