Feedback — Homework 2   Help Center

You submitted this homework on Tue 19 Jan 2016 10:30 PM PST. You got a score of 100.00 out of 100.00.

"If you stop at general math, you're only going to make general math money." - Snoop Dogg

The importance of math

The main emphasis of the homework in this class is helping you learn the math skills required to flourish in Computer Science. You will find these skills indispensable as you tackled more and more difficult topics in Computer Science. Remember that the "Science" part of Computer Science corresponds primarily to Mathematics. In this homework, we will review some basic topics that you should be familiar with from high school math.

Question 1

Functions

The first four questions cover mathematical functions. We recommend that you review the material in the Practice Activity for week 1 on "Functions" before attempting them.

Consider the following Python function:

```
def root (a, b, c):
    discriminant = b ** 2 - 4 * a * c
    return (-b - discriminant ** 0.5) / (2 * a)
```

Which mathematical function below computes the same value as this function?

Your Answer		Score	Explanation
○ $root(a,b,c) = \frac{b - \sqrt{b - 4ac}}{2a}$			
○ $root(a,b,c) = \frac{b - b^2 - 4ac}{2a}$			
⊙ $root(a,b,c) = \frac{-b - \sqrt{b^2 - 4ac}}{2a}$	✔	10.00	
○ $root(a,b,c) = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$			

Total	10.00 / 10.00

Question 2

Which of the mathematical functions displayed below are linear?

Your Answer		Score	Explanation
☑ $g(y) = 2y - 3$	✔	2.00	
☐ $c(z) = \sqrt{z}$	✔	2.00	This function is not polynomial.
☑ $h(z) = 3$	✔	2.00	Note that a constant function is also linear. In this case, the coefficient for the linear term is zero.
☐ $a(x) = x^2 + 2x + 1$	✔	2.00	This is a quadratic function.
☑ $f(x) = x + 10$	✔	2.00	
Total		10.00 / 10.00	

Question 3

As part of this class, we will develop methods for estimating the running time of various important algorithms as functions of the size of their input. One simple function that we will use in these estimates is the logarithm function, which is defined and discussed in Math notes on "Functions".

Review this part of the Math notes. Then compute the logarithm base 5 of $\sqrt{5^7}$ which corresponds to the value of the mathematical expression $\log_5\left(\sqrt{5^7}\right)$. Enter the answer the box below in decimal form.

You entered:

3.5

Your Answer	Score	Explanation

| 3.5 | ✔ | 10.00 | Correct. |

| Total | | 10.00 / 10.00 | |

Question Explanation

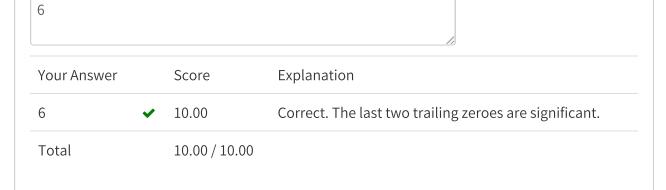Hint: What is the logarithm base 5 of 5^7?

Question 4

Significant figures

An important concept in working with numbers is that of significant figures. The significant figures of a number are those digits that carry meaning contributing to its precision. A digit is *significant* based on the three following rules:

- All non-zero digits are considered significant.
- Zeros appearing anywhere between two non-zero digits are significant.
- Trailing zeros in a number containing a decimal point are significant.

How many significant digits does the decimal number 0.00400100 have?

You entered:

```
6
```

Your Answer		Score	Explanation
6	✔	10.00	Correct. The last two trailing zeroes are significant.

| Total | | 10.00 / 10.00 | |

Question 5

Scientific notation is a way of writing numbers that are too big or too small to be conveniently written in decimal form. For decimal numbers, scientific notation has the form $a \times 10^b$ where a is a number in the range $1 \leq |a| < 10$ and b is an integer. The number a is the *mantissa* while the integer b is the *exponent*. The mantissa is usually expressed using the same number of significant digits as used in the original decimal form.

What is the mantissa for 0.00400100 when expressed in scientific notation?

Your Answer	Score	Explanation
○ $a = 0.400100$		
◉ $a = 4.00100$	✔ 10.00	Correct. The two trailing zero are significant in 0.00400100.
○ $a = 0.4001$		
○ $a = 4.001$		
Total	10.00 / 10.00	

Question 6

In Python, floating point numbers are represented in a binary version of scientific notation where the base 10 is replaced by 2 and the mantissa is a binary number that lies in the range $1 \le |a| < 2$ and has 53 significant bits. Floating point numbers are usually printed out with up to 12 significant digits (although with trailing zeros suppressed).

In some homework problems, you will be asked to write code that computes an answer as a floating point number and then enter your answer as decimal number with a specified number of significant digits. In practice, Python computes more significant digits than are required so you should round your answer to the closest decimal number with the specified number of significant digits.

For this question, look up (or compute) the decimal representation of the number π and enter the value of π with five significant digits of precision in the box below. Remember to round as describe above.

