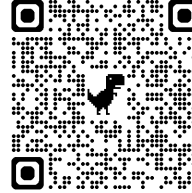


UNIVERSITY OF CALIFORNIA, BERKELEY
Department of Electrical Engineering and Computer Sciences
Computer Science Division

CS10 Spring 2025

TA: Victoria



Discussion 4: Algorithmic Complexity + Quest Practice

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 4" by next Discussion.
- Please open up snap.berkeley.edu/run on your computer.
- You can either explain the process in words, show a screenshot, or draw the block/process.

Group Activity / Question of the Day

- Look at the person diagonally across from you (or, if in a line, pick someone two spots away). Ask them, "If you could time travel, but ONLY in one direction, would you rather go 100 years into the past or 100 years into the future? Why? And what's something from today you'd bring with you or do to help survive (or thrive) in that time?"

Required (Pages 2 - 4):

Assigned Reading

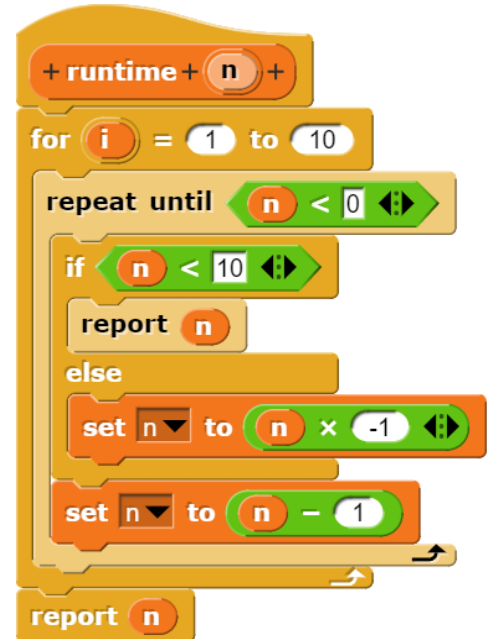
Algorithms are all around us! Some are good, but some can have bad consequences. Can you come up with an example where algorithms have done harm?

Section I - Algorithmic Complexity

1. What is the best case runtime for this function?

2. What is the worst case runtime for this function?

3. If the input, n , was 100, what would the function return?



Section II - Numeral Representation

1. Convert the number 18 from decimal to binary.

2. Convert the number 18 from decimal to hexadecimal.

Section III - Functions + Iteration

- Now, suppose we have a composite function $z(x) = 2|(x + 1)|^2$. Using the functions below, how can compose $h(x)$ to be in its current form. Represent your answer as $a(b(c(d(e(f(g(h(x)))))))$ form.

$$a(x) = x^2 \quad b(x) = x + 1$$

$$c(x) = 2x. \quad d(x) = |x|$$

$$e(x) = \sqrt{(x)} \quad f(x) = x^3$$

$$g(x) = x \div 2 \quad h(x) = \log x$$

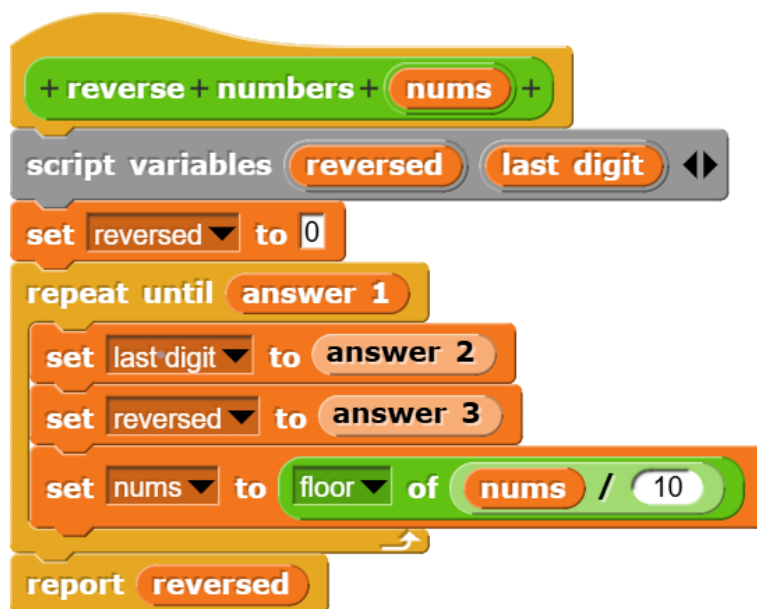
- Complete the function *reverse numbers(nums)* that takes a positive integer *nums* and returns its digits in reverse order. Use the repeat until block and mathematical operations—do not use string manipulation or the join block.

