```
Script started on 2023-10-25 13:07:54-05:00 [TERM="xterm" TTY="/dev/pts/6" COLUMNS=
ee43254@ares:~$ pwd
/home/students/ee43254
ee43254@ares:~$ cat time.info
Name: Kyle Enkhzul

Class: CSC121-001



Activity: The Times they are a' Changin'

Level: 3.5, 3.5 (base program),



Description:



The user inputs two times that are within the same day. It is input as military

time. The program then tells the user the difference between the two times in

various formats.



ee43254@ares:~$ show-code time.cpp


time.cpp:
```

```cpp
#include <iostream>
#include <cmath>

using namespace std;

/*
    This method is intended to take the amount of hours between two
    hour values and convert the difference to minutes.
    @return minutes from hours
*/
short convertHourToMin(short hour1, short hour2) {
    return static_cast<short>((hour2-hour1-1) * 60);
}

/*
    This method is intended to calculate the total amount of minutes
    between two times. It utilizes the helper function,
    convertHourToMin().
    @return total minutes between two times
*/
short calculateTotalMin(short min1, short min2, short hour1,
        short hour2) {
    return static_cast<short>(convertHourToMin(hour1, hour2) +
    abs((60-min1)+min2-1));
}

/*
    This method is intended to calculate the total amount of hours
    between two times. It utilizes the helper function,
    calculateTotalMin().
    @return double data type of total hours
*/
double calculateTotalHour(short hour1, short hour2, short min1,
        short min2) {
    return (calculateTotalMin(min1, min2, hour1, hour2) / 60.0);
 }

/*
    This method is intended to calculate the total amount of
    minutes between two values of minutes.
    @return total minutes between two values of minutes.
*/
short calculateMinBetweenTimes(short min1, short min2){
    return static_cast<short>((60-min1) + min2 - 1);
}

int main() {
    srand(static_cast<unsigned>(time(nullptr)));
    short hour1, hour2, min1, min2, rnd;
    char colon;

    cout << "\t\t Welcome to the Time Calculation Program!!!\t\t\n";
    cout << "\nWhat is your first time? ";

    cin >> hour1 >> colon >> min1;

    cout << "\nWhat is your second time? ";

    cin >> hour2 >> colon >> min2;

    cout << "\nThere are " << calculateTotalMin(min1,min2,hour1,hour2) <<
    " minutes between the two times ("
    << calculateTotalMin(min1, min2, hour1, hour2) + 2
    << " inclusive).\n";

    if(calculateMinBetweenTimes(min1, min2) >= 60) {
        cout << "\nThat's the same as "
        << floor(calculateTotalHour(hour1, hour2, min1, min2))
        << " hours and " <<  calculateMinBetweenTimes(min1, min2) % 60
        << " minutes or (" << hour2-hour1 << ":";
        cout.fill('0');
        cout.width(2);
        cout << calculateMinBetweenTimes(min1, min2) % 60 + 2
        << " inclusive).\n";
    }
    else {
    cout << "\nThat's the same as "
    << floor(calculateTotalHour(hour1,hour2,min1,min2)) << " hours and "
    <<  calculateMinBetweenTimes(min1, min2) << " minutes or ("
    << hour2-hour1-1 << ":" <<
    calculateMinBetweenTimes(min1, min2) + 2 << " inclusive).\n";
    }

    cout << "\nOh... and that's also "
    << calculateTotalHour(hour1, hour2, min1, min2) << " hours (or "
    << (calculateTotalHour(hour1, hour2, min1, min2) + (1/30.0))
    << " inclusive).\n";

    cout << "\nThank you for using the TCP!!\n";

    rnd = static_cast<short>(rand() % (3 - 1 + 1) + 1);

    switch(rnd) {
        case 1:
            cout << "\nHave a good day. \n";
            break;
        case 2:
            cout << "\nHave a marvelous day. \n";
            break;
        case 3:
            cout << "\nHave a wonderful day. \n";
            break;
    }
}

