Feedback — Homework 1

Help Center

Thank you. Your submission for this homework was received.

You submitted this homework on **Sat 18 Jul 2015 7:49 PM EDT**. You got a score of **90.00** out of **100.00**. You can attempt again, if you'd like.

> *"Searching is half the fun: life is much more manageable when thought of as a scavenger hunt as opposed to a surprise party."* - Jimmy Buffett
>
> *“This is the part in the class where that guy says, "Zombies? What zombies?" just before they eat his brains. I don't want to be that guy.”* - Holly Black, Kin

Question 1

Growth of functions

Review the math notes on the growth of functions. Which of the following functions grow at the same rate as $\frac{1}{2}\,n^2 - 5n + 20$?

Your Answer		Score	Explanation
○ $n\log(n)$			
○ n^3			
● n^2	✓	10.00	Correct. The ratio of n^2 and $\frac{1}{2}\,n^2 - 5n + 20$ tends to 2 as n grows large.
○ n			
Total		10.00 / 10.00	

Question 2

Many algorithms for sorting a list of numbers use comparisons (like greater than or less than) to determine the sorted order of the list. The problem of building fast sorting algorithms using comparisons is well-studied. In fact, we will consider a very elegant sorting algorithm of this type next week.

The fastest algorithms for sorting a list of size n share a bound (specified as a simple expression in n) for the minimal number of comparisons required to sort **any** list of length n. Use a web search engine (like Google) to look up this estimate and select the answer below that grows at the same rate as this expression.

Your Answer		Score	Explanation
● $n\log(n)$ comparisons	✓	10.00	Yes. In fact, you can prove that comparison sorts require some multiple of $n\log(n)$ comparisons to sort a list.
○ n^2 comparisons.			
○ n comparisons			
○ 2^n comparisons.			
Total		10.00 / 10.00	

Question 3

Review this week's practice activity on sorting strings. The activity discusses a grid-based method for sorting strings that does not require comparisons. Given a list of n three-letter words, which expression grows as the same rate as the number of statements executed during this sort?

Your Answer	Score	Explanation

● n	✓	10.00	Correct. Remember a constant multiple of n grows at the same rate as n.
○ $\log(n)$			
○ n^2			
○ $n\log(n)$			
Total		10.00 / 10.00	

Question 4

Stacks and queues

Consider a stack in which we have performed n pushes followed by n pops. Which of the following are true statements concerning this sequence of operations?

Your Answer		Score	Explanation
□ The last element pushed onto the stack is the last element popped off of the stack.	✓	2.00	
☑ The first element pushed onto the stack is the last element popped off of the stack.	✓	3.00	
☑ The last element pushed onto the stack is the first element popped off of the stack.	✓	2.00	
□ The first element pushed onto the stack is the first element popped off of the stack.	✓	3.00	
Total		10.00 / 10.00	

Question 5

Consider a queue in which we have performed n enqueues followed by n dequeues. Which of the following are true statements concerning this sequence of operations?

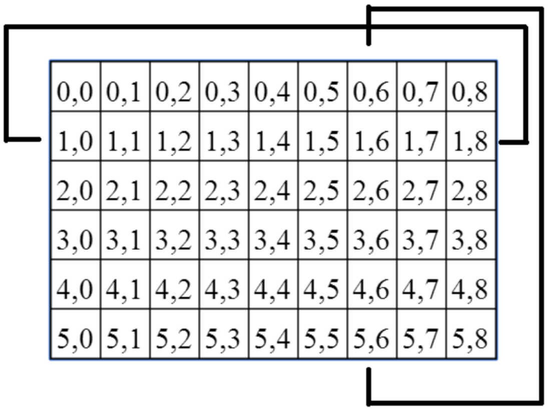
Your Answer		Score	Explanation
□ The first element enqueued into the queue is the last element dequeued out of the queue.	✓	3.00	
☑ The first element enqueued into the queue is the first element dequeued out of the queue.	✓	3.00	
☑ The last element enqueued into the queue is the last element dequeued out of the queue.	✓	2.00	
□ The last element enqueued into the queue is the first element dequeued out of the queue.	✓	2.00	
Total		10.00 / 10.00	

Question 6

2D grids

Review the provided implementation for this week's grid class. In this implementation, the methods `four_neighbors` and `eight_neighbors` treat the boundaries of the grid as being impassable.

An alternative approach is to treat cells with the same row index on the left and right boundaries as being adjacent and cells with the same column index on the top and bottom boundaries as being adjacent. The thick lines in the figure below indicate that the cells `(1, 0)` and `(1, 8)` are horizontally adjacent while the cells `(0, 6)` and `(5, 6)` are vertically adjacent.



0,0	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8
1,0	1,1	1,2	1,3	1,4	1,5	1,6	1,7	1,8
2,0	2,1	2,2	2,3	2,4	2,5	2,6	2,7	2,8
3,0	3,1	3,2	3,3	3,4	3,5	3,6	3,7	3,8
4,0	4,1	4,2	4,3	4,4	4,5	4,6	4,7	4,8
5,0	5,1	5,2	5,3	5,4	5,5	5,6	5,7	5,8

Which of the following code fragments correctly computes `four_neighbors(row, col)` when the top/bottom rows and left/right columns are treated as being adjacent?