- What should *answer 1* be?

reverse numbers 729 927

- What should *answer 2* be?

- What should *answer 3* be?



Section IV - Higher Order Functions (HOFs)

1. Using HOFs and named inputs, write a function that filters out the odd indices (only keep the even indices), and then doubles the value. Any HOFs you implement must use the named inputs. This is how the function should behave:

filter out the even indices and double value

list 1 2 3 4



2. Using one map block and named inputs, write a block that takes in a list like [5, 6, 7, 8] and shifts every element one place to the left, replacing the right-most element with "Alonzo". The function should behave like this:

right shift mapper

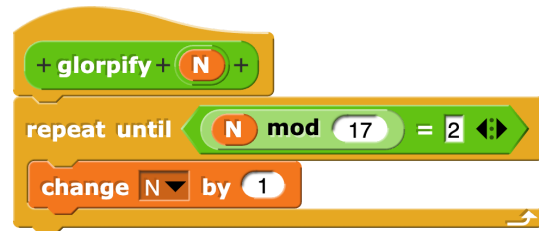
list 5 6 7 8



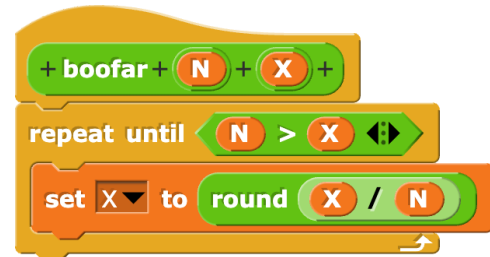
Optional Section (Extra Practice):

Optional Section I - Algorithmic Complexity

1. What is the worst case runtime for the following glorpify function?



2. *Extra Challenge:* What is the worst case runtime for the following boofar function?



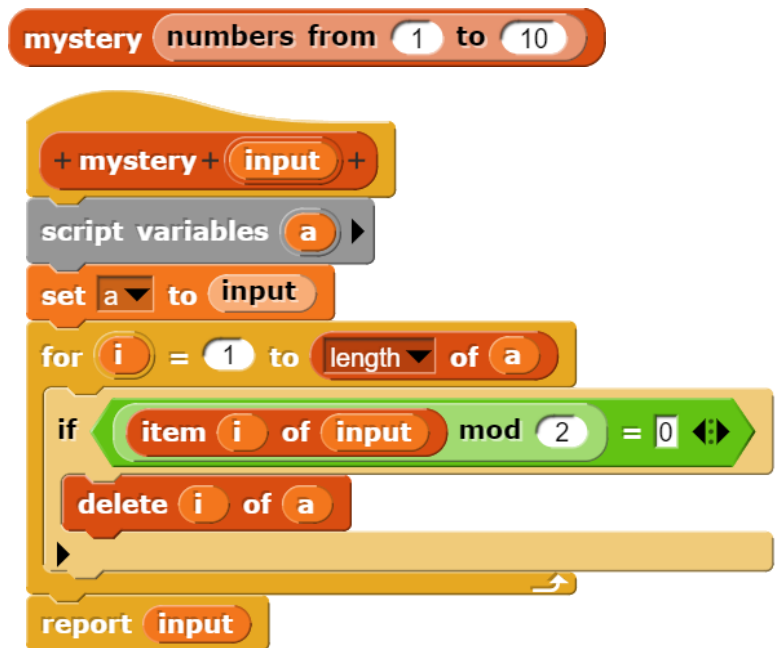
Optional Section II - Numeral Representation

1. Convert 0b101 to decimal.
2. Convert 0x101 to decimal.
3. Convert 101 in decimal to binary.
4. Convert 101 in decimal to hexadecimal.

Optional Section III - Functions + Iteration

1. What must be true about the relationship between the domains and ranges of two functions f and g if the composition $f(g(x))$ never results in an error?

2. What will the mystery function report with the following inputs?



Optional Section II - Higher Order Functions (HOFs)

1. What does the following block report?



2. How many items will the following block report? If the block will cause an error, write "error". If the answer depends on the functions r1, r2, and/or r3, write "r"

