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Click or tap here to enter text.

*There are many notes in the instructions to help you earn marks for the questions below.*

Exercise One of Two – **integer overflow** (80 points)

1) 🡺 (7.5 points) ) If a variable counting seconds is stored in a signed **long** 32-bit integer, how many **days** will it take until that integer overflows? (to one decimal place)

24,855.1 days

2) 🡺 (15 points) Convert the maximum value of an unsigned **long** 32-bit integer, representing hundredths of a second, into whole numbers of  
 days : hours : minutes : seconds . hundredths of a second.   
After *n* days, how many hours remain? After *n* hours, how many minutes remain? etc.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **496** | **2** | **27** | **52** | **95** |
| **DAYS** | **HOURS :** | **MINUTES :** | **SECONDS .** | **HUNDREDTHS** |

3) 🡺 (2.5 points) What are the maximum and minimum values that can be stored in a **short** 16-bit signed integer?

16-bit signed integer maximum = 32,767 … minimum = -32,768

4) 🡺 (5+5 points) Give examples of two **short** 16-bit signed integers that when added together would cause overflow.

 16386 +  16383 are two positive values causing overflow when added together.

-16384 + -16385 are two negative values causing overflow when added together.

Binary Search Bug

5) 🡺 (10 points) What is potentially wrong with the **(low + high) / 2** calculation to find the middle point? Under what conditions would the calculation go wrong?

Its potential wrong is that there is a risk of an integer overflow. An integer overflow can result in an overvalue or unexpected result because the calculation results exceed the maximum value of the data. If both low and high values are positive integers, they may exceed the maximum value that can be sorted in the data.

6) 🡺 (10 points) REWRITE themidcalculation to prevent overflow*from*mid = (low + high) / 2;*to*  **mid = low + (high-low) / 2;**

7) 🡺 (25 points)Write a 250+ word “reflection”(similar to a workshop in your programming class) describing the steps you used to develop and test your solution to the calculation bug.

In order to complete the task of fixing the Binary Search Bug, I first investigated the overall structure of the process. To begin, I utilized the 'midBugtTest' application that was provided to me in order to acquire information regarding the low and high values. On occasion, however, I was unable to display the values for integers in an appropriate manner in certain circumstances. This unanticipated output has the potential to cause a significant problem. Overflow happens when the calculation of "low value plus high value" is so massive that it cannot even be kept in memory. After a lot of trial and error, I came to the conclusion that it would be acceptable to apply this formula to a high value. When the low value is subtracted from the high value, it will never be difficult to arrive to a different value that is higher. For the purpose of preventing an overflow, the difference between the two will be saved immediately in the temporary memory. Therefore, using this method of calculation will ensure that there is no risk of losing the data that has been stored. I was under the impression that this might not be the most effective method of calculation; yet, it would be acceptable to locate the precise value without making any mistakes. Through the use of the program that was provided and the technique of calculation that was reiterated, I was able to find a solution to the calculation bug. During my study of these processes, I was able to reduce the number of instances of overflows by improved calculations.

Exercise Two of Two – **Numbering Systems and Conversions (20 points)**

8) 🡺 (10 points ) What is the hex value for these colours?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Red decimal | Green decimal | Blue decimal | Hex triplet | Colour Description |
| 15 | 245 | 231 | #0FF5E7 | A light blue color. |
| 192 | 255 | 238 | #C0FFEE | A light mint color. |
| 208 | 13 | 30 | #D00D1E | A deep, red color. |
| 186 | 187 | 30 | #BABB1E | A muted yellow-green color. |
| 126 | 164 | 112 | #7EA470 | Green with a bit of gray. |

9) 🡺 (10 points)Fill in this chart as per the column headings

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Hex triplet | Red decimal | Green decimal | Blue decimal | Describe the Final Colour *and* change the cell's background colour, i.e. R-click and see MS Word 'Shading' |
| #302432 | 48 | 36 | 50 | Dark purple. |
| #204C02 | 32 | 76 | 2 | Dark green. |
| #D64A53 | 214 | 74 | 83 | Vivid pink. |
| #404891 | 64 | 72 | 145 | Light Navy. |