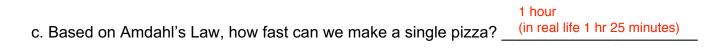
## **Discussion 5: Concurrency**

## Concurrency

1. CS10 has decided to open a pizzeria! To make a pizza, the following tasks must be completed:

Task	Time		
Make the dough	25 minutes		
Make the sauce	25 minutes		
Prepare the toppings	10 minutes		
Assemble the pizza	10 minutes		
Bake the pizza	50 minutes		

- a. Which of these tasks must be completed in serial? Assemble Pizza, Bake pizza
- b. Which of these tasks can be completed in parallel? Make dough, make sauce, prepare toppings



d. How many employees would the pizzeria need to make a pizza this fast? (in real life 3 workers)

e. Would adding an employee to your answer from part (d) change the time it takes to make a pizza?

No it would not because we are limited by the serial portion

2. Assume we click the green flag to run the code below, then wait 60 seconds. What are all the possible values of magic after 60 seconds have elapsed?

when Not clicked	when I receive Magic Show
set magic to X	wait pick random 1 to 5 secs
broadcast Magic Show	repeat until magic = A or magic = B
integre enterna	broadcast Magic Show -
	set magic - to C
when I receive Magic Show	when I receive Magic Show -
wait pick random 1 to 5 secs	wait pick random 1 to 5 secs
repeat until magic = B or magic = C	repeat until magic = A or magic = C
broadcast Magic Show -	broadcast Magic Show -
set magic - to A	set magic - to B

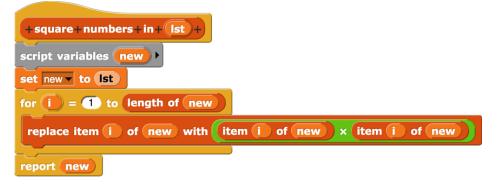
Possible values of magic: X the code will get caught in a deadlock

3. Which of the following could be the value of my\_name after the green flag is clicked?

when	<b>clicked</b>			when	clicked		
wait (	pick random	1 to 3	secs	wait (	pick random 🚺	) to 3	secs
set m	ny name 🗸 to 🛽	Dan		set my	name 🔻 to Garcia	a	
wait (	pick random	1 to 3	secs	wait (	pick random 🚺	) to 3	secs
set m	ny name 👻 to 🤇	join (my nam		set my	name 🗸 to join	(my nai	me Bear 🕩
Dan	Garcia	Dan Bear	Garcia Oski	Dan BearOski	Garcia Dan	Oski	Dan OskiBear

## Testing

The following questions are based off this block:



1. We try to test our code, but we get an error. What does it mean and how can we fix it?



The test block requires that all inputs for the function being tested be contained in a list. Here the input is a two-item list, so this list must be inserted into an outer list. The correct input should be list(list(1, 2)). Note that this is not true for the outputs (i.e., the output given here is formatted correctly). As a side note, if you ever see the error message above, you are probably using lists incorrectly somewhere in your code, likely by passing an invalid argument to a function.

2. Now, we try to run the following test, but it doesn't work as expected:



Why does it output this, and how could we fix it?

square numbers is mutating the input list! The first time we run square numbers with my list, the list is changed to [1, 4]. That means that the second time we try to run square numbers with input my list, we are running the function with input [1, 4]. This gives us output [1, 16] (not matching our expectations, and thus failing the test). We can fix this by making sure that square numbers is not using the replace block to mutate the input list. Instead, it should square the values in the input list and add them to a new output list (perhaps by using HOFs).

3. Assuming we haven't changed the code for square numbers, what should we expect this block to output? Is it any different from the output from part 2?



The test block will output [True, True] here. square numbers still mutates the input list, but because we are using a different input list each time we call square numbers, the mutation is not propagated between test cases. This example highlights the (often tricky) subtlety of mutability, as well as the necessity of having comprehensive test cases. If our test cases did not try using the same list as input twice, we would not catch the bug.

## Challenge

1. List all possible values of grade after the green flag is clicked.

set G	when clicked set Grade to 10 broadcast Apply Final Grading		
when I receive Apply Final Grading	when I receive Apply Final Grading		
Apply EPA Get Grade – 5	set Grade v to Get Grade × Get Grade		

Here are the definitions of the blocks used in the above scripts:



Possible values of grade:

Using a strategy similar to those described above, we can compute that the possible values are 225, 150, 105, and 195.