Feedback — Homework 2

Help Center

You submitted this homework on **Sun 7 Jun 2015 12:45 AM PDT**. You got a score of **88.00** out of **100.00**. You can attempt again, if you'd like.

"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
○ $root(a,b,c) = \frac{-b+\sqrt{b^2-4ac}}{2a}$		
○ $root(a,b,c) = \frac{b-\sqrt{b-4ac}}{2a}$		
○ $root(a,b,c) = \frac{b-b^2-4ac}{2a}$		

◉ $root(a,b,c) = \frac{-b-\sqrt{b^2-4ac}}{2a}$	✔	10.00
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	
☐ $a(x) = x^2 + 2x + 1$	✔	2.00	This is a quadratic function.
☑ $h(z) = 3$	✔	2.00	Note that a constant function is also linear. In this case, the coefficient for the linear term is zero.
☑ $f(x) = x + 10$	✔	2.00	
☐ $c(z) = \sqrt{z}$	✔	2.00	This function is not polynomial.
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 $\log_5(\sqrt{5^7})$. 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

Consider the mathematical function $explode(x) = (2^x)^2$. What is the result of evaluating $explode(\log_2(y))$ if $y > 0$? Your answer should be reduced to a simple expression that does not involve logarithms or exponentials.

Hint: review the math notes on "Functions" carefully and note the relationship between the exponential function and the logarithm function when computed using the same base.

Enter the answer as a math expression below. To format your expression correctly, please consult this page. Remember to use the Preview button (as well as the Help link) to make sure that your expression is formatted correctly.

You entered:

y**2

Preview Help

Your Answer		Score	Explanation
y**2	✔	10.00	Correct.
Total		10.00 / 10.00	

Question 5

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 6

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
$a = 4.001$	✔	3.00	Almost. The two trailing zero are significant in 0.00400100.

- $a = 4.00100$
- $a = 0.4001$
- $a = 0.400100$

Total	3.00 / 10.00

Question 7

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 $1 \leq |a| < 2$ 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:

3.1415

Your Answer		Score	Explanation
3.1415	✔	5.00	Almost. You truncated $3.14159\ldots$ to five digits. You should round to the closest decimal number with five significant digits.
Total		5.00 / 10.00	

Question 8

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 9

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 10

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