Software Design Structures

Program Structures Exercise

**Instructions:**

Program Outline: Working with Numbers

During the presentation I stipulated that the module Calculating Average could be part of a larger program Working with Numbers which resulted in the following structure chart:

Diagram

Description automatically generated

We have already designed the module Calculate Average using the following techniques:

* Structure Chart
* Algorithm (using stepwise refinement)
* Data Dictionary

**Algorithm :**

1.Start

2.Input Number

Print the user to enter three whole numbers(num1,num2,num3).

Store the three entered numbers in variables (num1, num2, num3).

3.Calculate Average

Calculate the sum of the three numbers: sum = num1 + num2 + num3

Calculate the average by dividing the sum by 3: average = sum / 3

4.Display Average

5.Output the average to the user: print(average)

|  |  |  |
| --- | --- | --- |
| Varible Name | Type | Description |
| num1 | float | The first whole number entered by the user. |
| num2 | float | The Second whole number entered by the user. |
| num3 | float | The Third whole number entered by the user. |
| num | float | The sum of three numbers (num1+num2+num3)/3 |
| average | float | The average value of three numbers (sum/3) |

# Function to get three numbers from the user

def input\_numbers():

    num1 = float(input("Enter the first  number : "))

    num2 = float(input("Enter the second number : "))

    num3 = float(input("Enter the Third number : "))

    return num1,num2,num3

#Function to calculate average

def calculate\_average(num1,num2,num3):

    sum = num1+num2+num3

    average  = sum/3

    return average

#Function to display average

def display\_average(average):

    print (f"The average of the three numbers is: {average }")

#Main Function

def main():

    num1,num2,num3 = input\_numbers()

    #calculate average

    average= calculate\_average(num1,num2,num3)

    display\_average(average)

if \_\_name\_\_ == "\_\_main\_\_":

    main()

**Output:**

Enter the first number : 20

Enter the second number : 30

Enter the Third number : 40

The average of the three numbers is: 30.0

--------------------------------------------------------------------------------------------------------------------------------   **Task:**

Using the same structures as above I want you to design each of the other modules contained in the high-level structure chart:

* **Adding Numbers**

Description – The program will get two numbers from the user. The program will then calculate the total when these two numbers are added together. The value of of the calculation will be displyed back to the user.

* **Dividing Numbers**

Description – The program will get two numbers from the user. The program will then calculate the total when the first numbers is divided by the second number. The value of the calculation will be displayed back to the user.

* **Mulitplying Numbers**

Description – The progam will get two numbers from the user. The program will then calculate the total by mulitplying these two numbers. The value of the calcuation will be displayed back to the user.

**Structure Charts**

**Add you structure charts here:**

Adding Numbers

Get First Number

Get Second Number

Calculate Total

Display Result

**Algorithms:**

**Add your algorithms here:**

Get two numbers from the user.

1. Calculate the total by adding the two numbers.

Display the result to the user.

2. Refining into Subtasks

1.Input two numbers:

2.Prompt the user for the first number.

3.Prompt the user for the second number.

4.Calculate total:

5.Add the two numbers together.

6.Display result:

Print the result of the addition.

3. Further Refining the Steps

1.Get First Number:

Print the user: "Please enter the first number."

Store the value in num1.

2.Get Second Number:

Print the user: "Please enter the second number."

Store the value in num2.

Calculate Total:

3.Compute the sum: total = num1 + num2.

Display Result:

Display: "The total of the numbers is: {total}".

**Add your data dictionary’s here:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Item** | **Type** | **Description** | **Valid** | **Intial Value** |
| Num1 | Float | The first number entered by the user. | Any valid number | **none** |
| Num2 | Float | The second number entered by the user. | |  | | --- | |  |  |  | | --- | | Any valid number | | **none** |
| total | Float | The total of the two numbers. | A floating-point value | **0.0** |

# Get two numbers from the user

num1 = float(input("Enter the first number: "))

num2 = float(input("Enter the second number: "))

# Add the two numbers

total = num1 + num2

# Display the result

print("The total of", num1, "and", num2, "is", total)

Output :

Enter the first number: 5

Enter the second number: 6

The total of 5.0 and 6.0 is 11.0

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**Multipying you structure charts here:**

Multiplying Numbers

Get First Number

Get Second Number

Calculate Numbers

Display Result

**Multiply your algorithms here:**

Get two numbers from the user.

1. Calculate the total by adding the two numbers.

Display the result to the user.

2. Refining into Subtasks

1.Input two numbers:

2.Prompt the user for the first number.

3.Prompt the user for the second number.

4.Calculate total:

5.Add the two numbers together.

6.Display result:

Print the result of the addition.

3. Further Refining the Steps

1.Get First Number:

Print the user: "Please enter the first number."

Store the value in num1.

2.Get Second Number:

Print the user: "Please enter the second number."

Store the value in num2.

Calculate Total:

3.Compute the sum: total = num1 \* num2.

Display Result:

Display: "The total of the numbers is: {total}".

**Multiply your data dictionary’s here:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Item** | **Type** | **Description** | **Valid** | **Intial Value** |
| Num1 | Float | The first number entered by the user. | Any valid number | **none** |
| Num2 | Float | The second number entered by the user. | |  | | --- | |  |  |  | | --- | | Any valid number | | **none** |
| total | Float | The total of the two numbers. | A floating-point value | **0.0** |

# Get two numbers from the user

num1 = float(input("Enter the first number: "))

num2 = float(input("Enter the second number: "))

# Multiply the two numbers

total = num1 \* num2

# Display the result

print("The total of", num1, "and", num2, "is", total)

**Output :**

Enter the first number: 6

Enter the second number: 7

The total of 6.0 and 7.0 is 42.0

**Dividing you structure charts here:**

Dividing Numbers

Get First Number

Get Second Number

Calculate Numbers

Display Result

**Dividing your algorithms here:**

Get two numbers from the user.

1. Calculate the total by adding the two numbers.

Display the result to the user.

2. Refining into Subtasks

1.Input two numbers:

2.Print the user for the first number.

3.Print the user for the second number.

4.Calculate total:

5.Divide the two numbers together.

6.Display result:

Print the result of the addition.

3. Further Refining the Steps

1.Get First Number:

Print the user: "Please enter the first number."

Store the value in num1.

2.Get Second Number:

Print the user: "Please enter the second number."

Store the value in num2.

Calculate Total:

3.Compute the sum: total = num1 / num2.

Display Result:

Display: "The total of the numbers is: {total}".

**Dividing your data dictionary’s here:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Data Item** | **Type** | **Description** | **Valid** | **Intial Value** |
| Num1 | Float | The first number entered by the user. | Any valid number | **none** |
| Num2 | Float | The second number entered by the user. | |  | | --- | |  |  |  | | --- | | Any valid number | | **none** |
| total | Float | The total of the two numbers. | A floating-point value | **0.0** |

# Get two numbers from the user

num1 = float(input("Enter the first number: "))

num2 = float(input("Enter the second number: "))

# Add the two numbers

total = num1 / num2

# Display the result

print("The total of", num1, "and", num2, "is", total)

**Output:**

Enter the first number: 24

Enter the second number: 2

The total of 24.0 and 2.0 is 12.0

**Note:** Submit your completed document to canvas ‘Design Structures Exercise Submission’.