```

```
ee43254@ares:~$ CPP time
time.cpp***


ee43254@ares:~$ ./time.out
                 Welcome to the Time Calculation Program!!!

What is your first time? 12:40

What is your second time? 18:24

There are 343 minutes between the two times (345 inclusive).

That's the same as 5 hours and 43 minutes or (5:45 inclusive).

Oh... and that's also 5.71667 hours (or 5.75 inclusive).

Thank you for using the TCP!!

Have a good day.
ee43254@ares:~$ ./time.out
                 Welcome to the Time Calculation Program!!!
```

```
What is your first time? 13:20

What is your second time? 18:24

There are 303 minutes between the two times (305 inclusive).

That's the same as 5 hours and 3 minutes or (5:05 inclusive).

Oh... and that's also 5.05 hours (or 5.08333 inclusive).

Thank you for using the TCP!!

Have a good day.
ee43254@ares:~$ ./time.out
                 Welcome to the Time Calculation Program!!!

What is your first time? 15:20

What is your second time? 18:30

There are 189 minutes between the two times (191 inclusive).

That's the same as 3 hours and 9 minutes or (3:11 inclusive).

Oh... and that's also 3.15 hours (or 3.18333 inclusive).

Thank you for using the TCP!!

Have a marvelous day.
ee43254@ares:~$ cat time.tpq
1. How can you get the '0'to print in front of times with only one digit?



        We can get '0' to print in front of the times with only one digit by

        testing whether or not the total minutes between the two times are greater

        than or equal to 60. If this is so, we can modulo out 60 and cout.fill

        with 0 and cout.width to 'two' to have a properly formatted single digit

        time.



2. How many functions did you write for this program? Describe each briefly –

explain what needs to come into each function, what it sends back out, and

its general purpose.
```

I wrote four functions. For the:

convertHourToMin: This function takes the amount of hours between two hour values and converts the difference to minutes. It takes in the two hours and returns back how many minutes are in the difference of the two hours.

calculateTotalMin: This function calculates the total amount of minutes between two times. It utilizes the helper function, convertHourToMin. It takes in the minutes and hours of both times and returns the amount of minutes between the two times.

calculateTotalHour: This function calculates the amount of hours between two times. It utilizes the helper function, calculateTotalMin. It takes in the minutes and hours of both times and returns the amount of hours between the two times as a decimal.

calculateMinBetweenTimes: This function calculates the total amount of minutes between two values of minutes. It takes in the two minutes and returns the total minutes between the two values. It is helpful in determining whether to account if the time between minutes is more than one hour.

3. How are reference arguments used in this program?
(On what function(s)? How many references on each function?)

Reference arguments are used to manipulate the input of minutes and hours within the scope of the function in order to achieve a desired output.
I named my reference arguments the same as my global variables for the sake of easier debugging and reading but it does the same effect.
Each function has:

convertHourToMin: 2

calculateTotalMin: 4

calculateTotalHour: 4

calculateMinBetweenTimes: 2

4. Describe the flow of information in this program. Where does the data start?
Where do variables exist? How is data passed from one function to another?
Where are references made? Where are copies of data made?

The program starts off by declaring our global variables for the two short values of hours and minutes. It also declares the char variable to account for the colon in the user's input of time. These global variables exist throughout the whole program. It then cout statements and then prompts the user for both times. The program takes these two times and stores them accordingly into the two values of hours and two values of minutes respectively. From here, the rest of the program is various functions manipulating the user's input data of times to achieve the desired calculated outputs. The reference arguments in each of the function only have a local scope within the function. Even though my reference arguments are named the same as the global variables, they only exist within the function. Data is passed from one function to another by return statements Each function returns a certain calculated data which can then be used by other calling functions. Copies of data are made within a function and then returned.

```
5. How can you get the program to print a random message at the end of every

run?

        The program can print a random message at the end of every run by generati

        a random number at the start of the program. Depending on the value,

        it can then print out a goodbye statement depending on which random value

        was generated. This is limited by how many random print statements the

        programmer wants implemented and thus the random generation will be in the

        bounds of how many statements there will be. ee43254@ares:~$ exit
exit

Script done on 2023-10-25 13:08:48-05:00 [COMMAND_EXIT_CODE="0"]
```