



# PROBLEM SET: CSC101+L

SUMMER-2017

# IMPORTANT NOTES

- ☐ The problems set contains a number of primitive problems. You should create a repository of solutions for all the problems. The solutions will help you solving complex problems in the future. Your initial version of solutions mostly will be naïve and inefficient. The repository will help you improving those to more efficient, and robust version.
- ☐ Exposure to mathematical formulas required for this problem set is assumed to be inherent. If you find unfamiliar terms or mathematical formulas in a problem's description, search Wikipedia or Google for better exposure.
- ☐ Your written program must be tested with all the provided test cases. You should design additional test cases. Designing test cases and testing your program with those will give you clear understanding of the problems and will help you to make robust solution.
- ☐ New problems will be added to this problem set as need arises to solve those problems. You should periodically look for an updated version of this problem set.

1. Write a program that does nothing.

Input: No input will be given to the program.

Output: No output should be produced by the program.

2. Print the text “Hello World!!!” in the display.

Input: No input will be given to the program

Output: A single line containing the text “Hello World!!!”, without the surrounding quotes.

Sample input	Sample Output
	Hello World!!!

3. Print multiple lines of text as described below.

Input: No input will be given to the program.

Output: As shown in the sample output.

Sample input	Sample Output
	First line of text.
	Second line of text.
	Third line of text.

4. Print the shape of text shown below.

Input: No input will be given to the program.

Output: As shown in the sample output.

Sample input	Sample Output
	#####
	##
	##
	#####
	##
	##
	#####

5. Print the shape shown below.

Input: No input will be given to the program.

Output: As shown in the sample output.

[illegible]

6. Print the value of pi rounded to 4 digits after decimal point.

Input: No input will be given to the program.

Output: As shown in the sample output.

Sample input	Sample Output
	3.1416

7. Take an integer as input and echo the integer in the display.

Input: An integer  $N$ ,  $-2^{31} \leq N \leq 2^{31} - 1$ .

Output: A single line containing the integer  $N$ .

Sample input	Sample Output
<b>45</b>	45
<b>-30</b>	-30
<b>0</b>	0

8. Given a character as input, echo the character in the display.

Input: A character.

Output: Character taken as input.

Sample input	Sample Output
<b>G</b>	G
<b>\$</b>	\$
<b>8</b>	8
<b>t</b>	t

9. Given a number as input, print the negative of the number.

Input: A number.

Output: Negative of input number.

Sample input	Sample Output
<b>20</b>	-20
<b>-30.5</b>	30.5
<b>0</b>	0
<b>0.0675</b>	-0.0675

10. Given a number as input, print the reciprocal of the number.

Input: A number.

Output: Reciprocal of the input number.

Sample input	Sample Output
<b>2</b>	0.5
<b>0.5</b>	2
<b>0</b>	inf
<b>-0.333333</b>	-3

**11.** Given a lowercase letter, print the letter in upper case.

Input: A character in lowercase.

Output: Uppercase of the input character.

Sample input	Sample Output
<b>a</b>	A
<b>r</b>	R
<b>z</b>	Z

**12.** Given an uppercase letter, print the letter in lower case.

Input: A character in uppercase.

Output: Uppercase of the input character.

Sample input	Sample Output
<b>Q</b>	q
<b>F</b>	f
<b>O</b>	o

**13.** Given two integers, print the results of summation, and multiplication of given integers.

Input: Two integers n1, n2 separated by space.

Output: Result of summation, and multiplication separated by comma.

Sample input	Sample Output
<b>10 2</b>	12, 20
<b>10 -10</b>	0, -100
<b>3000 0</b>	3000, 0

14. Given two integers, print the differences, and results of division (remainder, quotient) of given integers.

Input: Two integers n1, n2 separated by space.

Output: Differences (n1~n2), and results of division (n2 divided by n1, and n2 divided by n1).

Sample input	Sample Output
10 5	10 minus 5: 5 5 minus 10: -5 Quotient of dividing 10 by 5: 2 Remainder of dividing 10 by 5: 0 Quotient of dividing 5 by 10: 0 Remainder of dividing 5 by 10: 5
100 100	100 minus 100: 0 100 minus 100: 0 Quotient of dividing 100 by 100: 1 Remainder of dividing 100 by 100: 0 Quotient of dividing 100 by 100: 1 Remainder of dividing 100 by 100: 0
5 31	5 minus 31: -26 31 minus 5: 26 Quotient of dividing 5 by 31: 0 Remainder of dividing 5 by 31: 5 Quotient of dividing 31 by 5: 6 Remainder of dividing 31 by 5: 1

15. Given two numbers, print results of addition, subtraction, multiplication, and division of given numbers.

Input: Two numbers n1, n2 separated by space.

Output: Results of addition, subtraction (n1 minus n2), multiplication, and division on n1, n2.

