Feedback — Homework 5

Help Center

Thank you. Your submission for this homework was received.

You submitted this homework on Thu 18 Feb 2016 3:47 AM PST. You got a score of 86.00 out of 100.00.

"I arise in the morning torn between a desire to improve the world and a desire to enjoy the world. This makes it hard to plan the day." E. B. White - author of *Charlotte's Web*

Analyzing the Greedy Boss Scenario

In this week's mini-project, we will investigate various strategies for the simple (but popular) game "Cookie Clicker". (If you think Cookie Clicker is silly, just remember that "Farmville" made the founders of Zynga rich.) As a warmup, this week's Practice Activity, The Case of the Greedy Boss, considers a simple scenario that is very similar to Cookie Clicker in which you can repeatedly bribe your boss to have him increase your salary.

This homework will analyze the behavior of the greedy boss simulator for several simple cases. If you have not taken a look at this practice activity, you should work through it first before attempting this homework.

Question 1

Use the function `run_simulations` in the greedy boss simulator to plot the graph of total salary earned as a function of the number of days for `bribe_cost_increment = 0, 500, 1000, 2000`. Which value for `bribe_cost_increment` generates the fastest growth in total salary earned in the simulation?

Remember to compare the plots of the functions over roughly the same number of days.

Your Answer		Score	Explanation
○ 2000			
○ 1000			
◉ 0	✔	10.00	Correct. Lower cost for bribes leads to faster growth in total salary earned.

500			
Total	10.00 / 10.00		

Question 2

One scenario that the greedy boss simulator does not cover is the situation when you refuse to provide a bribe. Which of the following arithmetic sums evaluates to your total salary earned after d days?

Your Answer		Score	Explanation
$1 + 2 + \ldots + (d-1) + d$			
$100 + 200 + \ldots + 100(d-1) + 100d$			
$1 + 1 + \ldots + 1 + 1$ (with d terms in sum)			
$100 + 100 + \ldots + 100 + 100$ (with d terms in sum)	✔	10.00	Correct. You earn 100 dollars per day over d days.
Total		10.00 / 10.00	

Question 3

Reduce the arithmetic sum that you selected in Question 2 to a polynomial expression in the number of days d using the rules for arithmetic sums specified in the Math notes. This expression should evaluate to your total salary earned after d days.

Enter the answer as a math expression below

You entered:

```
100 * d
```

Preview Help

Your Answer		Score	Explanation
100 * d	✔	10.00	Correct. Your salary earned grows linearly.
Total		10.00 / 10.00	

Question 4

For the next three problems, we will consider the case when `bribe_cost_increment == 1000`. First, convert the output of `greedy_boss()` into Log/Log form by taking the logarithm of both `current_day` and the total salary earned using `math.log()` before they appended to the list `days_vs_earnings`.

The plot of the resulting graph approaches a straight line as the number of days increase. This observation signals that the function might be a polynomial function. Compute the slope of this line and round it to the nearest integer to estimate the degree of this polynomial.

You entered:

2

Your Answer		Score	Explanation
2	✔	10.00	Correct. The graph corresponds to a quadratic function.
Total		10.00 / 10.00	

Question 5

Examine the output of the simulation `greedy_boss(50, 1000)`. Note you accumulate enough savings to pay a bribe once every 10 days.

Which of the arithmetic sums below evaluates to the total salary earned after n bribes?

Your Answer	Score	Explanation
○ $1000 + \frac{1000}{2} + \frac{1000}{2^2} + .. + \frac{1000}{2^n}$		

$1000 + 1000 + 1000 + \ldots + 1000$			
$1000 + 2000 + 3000 + \ldots + 1000n$	✔	10.00	Correct. The total salary earned grows at a quadratic rate.
$1000 + \frac{1000}{2} + \frac{1000}{3} + \ldots + \frac{1000}{n}$			
Total		10.00 / 10.00	

Question 6

Reduce the arithmetic sum that you selected in Question 5 to a closed-form expression in n using the rules for arithmetic sums specified in the Math notes. This expression should relate total salary earned to the number of bribes.

Finally, use the fact that each bribe happens once every 10 days to derive a polynomial expression that approximates the total salary earned in terms of the number of days d. As a check, this expression in d should evaluate exactly to the total salary earned by the end of the day of each bribe.

Enter this expression in d as a math expression below.

