BRAINIACS
OLYMPIAD

GRADES 10-12

CODING
SAMPLE CHALLENGES

ORGANIZED BY ©BRAINIACS OLYMPIAD COMMITTEE

info@brainiacsolympiad.com www.brainiacsolympiad.com

CODING SAMPLE PAPER-GLOBAL FINAL
Grade: 10-12
Time: 120 minutes
Total points: 100
Equipment: Laptop

Easy challenges - 15
Task 1
Write a program to check if the entered integer is even or odd.
If the given number is odd, then print “Odd”
If the given number is even, then print “Even”
Example:
For this input:
4
the result should be:
“Even”

Task 2
Convert a given string to title case.
In the title case, each word starts with a capital letter and all remaining words are small letters.
Note: Assume that the input string contains letters and spaces only. Don’t use build-in functions in python.
Example
For this input:
‘hello world’
the result should be:
‘Hello World’

Task 3
Write a program to convert a number into a string of dashes equal to the number.
Example:
For this input:
5
The result should be:
‘- - - - -‘

Task 4
Write a program that reads a list of numbers and calculates their average value.
Example:
For this input:
[1, 2, 3, 4, 5, 6]
the result should be:
The average value = 3.5

Task 5
Smallest of 3 numbers.
Print the smallest number between three given numbers.
Example
For this input
5 2 3
the result should be
2

Task 6
Write a program to calculate the discount received.
We can find the discount received by subtracting the discounted price from the original price.
Print the discount received from the given original price and discounted price in percent.
Example:
For this input:
original_price = 500
discounted_price = 400
the result should be:
The discount is 20%

Task 7
Write a function to check if a given number is within a specified range.
The program takes three integers as input: the number to check, and the start and end of the range.
Print True if the number is within the range, otherwise print False.
Example:
For this input:
5 1 10
the result should be:
True
Reason: The number 5 is within the range from 1 to 10. Therefore, the program prints True.

Task 8
Write a program to return the interval between two faces on a clock.
You need to print the smallest interval.
Example
For this input:
3 9
the result should be:
6
Reason: The smallest interval between face 3 and face 9 on a clock is 6.

Task 9
Write a program to check if the sum of two numbers is less than a third number.
Print True if the sum is less than the third number, otherwise print False.
Example:
For this input:
2 3 6
the result should be:
True

Task 10
Write a program to replace all vowels in a string with a specified character.
Print the modified string.
Example:
For this input:
‘hello world’
‘x’
the result should be:
‘hxllx wxrld’

Task 11
Write a program to calculate the Body Mass Index(BMI) of a person.
Program takes two float numbers as input representing weight in kilograms and height in meters.
Return the BMI rounded off to two decimal places.
Hint: BMI is a measure of body fat based on an individual's weight and height. The formula for calculating BMI is weight(kg) / height (m) ^ 2
Example:
For this input
70
1.75
the result should be:
22.86

Task 12
Write a program that creates a frequency distribution of letters in a word.
Requirements:
The program asks the user to enter a word.
Count how many times each letter appears in the word.
Uppercase and lowercase letters should be treated as the same.
Display the result for each letter.
Example:
For this input:
Cucumber
the result should be:
c=2, u=2, m=1, b=1, e=1, r=1

Task 13
Write a program to check if a given string is a palindrome.
Print True if the string is a palindrome, otherwise print False.
Example:
For this input:
madam
the result should be:
True

Task 14
Write a program to calculate the sum of even numbers from a given list.
Example:
For this input:
1 2 3 4 5
the result should be:
6
Reason: the even numbers in the list are 2 and 4. Their sum is 6.

Task 15
Write a program to find the symmetric difference between two sets.
The symmetric difference of two sets is a setoff elements which are in either of the sets but not in their intersection.
Example:
For this input:
1, 2, 3, 4

3, 4, 5, 6
the result should be:
1, 2, 5, 6

Medium challenges – 12

Task 1
Write a program to check if a given number is a Pronic number or not.
A Pronic number is a number that is the product of two consecutive integers.
That means n is Pronic if and only if there are two consecutive integers i and i+1 such than n=i*(i+1)
Example:
For this input
6
the result should be:
True
Reason: the given number 6 can be expressed as the product of two consecutive numbers: 2 and 3. Hence, it's a Pronic number.