Sample input	Sample Output
10 5	15

		5
		50
		2
<b>100 100</b>		200
		0
		10000
		1
<b>2.5 2</b>		4.5
		0.5
		5
		1.25

**16.** Given a number, print square and cube of the number.

Input: A number  $r$ .

Output:  $r^2$ , and  $r^3$

Sample input	Sample Output
<b>2</b>	4, 8
<b>5</b>	25, 125
<b>0.5</b>	0.25, 0.125

**17.** Given two numbers  $r$ , and  $s$ , evaluate  $(r-s) + |r-s|$ .

Input: two numbers  $r$ , and  $s$ .

Output:  $(r-s) + |r-s|$

Sample input	Sample Output
<b>5 5</b>	0
<b>10 5</b>	10
<b>5 10</b>	0

**18.** Given radius of a circle, find circumference and area of the circle. Assume pi's value is 3.1416.

Input: A positive number, denoting radius of a circle.



Output: Circumference, and area of the circle, given radius as input.

Sample input	Sample Output
<b>1</b>	6.2832, 3.1416
<b>10</b>	62.832, 314.16
<b>5.5</b>	34.5576, 95.0334

**19.** Given x and y , evaluate  $x^2 + y^2 + 2xy + 30$ .

Input: Two numbers x, y.

Output: A single line containing a number which is the result of evaluating the expression.

Sample input	Sample Output
<b>3 5</b>	94
<b>5.3 1.9</b>	81.84
<b>0 0</b>	30

**20.** Given two Cartesian coordinates (x1, y1) and (x2, y2), find Euclidian distance between the coordinates.

Input: 4 numbers in the order x1, y1, x2, y2.

Output: A single line containing the distance between given two coordinates (x1, y1), (x2, y2).

Sample input	Sample Output
<b>3 5 2 5</b>	1
<b>0 0 10 10</b>	14.1421
<b>6 -5 2 -5</b>	4

**21.** Given center (h, k) of circle and a point (x, y) on the circle, find area enclosed by the circle. Use 3.1416 as pi.

Input: 4 numbers in the order h, k, x, y.

Output: A single line containing the area enclosed by circle.

Sample input	Sample Output
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<b>3 5 2 5</b>	3.1416
<b>0 0 10 10</b>	628.317
<b>6 -5 2 -5</b>	50.2656

22. Given present value of an investment  $p$ , interest rate  $r$ , and number of periods  $n$ . Find compound interest  $F$ , where  $F = p * (1 + r)^n$ .

Input: 3 positive numbers  $n$ ,  $p$ ,  $r$ .

Output: A number, denoting the value of  $F$ .

Sample input	Sample Output
<b>5 30000 0.15</b>	60340.7
<b>3 30000 0.3</b>	65910
<b>3 10000 0.85</b>	63316.3

23. Given present value  $p$ , future value  $f$ , interest rate  $r$ , of an investment. Find number of periods  $n$ , where the relation is  $F = p * (1 + r)^n$ .

Input: 3 positive numbers  $f$ ,  $p$ ,  $r$ .

Output: A number, denoting the value of  $n$ .

Sample input	Sample Output
<b>50000 10000 0.1</b>	16.8863
<b>65910 30000 0.3</b>	3
<b>50000 10000 0.65</b>	3.21389

24. Given 3 numbers  $x$ ,  $y$ ,  $z$ , evaluate the expression  $x^{10} + y^{20} + z^{20} + \sqrt{xy} + \sqrt[x]{yz} + \sqrt[3]{z^5}$ .

Input: 3 positive numbers  $x$ ,  $y$ ,  $z$ .

Output: The number denoting result of evaluation of the expression.

Sample input	Sample Output
<b>2 3 4</b>	1.103e+12
<b>0.2 0.2 0.3</b>	0.500001
<b>1.5 1 0.5</b>	61.0197

25. Given a polar coordinate, convert this to a Cartesian coordinate.

Input: 2 positive numbers  $r$  and  $\theta$ .

Output: The Cartesian form of the given coordinate in (X, Y) form.

Sample input	Sample Output
8 0	(8, 0)
5 53.1301	(3, 4)
5 36.8699	(4, 3)

26. A tree was broken into two pieces during a hurricane. Lower part of the tree stands still and one side of the upper part hangs upon lower part and creates an angle of  $d$  degree with base. Length of the upper part is  $x$  meter. Find length of the lower part of the tree.

Input: 2 positive numbers  $x$ , and  $d$ . Angle  $d$  is in degree and  $0^\circ \leq d \leq 90^\circ$ .

Output: A positive number denoting the length of the lower part of the tree.

Sample input	Sample Output
30 30	15
60 90	60
150 60	129.904

27. A ladder is inclined to a wall. Height of the wall is  $h$  meter and bottom of the latter is  $x$  meter away from the wall. Find the angle of inclination of the ladder with the wall.

Input: 2 positive numbers  $x$ , and  $h$ .

Output: A positive number denoting the angle of inclination of the ladder with the wall in degree.

