Coding Arena

Problem : Reliability and Availability Calculator

Mr. Dhirubhai is running a small manufacturing unit. Since past few months, he has observed that few of the components of the System are failing continuously and the Repair team has to spend some time to get that component up and running which causes an outage for production.

Dhirubhai wants to know system availability during a particular period to avoid failures so as to take action to increase productivity of the system in near future. Your task is to write a program to calculate the Reliability (MTBF, MTTR) and Availability parameters of the system for given tenure. The parameters are

- Mean Time Between Failures (MTBF)
- Mean Time To Repair (MTTR)

Let us understand the terms using an example

Example of calculation of terms using data

If Dhirubhai looks outage details for the month of April 2015 then Availability, MTBF, MTTR has been calculated as below

Month	April, 2015
Name of Machine	M4
Operation availability (min/month)	24,960

Input Parameter

Frequency	11

Input Parameter

MTBF (min)	2,095	Output
MTTR (min)	175	Output
AVAILABILITY	92%	Output

No.	Date	Time Start	Time Finish	Down (min)	Replacement
1	01-Apr	10:00 AM	12:00 PM	120	Parts 56
2	03-Apr	10:00 AM	12:00 PM	120	Parts 98
3	04-Apr	10:00 AM	12:00 PM	120	Parts 33
4	05-Apr	10:00 AM	12:00 PM	120	Parts 11
5	06-Apr	10:00 AM	12:00 PM	120	Parts 12
6	07-Apr	10:00 AM	12:00 PM	120	Parts 98
7	15-Apr	6:00 AM	6:00 PM	720	Parts 09
8	22-Apr	2:00 PM	6:00 PM	240	Parts 12
9	25-Apr	10:30 AM	12:00 PM	90	Parts 98
10	25-Apr	3:30 PM	4:30 PM	60	Parts 09
11	26-Apr	10:30 AM	12:00 PM	90	Parts 12
Total down time (min)				1,920	Input Parameter

Operation Availability (in minutes for tenure) = # of working days * # of working Hrs in a day * 60
Frequency - Total no. of failures during tenure
Total Down Time (in minutes) - Total down time during tenure

Important Points

- **MTBF** - Mean time Between Failures
- MTBF calculated using formula MTBF = (Operation Availability - Total Down Time) / Frequency
- **MTTR** - Mean Time To Repair

MTTR calculated using formula MTTR = Total Down Time / Frequency
- **Availability** - Total system Availability during given tenure
  Availability calculated using formula Availability = (MTBF/(MTBF+MTTR))*100
- Frequency should always be positive integer value.
- All values should be positive.
- MTBF, MTTR in simple terminology
  Failure----------Repair----------Failure
  <------MTTR---------->
  <----------MTBF---------->

Input Format:

First line contains Operation Availability in minutes for tenure denoted by an integer N
Second line contains frequency of failures for components denoted by an integer F
Third line contains Total down time in minutes during tenure denoted by an integer T

Output Format:

MTBF in minutes
MTTR in minutes
Total system Availability during given tenure

Constraints:

N > 0 ; F >=0 ; T > 0

T <= N (Total down time should be <= operation availability)

If Frequency is zero then display should as below

Total Down Time: 0
0
0
100%

If no failures are observed during tenure then Frequency and Total down time should be zero

Calculations for MTBF, MTTR and Availability should be done upto 11 precisions and calculated values (MTBF,MTTR and System Availability) must be printed as nearest integer value

Use % symbol while displaying System Availability in the output

Prompt for input until valid input is given

Print Invalid Input if non numeric value and / or negative values are given as inputs and prompt user to reenter numeral value for same input.

Sample Input and Output

SNo.	Input	Output
1	500 2 25	238 12 95%
2	-2490 630 -3 3 0 315	Invalid Input Invalid Input Invalid Input 105 105 50%

Explanation of Input 2:-

1. First input is Operation Availability, which does not follow the constraint; viz. N > 0 so output is **Invalid Input**.
   Again prompt for Operation Availability. Now we have entered 630 which is a valid input.
2. **Second input is Frequency of Failures**, which does not follow the constraint, viz. F >= 0 so output is **Invalid Input**.
   Again prompt for Frequency of Failures. Now we have entered 3 which is a valid input.
3. **Second input is Total down time**, which does not follow the constraint, viz. T > 0 so output is Invalid Input.
   Again prompt for Total down time. Now we have entered 315 which is a valid input.
4. Now calculations for MTBF, MTTR and System Availability are done upto 11-digit precision and display the output to nearest integer values for all calculated values. So the output is :-
   105
   105
   50%

Note:

Please do not use package and namespace in your code. For object oriented languages your code should be written in one class.

Note:

Participants submitting solutions in C language should not use functions from <conio.h> / <process.h> as these files do not exist in gcc

Note:

For C and C++, return type of main() function should be int.

Submit Answer

I , **ABHISHEK SARKAR** confirm that the answer submitted is my own.

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