Task 2
Write a program to calculate the total time spent washing hands.
Program takes two integers as input: the number of times you wash your hands in a day and the number of month. The output is the total time spent washing hands in minutes and seconds.
Note: assume each month has 30 days. One hand wash takes 21 seconds.
Example
For this input:
8
7
the result should be:
588 minutes and 0 seconds

Task 3
Write a program to check if a number is weird.
1. If the number is odd, it's "weird"
2. If the number is even and in the inclusive range of 2 to 5, it's "not weird"
3. If it's even and in the inclusive range of 6 to 20, it's "weird"
4. If it's even and greater than 20, it's "not weird"

The output is a string stating whether the number is "Weird" and "Not Weird"
Example:
For this input:
3
the result should be:
"Weird"
Reason: the number 3 is odd, so it's considered as "Weird"

Task 4
Write a program to count the number of zeros in the binary representation of a given number.
Output the count of zeros in the binary representation of the input number.
Example

For this input:
18
the result should be
3
Reason: The binary representation of 18 is 10010, which contains 3 zeroes.

Task 5
Fibonacci sequence less than a given number.
The Fibonacci sequence starts with 0 and 1. Each subsequent number is the sum of the previous two.
So, our first 10 terms in the Fibonacci sequence is:
0, 1, 1, 2, 3, 5, 8, 13, 21, 34
Print all numbers in the sequence less than a given number.

Example:
For this input:
22
the result should be:
0, 1, 1, 2, 3, 5, 8, 13, 21

Task 6
Write a program to determine whether a given string represents stalactites and stalagmites.
Hint: Stalactites are rock formations that hang from the celling of caves while stalagmites grow from the floor.
In this challenge, we are considering the top half of a string to represent stalactites and bottom half to represent stalagmites.
Print Stalactites if there are more non space characters('#')in the upper half of the string and 'Stalagmites' if there are more characters in the lower half. If they are equal, print 'Both'.

Example:
For this input:
'#####\n #\n #\n #\n#'
the result should be
'Stalactites'

Reason:
1. The string has multiple newlines and characters, and we split it into two halves while counting \n
2. The top half contains ('#####\n#')
3. The bottom half contains ('\n#\n#')
4. Since the top half has more #, the program print 'Stalactites'

Task 7
Write a program to show the intensity of explosion
We can find the intensity of an explosion by repeating each character in a string based on its position.
1. Define a function that takes a string as an input
2. Inside the function, repeat each character in the string based on its position (1-indexed)
3. Return the resulting string representing the explosion intensity.
Example:
For this input
Boom
the result should be:
Booooommmm

Reason: The first character ‘B’ is repeated once, the first ‘o’ is repeated twice, the second ‘o’ is repeated three times and ‘m’ is repeated four times.
So, the resulting string is Booooommmm

Task 8
N differences
Write a program to calculate the difference between consecutive elements in a list until the list has only one element left.

Example:
For this input:
5, 2, 1
The result should be:
2
Reason:
First iteration:
Calculate differences between consecutive elements:
2 – 5 = - 3
1 -2 = -1
The new list is
[-3, -1]
Second iteration
Calculate the difference between the remaining consecutive elements:
-1 – (- 3) = 2
The new list is: [2]
Since the list now contains only one element, the program ends.

Task 9
Write a program to calculate the primorial of a number.
The primorial of a number is the product of all prime numbers up to that number.
Example:
For this input:
5
the result should be:
30
Reason: The prime numbers up to 5 are 2,3,5. The product is 30

Task 10
Radio towers
The city has several radio towers of various heights. A pair of radio towers can communicate with each other if their difference in height is less than or equal to 10 m.
Write a program that receives the number of radio towers and the height of each of the radio towers as input and outputs the number of radio tower pairs that can communicate with each other.