Sample input	Sample Output
30 30	45
60 0	90
100 5	87.1316

28. Given an integer, print 3<sup>rd</sup> digit, from the right of the given integer.

Input: An integer  $n$ ,  $n \geq 100$ .

Output: Digit, which lies in 3<sup>rd</sup> position from right side of n.

Sample input	Sample Output
534	5
3766	7
89598	5

29. Given an integer n, print digits of n.

Input: An integer n,  $100000 \leq n \leq 999999$ .

Output: Digits of n from right to left, separated by spaces.

Sample input	Sample Output
989123	3 2 1 9 8 9
111223	3 2 2 1 1 1
576894	4 9 8 6 7 5

30. You are given 4 digits. Form a number using given digits. Also form reverse of the number.

Input: 4 single digit numbers  $d_1, d_2, d_3$ , and  $d_4$ . For  $i=1, \dots, 4$ ,  $0 \leq d_i \leq 9$ .

Output: Numbers  $(d_1 d_2 d_3 d_4)_{10}$  and  $(d_4 d_3 d_2 d_1)_{10}$ .

Sample input	Sample Output
9 8 2 1	9821 1289
0 1 2 3	123 3210
4 5 8 8	4588 8854

31. You are given a number. Find the number formed by reversing order of the digits of given number.

Input: An integer n,  $100000 \leq n \leq 999999$ .

Output: The number formed by reversing order of the digits of n.

Sample input	Sample Output
98221	12289
22235	53222

**11220**

**2211**

- 32.** Given three Cartesian coordinates, representing three corners of a triangle, find area enclosed by the triangle. Use shoelace formula.

Input: 3 pairs of numbers  $x_1, y_1, x_2, y_2, x_3, y_3$ .

Output: A positive number denoting the area enclosed by the triangle.

Sample input	Sample Output
<b>0 0 0 8 8 0</b>	32
<b>9 9 1 8 5 4</b>	18
<b>-1 0 0 1 1 0</b>	1

- 33.** Given 8 Cartesian coordinates, representing 8 corners of a polygon, find area enclosed by the polygon. Use shoelace formula.

Input: 8 pairs of numbers  $x_1, y_1, x_2, y_2, x_3, y_3, x_4, y_4, x_5, y_5, x_6, y_6, x_7, y_7, x_8, y_8$ .

Output: A positive number denoting the area enclosed by the given coordinates.

Sample input	Sample Output
<b>0 0 2 0 4 0 8 0 8 8 4 8 2 8 0 8</b>	64
<b>-8 0 0 0 0 -4 4 0 8 0 8 8 -8 8 -12 4</b>	152
<b>-2 0 2 0 2 4 1 4 1 6 -1 6 -1 4 -2 4</b>	20

- 34.** You are given a positive integers  $n$ , find sum of natural numbers from 1 to  $n$ .

Input: A positive integer  $n$ .

Output: Sum of natural number from 1 to  $n$ .

Sample input	Sample Output
<b>5</b>	15
<b>20</b>	210
<b>31</b>	496

- 35.** You are given a positive integers  $n$ , find sum of square of natural numbers from 1 to  $n$ .

Input: A positive integer  $n$ .

Output: Sum of square of natural numbers from 1 to n.

Sample input	Sample Output
5	55
20	2870
31	10416

36. You are given a positive integers n, find sum of cube of natural numbers from 1 to n.

Input: A positive integer n.

Output: Sum of cube of natural numbers from 1 to n.

Sample input	Sample Output
5	225
20	44100
31	246016

37. You are given coefficients of a quadratic equation  $ax^2 + bx + c = 0$ , where  $b^2 - 4ac \geq 0$ . Find root(s) of the equation.

Input: 3 numbers a , b, and c,  $a \neq 0$  and  $b^2 - 4ac \geq 0$ .

Output: Root(s) of the equation separated by a comma and a space.

Sample input	Sample Output
1 2 1	-1
1 -6 5	1, 5
1 6 5	-1, -5

38. Given 5 numbers, find the average of given numbers.

Input: 5 numbers, separated by spaces.

Output: Average of given input numbers.

Sample input	Sample Output
10 10 10 10 10	10

**5 -5 5 -5 5**

**5**

**10 20 30 40 50**

**30**

**39.** Given 5 numbers, find standard deviation of given numbers.

Input: 5 numbers, separated by spaces.

Output: Standard deviation of given input numbers.

**Sample input**

**Sample Output**

**10 10 10 10 10**

**0**

**5 -5 5 -5 5**

**4.89898**

**10 20 30 40 50**

**14.1421**

**40.** Given 3 characters, print all the permutation of the characters.

Input: 4 characters, separated by spaces.

Output: All the permutation of given characters.

**Sample input**

**Sample Output**

**A b 2**

**Ab2**

**A2b**

**bA2**

**b2A**

**2Ab**

**2bA**

**# F g**

**#Fg**

**#gF**

**F#g**

**Fg#**

**gF#**

**g#F**