



# **BRAINIACS OLYMPIAD**

**GRADES 8-9**

## **CODING SAMPLE CHALLENGES**



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## **CODING SAMPLE PAPER-GLOBAL FINAL**

**Grade: 8-9**

**Time: 120 minutes**

**Total points: 100**

**Equipment: Laptop**

Easy challenges - 15

Task 1

Check if a person can enter the club. The club only allows people who are 21 years old or older.

Print True if the person can enter the club. Otherwise, print False if the cannot enter the club.

Example:

For this input:

30

Result should be

True

Reason: The person is 30 years old which is greater than or equal to 21, so they are allowed to enter the club.

Task 2

Check if an integer is divisible by five. Print True if the number is divisible by 5. Otherwise, print False.

Example:

For this input:

10

the result should be:

True

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

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 6

Write a program to check if a given number is a multiple of 10.  
Print True if the number is a multiple of 10, or False otherwise.

Example:

For this input:

30

the result should be:

True

#### Task 6

Write a program to convert minutes to seconds.

Example:

For this input:

5

the result should be:

300

Reason: 5 minutes is equal to 300 seconds because  $5 * 60 = 300$

#### 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 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:

'hxlx wxrld'

#### Task 9

Write a program to calculate the sum of elements in a list that are greater than a given number

Example

For this input

[1, 2, 3, 4, 5]

3

the result should be:

9

Reason: The numbers in the list that are greater than 3 are 4 and 5.

#### Task 10

Write a program to find the area of a right angled triangle rounded off to two decimal points.

#### Example

For this input:

3

4

the result should be:

6.0

Reason: The area of a right angled triangle is given by  $1/2 * \text{base} * \text{height}$ . So, for base = 3 and height = 4, it's  $1/2 * 3 * 4 = 6.0$

#### Task 11

Write a program that calculates how many train carriages are needed to fit all passengers.

Requirements:

The program asks the user to enter two integers:

The number of seats in one carriage.

The total number of passengers.

The program calculates how many carriages are required so that all passengers have seats.

If the passengers do not divide evenly, one additional carriage must be added.

The program prints the required number of carriages.

Example

For this input:

50

20

the result should be:

3

#### Task 12

Write a program to calculate the sum of all square numbers in a list.

Example

For this input:

2 3 4

the result should be:

29

#### 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 find the sum of the two smallest numbers in a list.

Example:

5 8 12 18 22

the result should be:

13

Reason: The two smallest numbers in the list are 5 and 8. Their sum is 13.

### Task 15

Write a program to split the restaurant bill among friends.

#### Task

1. Take the subtotal of the bill and the number of friends as inputs.
2. Calculate the total bill by adding 20% tax to the subtotal and then divide it by the number of friends.
3. Print the amount each friend has to pay, rounded off to two decimal places.

Example:

For this input:

100

5

the result should be:

24.0

Reason: The total bill after adding 20% tax is 120. When this is divided among 5 friends, each has to pay 24.

### Medium challenges – 12

#### Task 1

Write a program to calculate the sum of the harmonic series up to a given number.

Print the sum of the harmonic series rounded off to two decimal places.

The harmonic series is defined as  $1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n}$

Example:

For this input:

5

the result should be:

2.28

Reason: The sum of the first five terms of the harmonic series is 2.28. This is calculated as follows:

$$1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} = 2.28$$

#### Task 2

Write a program to find the product of a list except for the current index.

Print a list where each element is the product of all other elements in the list except for itself.

If there is only one element, print an empty list.

Example:

For this input:

[1, 2, 3, 4]

the result should be:

[24, 12, 8, 6]

Reason: For each index in the list: 0, 1, 2 and 3, we calculate the product of every number except this index. So for the index 0, we have  $2*3*4 = 24$ , for index 1, we have  $1*3*4=12$ , for index 2, we have  $1*2*4 = 8$ , and finally for index 3, we have  $1*2*3 = 6$ . So our final output is [24, 12, 8, 6].

