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*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)

A 32-bit long integer can store values from-2,147,483,648 to 2,147,483,648. So the no. of days taken to overflow=(dividing the storage value of int by no of seconds in a day) =24,855.1 days. (answering after a really big and weird calculation)

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.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **49** | **??** | **??** | **??** | **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.

 32,760 +  10 are two positive values causing overflow when added together.

-32,760 + (-28) 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?

The sum of low and high is potentially go wrong as the values may not fall in between the range of the data type they are assigned to resulting in an overflow .The calculations would go wrong here if both the integers low and high are a positive higher number or simply ( very large numbers), as the sum of these could result in an overflow (and potentially send my computer into hyperventilating mode 🚒👨‍🚒🧯)

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.

First and foremost I tried running the code in its entirety which wasn’t possible then I examined the calculation problem and tried modifying the formula in a way that the output comes out desired without any overflow or even (an underflow happening). Changing the formula in the code from adding low and high and then dividing by 2 to firstly subtracting the low from high and then adding the low and dividing it by 2 essuring that overflow is prevented.Then I tried building the solution and (voila!) it happened the code was run successfully. As the problem wasn’t with any other thing but just the arthemetic formula.

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 | CYAN |
| 192 | 255 | 238 | #C0FFEE | LIGHT CYAN |
| 208 | 13 | 30 | #D00D1E | DARK RED |
| 186 | 187 | 30 | #BABB1E | OLIVE GREENISH |
| 126 | 164 | 112 | #7EA470 | DARKISH GREEN |

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 GREYISH |
| #204C02 | 32 | 76 | 2 | DARK GREEN |
| #D64A53 | 214 | 74 | 83 | DARK PEACH |
| #404891 | 64 | 72 | 145 | NAVY BLUE |