

Test sheet 3 (Lap times)

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WORKSHEET 3 – TESTING (Lap Times)

1. Original code:

```
#define _CRT_SECURE_NO_WARNINGS
#include <stdio.h>
#include <math.h>
#include <string.h>
#include <windows.h>

void main()
{
    float lapTimes[5], overallTime = 0, targetLap, averageLapTime, fastestLap = 1000,
    slowestLap = 0;
    int laps[5] = { 1, 2, 3, 4, 5 }, count = 0 ;

    printf("Welcome to the Racing statistics program:\n\n");

    printf("Please enter the latest lap times (in seconds)\n");

    for (int i = 0; i < 5; i++)
    {
        printf("Lap %d: ", laps[i]);
        scanf("%f", &lapTimes[i]);

        overallTime = overallTime + lapTimes[i];
    }

    printf("\n\nWhat is your target lap time? ");
    scanf("%f", &targetLap);

    printf("\n\n");
    printf("Your statistics are....\n\n");

    printf("1. Overall time for 5 laps: %.2f\n", overallTime);
    printf("\n");

    averageLapTime = overallTime / 5;
```

```

printf("2. Average lap time was: %.2f\n", averageLapTime);
printf("\n");

for (int i = 0; i < 5; i++)
{
    if (lapTimes[i] < fastestLap)
    {
        fastestLap = lapTimes[i];
    }
}

printf("3. The fastest lap time was %.2f seconds\n", fastestLap);
printf("\n");

for (int i = 0; i < 5; i++)
{
    if (lapTimes[i] > slowestLap)
    {
        slowestLap = lapTimes[i];
    }
}

printf("4. The slowest lap time was %.2f seconds\n", slowestLap);
printf("\n");

for (int i = 0; i < 5; i++)
{
    if (lapTimes[i] <= targetLap)
    {
        count = count + 1;
    }
}

printf("5. %d of your laps were better than or equal to your target laptime \n", count);
printf("\n");
}

```

2. Code Testing

For each test below, run your code and show the results of the scenarios below. Present a screenshot of what happened when the programme ran. Did the programme behave correctly or did it do something unexpected, and if so, why?

a) Test a lap time for your programme:

- i) 42 seconds
- ii) 2 seconds
- iii) -4 seconds
- iv) 53444 seconds
- v) Test the target lap time – show that the values entered are reasonable

b) Using the same five lap times as the sample output ie

Lap 1: 42.3
Lap 2: 42.1
Lap 3: 44
Lap 4: 44
Lap 5: 39.4

Examine each statistic (1-6) and comment on whether the correct answer(s) are displayed or not. (If any statistics were incomplete after Phase 1 (code completed in class) simply write "Unfinished")

c) Test two further sets of lap times of your own choice.

Test:

A) Test a lap time for your programme

Screenshot(s) of output:

```
Welcome to the Racing statistics program:

Please enter the latest lap times (in seconds)
Lap 1: 42
Lap 2: 2
Lap 3: -4
Lap 4: 53444
Lap 5: 39.6

What is your target lap time? 39.6
```

Result: Did the programme behave as expected ie syntactically and logically correct?

Test A) i) this test allowed the user to enter a lap time of 42 seconds this worked as expected.

ii) although the programme has allowed the user to enter a lap time of two seconds this is incorrect, there needs to be some lower limit validation added to the programme to keep the lap times entered logical.

iii) like the previous test the user was able to enter -2 for the lap time however as its impossible to have completed a lap in minus seconds the programme will need lower-level validation to keep inputs logical.

iv) In contrast to the previous two tests, The user was able to enter a lap time of 53444 seconds as this is an unrealistically long time to complete a lap it shows that the programme will need upper limit validation added.

v) The user entered a value of 39.6 seconds, this worked as expected and the value entered was positive and reasonable. However, there is no validation in the code to stop negative or overly large values being entered.

Test:

B) Statistic accuracy testing

Screenshot(s) of output:

```
Welcome to the Racing statistics program:

Please enter the latest lap times (in seconds)
Lap 1: 42.3
Lap 2: 42.1
Lap 3: 44
Lap 4: 44
Lap 5: 39.4

What is your target lap time? 40

Your statistics are....

1. Overall time for 5 laps: 211.80
2. Average lap time was: 42.36
3. The fastest lap time was 39.40 seconds
4. The slowest lap time was 44.00 seconds
5. 1 of your laps were better than or equal to your target laptime
```

Result: Did the programme behave as expected ie syntactically and logically correct?

Statistic 1) overall time for the 5 laps entered was a correct output of 211.8 seconds.

Statistic 2) The output for the average lap time was correct. The program correctly added the lap times together and divided the total by the number of laps to calculate the average.

Statistic 3) the programme correctly referenced the lap times entered and displayed the fastest time of 39.4 seconds.

Statistic 4) similarly to statistic 3 the programme correctly displayed the slowest lap time of 44 seconds.

Statistic 5) The program correctly compared the lap times to the target lap time and counted how many laps were faster than the target.

Statistic 6) unfinished

Test:

C) Testing lap times of own choice

Screenshot(s) of output:

```
Welcome to the Racing statistics program:

Please enter the latest lap times (in seconds)
Lap 1: 45
Lap 2: 49
Lap 3: 51
Lap 4: 51
Lap 5: 48

What is your target lap time? 48

Your statistics are....

1. Overall time for 5 laps: 244.00
2. Average lap time was: 48.80
3. The fastest lap time was 45.00 seconds
4. The slowest lap time was 51.00 seconds
5. 2 of your laps were better than or equal to your target laptime
```

Result: Did the programme behave as expected ie syntactically and logically correct?