Examples:
Input: 3
1 11 15
Answer: 2
Input: 5
8 29 22 16 30
Answer: 5

Task 11

Robot Speech Analyzer

Your robot assistant, R-42, is learning to speak like a human. To measure its progress, scientists analyze the average length of real words in everything the robot says.

However:

Only alphabet letters (A–Z, a–z) count as part of words.

Any symbols, numbers, emojis, punctuation, or sound effects must be ignored.

Consecutive letters form a word.

Your job is to compute the average length of all valid words, rounded to two decimal places.

Task

Write a program that analyzes the robot's message and calculates:

- Average number of letters per word, using only the English alphabet.
- Round the result to two decimal places.

Input

```
Beep! System reboot complete.
```

Output

```
6.00
```

Words considered: Beep (4), System (6), reboot (6), complete (8)

Average = (4 + 6 + 6 + 8) / 4 = **6.00**

Task 12

Write a program to implement the Mubashir Cipher

The Mubashir Cipher takes a string and replace each letter with the letter that is directly opposite it in the English alphabet.

Hint: In English alphabet 'a' is opposite to 'z', 'b' is opposite to 'y', 'c' is opposite to 'x' and so on. The same rule applies for uppercase letters.

Example:

For this input:

'abc'

the result should be:

'zyx'

Hard challenges – 8

Task 1

Security Digit

To check whether an account number is genuinely a number allocated by the bank, the Pomme Bank of Paris uses the following technique. All the non-zero digits in the number are multiplied by each other. All the non-zero digits of the resulting number are again multiplied by each other – and so on until a single digit is left. That is the security digit.

Write a program that will provide the security digit for any number with up to 20 digits.

Example 1:

Input: Number? 469795

Output: Security digit = 8

Example 2:

Input: Number?1234239003

Output: Security digit = 9

Task 2
Write a program to convert a decimal number lying between 1 and 3999 to Roman numerals.
Output the Roman numerals equivalent of the input number.
Example:
For this input:
3
the result should be:
III

Task 3
Write a program to reverse a binary representation of a number.
Example:
For this input
18
the result should be:
9
Reason: the binary representation of 18 is 10010. Reversing this gives us 01001, which is 9 in decimal

Task 4
Is Disarium number?
A number is considered Disarium when the sum of its digits, each raised to the power of their respective positions, equals the number itself.
For example, consider the number 175. Here,
1^1 + 7^2 + 5^3 = 175
So, 175 is a Disarium.

Example
For this input:
135
the result should be
True
Reason: For the input 135, 1^1 + 3^2 + 5^3 = 135

Task 5
Write a program to sort a string in ginortS order.
In ginortS, all sorted lowercase letters are ahead of uppercase letters, all sorted uppercase letters are ahead of digits, and all sorted odd digits are ahead of sorted even digits.
Print the sorted string.

Example:
For this input:
'Sorting1234'
The result should be
'ginortS1324'
Reason: in the output, all lowercase letters are sorted and placed first, followed by sorted uppercase letters, then odd digits, and finally even digits. Hence, 'Sorting' becomes 'ginort' +'S' + '13' + '24'.

Task 6
Write a program that prints indices of the two numbers in an array such that they add up to a given target.

Instruction
1. Program takes a list of integers and an integer as an inputs.

2. Iterate over the list. For each number, check if there is another number in the list such that their sum equals the target. If so, return their indices.
3. Print all possible combination of the indices of two numbers that add up to the target.
Example:
For this input
2, 7, 11, 5, 4
9
the result should be
0, 1
3,4

Task 7
Write a program to group anagram together from a given list of strings.
Print a list of lists where each sublist contains grouped anagrams.
The output should be in sorted order

Example:
For this input:
['eat', 'tea', 'tan', 'ate', 'nat', 'bat']

The result should be:
['ate', 'eat', 'tea'] , ['nat', 'tan'], ['bat']

Task 8
Write a program to find the length of the longest substring without repeating characters from a given string.
Instruction
1. Program that takes a string as an input.
2. Use a sliding window approach to keep track of the longest substring without repeating characters.
3. Print the length of the longest substring without repeating characters and substring itself.

Example
For this input:
'abcabcbb'
the result should be:
abc 3