You entered:

(1+n)*n*500

Preview Help

Your Answer		Score	Explanation
(1+n)*n*500	✔	5.00	Partially correct. You have need to rewrite this expression in terms of d instead of n.
Total		5.00 / 10.00	

Question 7

The next two questions will examine the case when the cost of a bribe does not increase, i.e; `bribe_cost_increment == 0`. Our first task is to check whether the total salary earned is a polynomial function of the number of days in this case. To this end, create a Log/Log plot of the output of `greedy_boss` and examine the resulting graph.

Does the graph approach a straight line as the number of days increases?

Your Answer		Score	Explanation
◉ No, the graph does not approach a straight line.	✔	10.00	Correct. This observation means the the function can not be a polynomial.
○ Yes, the graph approaches a straight line.			
Total		10.00 / 10.00	

Question 8

To conclude our analysis of this case, we will do some manual experimentation to locate an expression in d that grows at a similar rate to total salary earned when `bribe_cost_increment == 0`.

Compare the growth rates of the expressions below to the growth rate of total salary earned using the plotting technique described in the Math notes. Which expression grows at approximately the same rate as total salary earned?

Your Answer		Score	Explanation
◉ $e^{0.095d}$	✔	10.00	Correct. The ratio of the two quantities approaches a constant (approximately) as d increases.
○ $95d^2$			
○ $9.5d^4$			
○ $e^{9.5d}$			
Total		10.00 / 10.00	

Question 9

In the next two questions, we will consider a simple version of Cookie Clicker in which there is only one possible upgrade option. Instead of increasing the cost of an upgrade by some fixed amount after each upgrade as done in the greedy boss simulator, each upgrade in Cookie Clicker costs 15% more than the cost of the previous upgrade. (Note that this cost compounds in the same manner that interest does.)

If the first upgrade costs one unit, enter a math expression that models the cost of the nth upgrade.

You entered:

Preview Help

Your Answer		Score	Explanation
	✖	0.00	Could not parse student submission
Total		0.00 / 5.00	

Question Explanation

The cost of each upgrade grows exponentially. Also, make sure that your answer evaluates to 1 when $n == 1$.

Question 10

For the case when `bribe_cost_increment == 1000`, the cost of the nth bribe was exactly $1000n$. Which expression in n grows faster (as defined in the Math notes), $1000n$ or your answer to question 9?

You may want to plot some examples using `SimplePlot` for large values of n to help in making this comparison.

Your Answer	Score	Explanation

○ Both expressions grow at the same rate.			
○ The cost of an upgrade in Cookie Clicker grows more slowly than the cost of a bribe in the greedy boss scenario.			
◉ The cost of an upgrade in Cookie Clicker grows faster than the cost of a bribe in the greedy boss scenario.	✔	5.00	Correct. In this simplified version of Cooke Clicker, the cost of upgrades grows faster than in the greedy boss scenario. Therefore, the total cookies generated in this version grows at rate that is bounded by a quadratic function.
Total		5.00 / 5.00	

Question 11

For your final homework problem in this part of Principles of Computing, your task is to create a collection of test cases for the function `gen_all_holds()` that you implemented for Yahtzee. This OwlTest will automatically assess how effective your list of test cases is in detecting erroneous programs from a suite of implementations of `gen_all_holds()` that we have compiled. Tests that detect more erroneous programs from this suite receive a higher score. The max score on this problem is 10 points.

To complete this problem, visit the OwlTest page linked above and follow the directions for creating and submitting a list of test cases. Once OwlTest has successfully assessed your test cases, you will see the message `TEST CASES successfully assessed.`. Following this message is a seven-digit number that you should enter in the form below. For this task, please ignore the fact that this message appears under the red Unit Test Failures tab.

Note that OwlTest will rejected test cases that do not follow the guidelines specified on the OwlTest page. In this case, the returned message will begin with `Test cases rejected.` and then conclude with the reason for the test cases being rejected. Correct your test cases to conform to the guidelines and resubmit.

Finally, note that for this final question on testing, OwlTest will not provided you with

an erroneous implementation that pass all of your tests when your list of test cases is incomplete (as done on previous homeworks). This design is by choice to encourage you to put extra thought into the construction of your test cases.

You entered:

```
9817460
```

Your Answer		Score	Explanation
9817460	✔	6.00	Your code was valid. Add/improve your tests to get a better score.
Total		6.00 / 10.00	