Your Answer		Score	Explanation

●
up = (row - 1) % (self._grid_height - 1)
down = (row + 1) % (self._grid_height - 1)
left = (col - 1) % (self._grid_width - 1)
right = (col + 1) % (self._grid_width - 1)
return [[up, col], [down, col], [row, left], [row, right]]
	✖	0.00	No. You are off by one on the boundary.

○
up = (row - 1) % (self._grid_height + 1)
down = (row + 1) % (self._grid_height + 1)
left = (col - 1) % (self._grid_width + 1)
right = (col + 1) % (self._grid_width + 1)
return [[up, col], [down, col], [row, left], [row, right]]			

○
up = (row - 1) % self._grid_height
down = (row + 1) % self._grid_height
left = (col - 1) % self._grid_width
right = (col + 1) % self._grid_width
return [[up, col], [down, col], [row, left], [row, right]]			

○
up = (row - 1) % self._grid_width
down = (row + 1) % self._grid_width
left = (col - 1) % self._grid_height
right = (col + 1) % self._grid_height
return [[up, col], [down, col], [row, left], [row, right]]			

Total		0.00 / 10.00	

Question 7

Breadth first search

Consider the wildfire demo from lecture, which line in the implementation of `update_boundary` checks whether the fire can spread to an unburned cell?

Your Answer	Score	Explanation
○ self.set_full(neighbor[0], neighbor[1])		
● if self.is_empty(neighbor[0], neighbor[1]):	✓ 10.00	Yes. This line checks whether the neighbor cell is unburned (`EMPTY`) or burned (`FULL`).
○ for neighbor in neighbors:		
○ neighbors = self.four_neighbors(cell_index[0], cell_index[1])		
Total	10.00 / 10.00	

Question 8

Consider the case in which one steps through the entire breadth first search of the grid in the wildfire demonstration. Which of the following expressions grows at the same rate as the number of statements executed during this breadth first search? Assume the grid has size m-by-n.

Your Answer	Score	Explanation
○ 2^{m+n}		
○ $m^2\, n^2$		
○ $m + n$		
● $m\, n$	✓ 10.00	Yes. The number of statement executed during breadth first search is proportional to the size of the grid, which is $m \times n$.

Total	10.00 / 10.00

Question 9

Depth first search

Complete this template and implement a `Stack` class. Once your implementation is complete, uncomment the test code at the end of the template and enter the number printed out by this template.

You may wish to create your own test data if you are having trouble with this problem.

You entered:

77

Your Answer		Score	Explanation
77	✓	10.00	Correct.
Total		10.00 / 10.00	

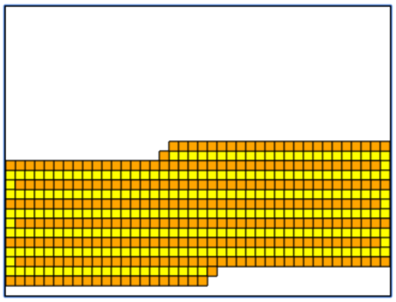
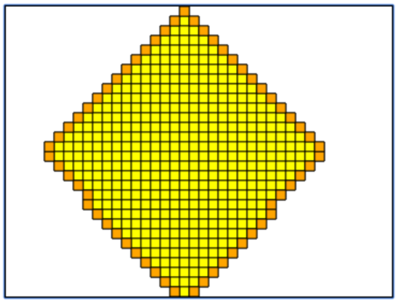
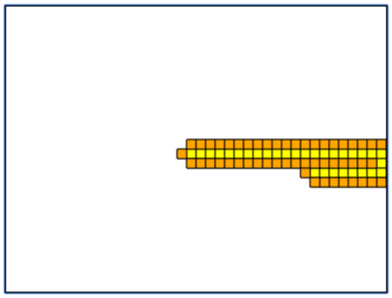
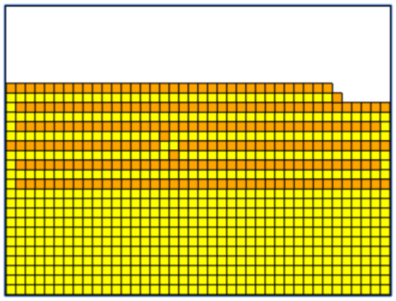
Question 10

Take the provided `Queue` class available here and modify the `enqueue` and `dequeue` methods to behave like the `push` and `pop` methods for your `Stack` class.

Save this modified class definition. Then, take the wildfire demo and import this modified definition for the `Queue` class at the top of the wildfire demo code. In CodeSkulptor, the modified import statement would have the form:

```
import userXX_XXXXX as poc_queue
```

Now, run this modified demo and add a single cell in the middle of the canvas to the boundary queue prior to starting the search. Which of the images below correspond to a possible state of the grid during the resulting depth first search?

Your Answer		Score	Explanation
☑ 	✓	2.00	
□ 	✓	4.00	
☑ 	✓	2.00	
☑ 	✓	2.00	
Total		10.00 / 10.00	