

Problem 1.

Convert the decimal numbers $(12)_{10}$ and $(-4)_{10}$ into 8-bits binary signed integers (two's complement), perform the binary addition and convert the result back to a decimal number. You may type your answers in a text editor or MS Word. Or you may also write your answers on paper, take a picture and include it in your write up.

Converting Decimal to 8-Bits Signed Binary:

★ $(12)_{10} = (00001100_2)$

- First digit (0) shows the number is positive

Remaining digits:

$$(0 \times 2^7) + (0 \times 2^6) + (0 \times 2^5) + (0 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0)$$

★ $(-4)_{10} = (10000100_2)$

- First Digit (1) shows the number is negative

Remaining digits:

$$(0 \times 2^6) + (0 \times 2^5) + (0 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0)$$

Binary Addition:

★ Two's Complement

- For $(-4)_{10}$
- Inverts $(+4)_{10}$ Binary = (00000100_2)
to get: (11111011_2)
- Add 1 →
$$\begin{array}{r} 11111011 \\ + 1 \\ \hline 11111100 \end{array}$$
 Result is (11111100_2)
- Add Result to $(12)_{10} = (00001100_2)$:

and drop extra 1 only need other 8 digits

$$\begin{array}{r} 00001100 \\ + 11111100 \\ \hline 00001000 \end{array}$$

Produces (00001000_2)

Convert Result Back into Decimal:

- (00001000_2)
- First digit (0) indicates positive
- $(0 \times 2^7) + (0 \times 2^6) + (0 \times 2^5) + (1 \times 2^3) + (0 \times 2^2) + (0 \times 2^1) + (0 \times 2^0)$
 $= 2^3 = 8$

$(+8)_{10}$

Problem 2. Short answers

(a) Find all syntactic errors in the following code (hint: if you are not sure whether you find all of them, try to compile your code and run it).

The red indicates changes I made to the code:

```
#include <iostream>
(Space right here)
using namespace std;

int main() {

    int i=1;
    int j=2;
    cout << (i and j) << endl;
    double grade = 90.0;
    cout << grade << endl;

    return 0;

}
```

(b) What is the output of the following block of C++ code?

```
int i = 5, j = 6;
cout << i << " " << j << endl;
i = j;
cout << i << " " << j << endl;
```

Putting in the same code gave me:

```
5 6
6 6
```

(c) Here we have eight variable names, which are acceptable in C++?

Apple, 2nd_exam, unitPrice, sizeofstudent_ID,
test#1, apple(price), return

Acceptable Names: Apple, unitPrice, sizeofstudent_ID

d) What is the output of the following block of C ++ code?

```
double a = 5/2;  
double b = 5.0/2;  
int c = 5.0/2.0;  
float d = float (5)/2;  
float e = float(1/2);  
cout << a <<" "<< b <<" "<<c;  
cout <<" "<< d <<" "<< e <<endl;
```

Putting in the same code gave me:

2 2.5 2 2.5 0

(e) What is the output of the following block of C ++ code?

```
int a;  
double b = 6.7;  
a = b;  
cout << a <<" "<< b << endl;
```

Putting in the same code gave me:

6 6.7

Problem 3.

Write a C++ program to compute the area and perimeter of a rectangle. The program should ask the user to enter the width and length of the rectangle from the keyboard (data type: double) and display the results on the screen.

(.cpp file is attached)

The Output:

```
student@student-VirtualBox:~/Desktop/Rectangle$ g++ -o PerimeterArea  
WidthArea.cpp  
student@student-VirtualBox:~/Desktop/Rectangle$ ./PerimeterAreaEnter
```

Width of the Rectangle = 3

Enter Height of the Rectangle = 64

Area of Rectangle is 192

Perimeter of rectangle is 134