#### Task 3

Write a function to check if there are two numbers in a list that add up to a target value.

Example:

For this input:

[1, 2, 3, 4]

5

the result should be:

[1, 4]

Reason: the number 1 and 4 in the list add up to the target value 5.

#### 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 calculate duration in minutes between a starting time and a final time.

Example:

For this input:

"14:30"

"16:00"

the result should be:

90

#### Task 7

Rock, paper, scissors

Write a program that takes two strings as an input.

Inside the function, implement the rules of the game: rock beats scissors, scissors beats paper, and paper beats rock.

3. Print the result of the game: either 'Player 1 wins', 'Player 2 wins', or 'It's a tie'.

Example:

For this input:

'rock'

'scissors'

the result would be:

'Player 1 wins'

#### Task 8

Write a program to replace each letter in the string with its position in the alphabet

For this input:

hello

the result should be:

8 5 12 12 15

Reason: in the word 'hello', 'h' is the 8<sup>th</sup> letter of the alphabet, 'e' is the 5<sup>th</sup> and 'l' is the 12<sup>th</sup>.

#### Task 9

Write a program to convert bird names into four-letter bird codes.

Instruction

1. Program takes a string as an input
2. Split the bird name into words
3. If there is only one word, take the first four letters
4. If there are two words, take the first two letters of each word.
5. If there are three or more words, take the first letter from each of the first three words and add the first letter of the last word.
6. Print the four-letter bird code in uppercase.

Example:

For this input:

Northern Cardinal

the result should be:

NOCA

#### Task 10

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 11

Write a program to help jump across an array.

The frog can jump only forward and it jumps from one number to the next higher number.

Don't jump unless there is a higher number going forward.

Output the total number of jumps.

Example:

For this input:

[2, 1, 3, 4]

the result should be:

2

Reason: the frog starts at 2, then jumps to the next higher number 3 instead of the next index element 1.

Then it jumps from 3 to its next higher number 4. So it makes a total of 2 jumps.

#### Task 12

##### **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 =  $(4 + 6 + 6 + 8) / 4 = 6.00$

Hard challenges - 8

Task 1

Find a given anagram in a given list.

Write a program that takes two strings as input: the first one is the text to search and the second one is the anagram to find

Iterate over the text and check if a substring of the first string is an anagram of the second string.

Print the first found anagram. If no anagram is found, print 'Anagram not found'.

Example

for this input:

'The quick brown fox jumps over the lazy dog'

'god'

the result should be

'dog'

Task 2

Write a program to determine if all the concert attendees can see the stage.

The attendees can only see the stage if the height of each person is strictly greater than the height of the person in front of them.

Output True if all attendees can see the stage, otherwise print False.

Example

For this input:

[[1,2,3], [4,5,6], [7,8,9]]

the result should be:

True

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

Write a program to simulate a robot's path based on commands.

The robot starts at position (0,0). It can move up, down, left or right based on the command 'U', 'D', 'L', 'R' respectively.

1. Write a program that takes a string of commands as input
2. Iterate over the commands and update the robot's position accordingly
3. Print the final position of the robot as (x,y)

#### Example

For this input

'UURDDL'

the result should be

(0,0)

Reason: the robot moves up twice, right once, down twice and left once.

This results in a final position of (0,0)

#### Task 5

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 6

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 7

Write a program to implement the Caesar Cipher.

This is a type of substitution cipher in which each letter in the plain text is 'shifted' a certain number of places down the alphabet.

For example with a shift of 1 A would be replaced by B, B would become C, and so on.

Keep in mind that Z should look back to A and vice versa.

The program takes a string and an integer as inputs. Return the encrypted string.

Hint: In this challenge, you should only consider uppercase letters.

Example:

For this input:

'Hello'

3

the result should be

'KHOOR'

Reason: each letter in 'HELLO' has been shifted three places to the right in the alphabet resulting in 'KHOOR'.

Task 8

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