All lap time entered by the user in this test where realistic and worked as expected.

Statistic 1 to 5 all returned expected answers,

overall time for the laps entered was correctly returned at 244 seconds,

average lap time was correct at 48.8 seconds,

the programme correctly returned the fastest and slowest lap times of 45 seconds and 51 seconds,

the programme correctly referenced the lap times against the target lap time and accurately returned the amount of laps that were faster.

Test:

C) Testing lap times of own choice

Screenshot(s) of output:

```
Welcome to the Racing statistics program:

Please enter the latest lap times (in seconds)
Lap 1: 1000
Lap 2: -1000
Lap 3: 50
Lap 4:
1
Lap 5: a

What is your target lap time?

Your statistics are...

1. Overall time for 5 laps: -107374128.00
2. Average lap time was: -21474826.00
3. The fastest lap time was -107374176.00 seconds
4. The slowest lap time was 1000.00 seconds
5. 1 of your laps were better than or equal to your target laptime
```

Result: Did the programme behave as expected ie syntactically and logically correct?

In this test the user has tried to stress the programme by entering unrealistic lap times, negative lap times and characters.

Due to the user entering unrealistic lap times the statistics have been completely broken except for the slowest lap time. It has also broken the target lap time entry, as soon as the character was entered it skipped through the rest of the programme. This was due to the lack of validation in the original code. There needs to be validation added to stop users entering unrealistic lap times and characters this would help keep the programme running something and efficiently.

Consider the results of the above tests and revisit your original code in order to address any tests that failed and/or improve code efficiency.

(Note: you may not be able to solve all of the problems that were encountered, but solve as many as you can.)

Paste your full revised code here :

```
#define _CRT_SECURE_NO_WARNINGS
#include <stdio.h>
#include <math.h>
#include <string.h>
#include <windows.h>

void main()
{
    float lapTimes[5], overallTime = 0, targetLap, averageLapTime, fastestLap = 1000,
    slowestLap = 0;
    int laps[5] = { 1, 2, 3, 4, 5 }, count = 0 ;

    printf("Welcome to the Racing statistics program:\n\n");

    printf("Please enter the latest lap times (in seconds)\n");

    for (int i = 0; i < 5; i++)
    {
        printf("Lap %d: ", laps[i]);

        while (scanf("%f", &lapTimes[i]) != 1 || lapTimes[i] <= 20 || lapTimes[i] >= 100)
        {
            printf("invalid input, Please enter a lap time between 0 and 100: ");
        }

        overallTime = overallTime + lapTimes[i];
    }

    printf("\n\nWhat is your target lap time? ");
    while (scanf("%f", &targetLap) != 1 || targetLap <= 0 || targetLap > 100)
    {
        printf("Invalid input, please enter a target lap time between 1 and 100 seconds: ");
    }

    printf("\n\n");
    printf("Your statistics are....\n\n");
```

```

printf("1. Overall time for 5 laps: %.2f\n", overallTime);
printf("\n");

averageLapTime = overallTime / 5;

printf("2. Average lap time was: %.2f\n", averageLapTime);
printf("\n");

for (int i = 0; i < 5; i++)
{
    if (lapTimes[i] < fastestLap)
    {
        fastestLap = lapTimes[i];
    }
}

printf("3. The fastest lap time was %.2f seconds\n", fastestLap);
printf("\n");

for (int i = 0; i < 5; i++)
{
    if (lapTimes[i] > slowestLap)
    {
        slowestLap = lapTimes[i];
    }
}

printf("4. The slowest lap time was %.2f seconds\n", slowestLap);
printf("\n");

for (int i = 0; i < 5; i++)
{
    if (lapTimes[i] <= targetLap)
    {
        count = count + 1;
    }
}

printf("5. %d of your laps were better than or equal to your target laptime \n", count);
printf("\n");

printf("6.\n");

printf("Lap 1 was %.2f\n", lapTimes[0]);

for (int i = 1; i < 5; i++)
{
    if (lapTimes[i] < lapTimes[i - 1])
    {

```

```
        printf("Lap %d was %.2f which was faster than the previous lap\n",
               i + 1, lapTimes[i]);
    }
    else if (lapTimes[i] > lapTimes[i - 1])
    {
        printf("Lap %d was %.2f which was slower than the previous lap\n",
               i + 1, lapTimes[i]);
    }
    else
    {
        printf("Lap %d was %.2f which was equal to the previous lap\n",
               i + 1, lapTimes[i]);
    }
}

}
```

Test sheet 3 (Lap times)

GRADEMARK REPORT

FINAL GRADE

16/0

GENERAL COMMENTS

WORKSHEET 3

Coding- Might be an idea to tell the user what the laptime range is to improve the user interface ("Please enter lap time 20-100" (you've written 0-100) Also, I can't enter 100, only 99, so be sure to test on the boundaries as well.

I'm not entirely sure why `lapTime!=1` is included in your while on line 23 - 1 is less than 20 anyway, so this seems redundant

Target lap time isn't validated, I was able to enter 2 seconds which would be pushing it even for Superman :)

There is scope to combine the for loops for 3 and 4 for efficiency.

The above are fairly minor points, you've got the core features working well, well done.

7/10

Testing - When you say validation is needed, state exactly what is needed (eg what boundaries). Overall though, well discussed 9/10

Overall- 16/20

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