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hope you have a great day :)

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

Exercise One of Two – **integer overflow** (65 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 integer can hold numbers from -231 to 231 so the highest number we can dedicate as seconds would be 2,147,483,648 and each day would have 24 x 60 x 60 secounds which is 86400 which means we ca save up to 24855 days BUT (from this point im just wondering around) if we start from -231 and count up to 231 it would be taking double the mount of time to run out of memory = 49710 days or 136 years

2) 🡺 (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 = 215 = 32768 … minimum = -215 = -32768

3) 🡺 (5+5 points) Give examples of two **short** 16-bit signed integers that when added together would cause overflow.

 32768 +  1 are two positive values causing overflow when added together.

-32768 + -1 are two negative values causing overflow when added together.

Binary Search Bug

4) 🡺 (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?

If the lowest and highest points of our number wouls be some very large number which are really close to our memory limits, then the computer would have problem calculating the middle point

5) 🡺 (10 points) REWRITE themidcalculation to prevent overflow*from*mid = (low + high) / 2;*to*  **mid = ( low / 2 ) + ( high / 2 ) ;**

6) 🡺 (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.

So a case that would make an error on the first version of the calculation would be when trying to find the middle point between two numbers that the sum of them would be higher than 215

For example lets try and find the middle point of 215 and 214.

In the new version we would have (215 / 2) + (214 / 2) which would be equal to (214) + (213)

The equivalent to the upper equation would be less than 215 by 213 (the difference) and would be way less than our memory limit, so it would be all good (unless the input numbers would not be higher than our limit)

Exercise Two of Two – **Numbering Systems and Conversions (35 points)**

7) 🡺 (10 points ) What is the hex value for these colours?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Red decimal | Green decimal | Blue decimal | Hex triplet | Colour Description |
| 15 | 245 | 231 | #0FF5E7 | Fluorescent cyan |
| 192 | 255 | 238 | #C0FFEE | celeste |
| 208 | 13 | 30 | #D00D1E | Fire engine red |
| 186 | 187 | 30 | #BABB1E | Old gold |
| 126 | 164 | 112 | #7EA470 | asparagus |

8) 🡺 (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 moss green |
| #D64A53 | 214 | 74 | 83 | Indian red |
| #404891 | 64 | 72 | 145 | Marina blue |