You entered:

```
3.1416
```

Your Answer	Score	Explanation
3.1416	✔ 10.00	Correct. $3.14159...$ rounds up to 3.1416.
Total	10.00 / 10.00	

Question 7

Grids

Consider the following code snippet:

```
row = ...
col = ...
nested_list = [[0, 1, 2, 3, 4], [5, 6, 7, 8, 9], [10, 11, 12, 13, 14]]
print nested_list[row][col]
```

If running this code snippet prints `13` in the console, what are the non-negative values of `row` and `col` ? Enter these two values below as numbers separated by a space.

You entered:

```
2 3
```

Your Answer		Score	Explanation
2	✔	5.00	
3	✔	5.00	
Total		10.00 / 10.00	

Question Explanation

If you missed this question, make sure that the entered values are not reversed.

Question 8

Review the math notes on "Grids". Given a grid of size 4×6, what are the row and column indices for the upper right cell in this grid? Enter the row and columns indices below as numbers separated by a space.
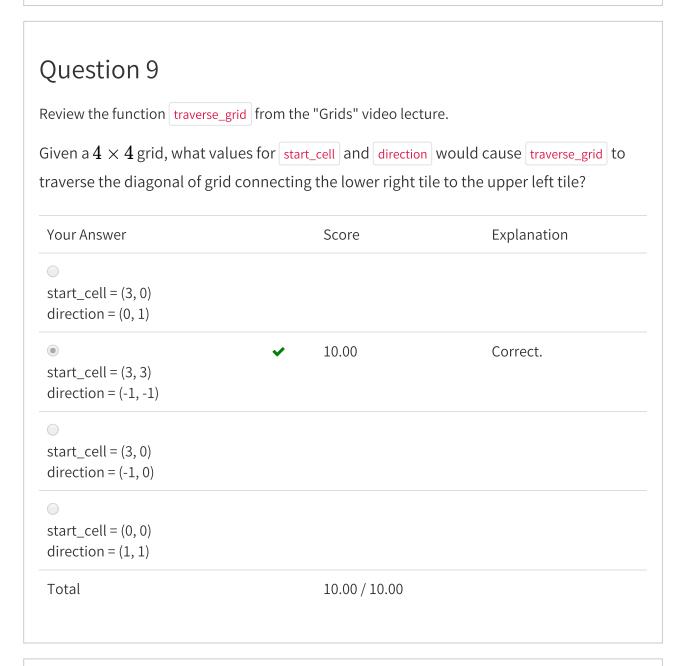
You entered:

```
0 5
```

Your Answer		Score	Explanation
0	✔	5.00	
5	✔	5.00	

Total	10.00 / 10.00

> Question Explanation
>
> Review the math notes on "Grids" if you missed this problem.

Question 9

Review the function `traverse_grid` from the "Grids" video lecture.

Given a 4×4 grid, what values for `start_cell` and `direction` would cause `traverse_grid` to traverse the diagonal of grid connecting the lower right tile to the upper left tile?

Your Answer	Score	Explanation
○ start_cell = (3, 0) direction = (0, 1)		
◉ start_cell = (3, 3) direction = (-1, -1)	✔ 10.00	Correct.
○ start_cell = (3, 0) direction = (-1, 0)		
○ start_cell = (0, 0) direction = (1, 1)		
Total	10.00 / 10.00	

Question 10

For the final question of each of the remaining homeworks in PoC1, your task will be to create a list of test cases for a function that you have implemented in IIPP or PoC. Our purpose in these problems is to focus your attention on the process of creating test cases on your own and not relying entirely on OwlTest. To assess the quality of your test cases, we have created a series of OwlTests that automatically assesses how well your test cases detect erroneous programs written by your peers.

For this question, your task is to create a collection of test cases for the function `format()` that you implemented for the Stopwatch mini-project in IIIPP1. To refresh your memory, the function `format(tenths)` takes an integer `tenths` corresponding to the number of tenths of second elapsed and returns a string of the form: `A:BC.D` where `A, C` and `D` are digits in the range 0-9 and `B` is in the range 0-5. This string is the readout of a digital stopwatch after `tenths` tenths of seconds have elapsed. Note that the string returned by `format` should always correctly include leading zeros. Here are several example inputs and outputs for `format()`:

- `format(0) = 0:00.0`
- `format(11) = 0:01.1`
- `format(321) = 0:32.1`
- `format(613) = 1:01.3`

To complete this problem, visit this OwlTest page 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. This program is an example of input to OwlTest that incorporates the four test cases given above and returns the grade code 2501758 which is worth five points when entered below.

This OwlTest automatically assesses how effective your list of test cases is in detecting erroneous programs from a suite of implementations of `format()` compiled from IIPP. Tests that detect more erroneous programs from this suite receive a higher score. The max score on this problem is 10 points. If your score on the problem is less than 10 points, OwlTest also outputs an example of one erroneous program that passes all of your submitted test cases. Note that trying to debug this program to create new test cases may be difficult and you may wish to consider other methods for creating test cases. Please consult this Practice Activity for more ideas.

You entered:

3202285

Your Answer		Score	Explanation
3202285	✔	10.00	Congratulations! Your tests did a great job of catching incorrect programs.
Total		10.00 / 10.00	