**CSC 1100 – Problem Solving and Programming**

**Homework 2 – Trevor Trusty**

**25 points – Due January 31, 11am**

**Late deadline is February 2, 11:59pm, but 20% off**

**a)** Save this document with your name and the homework number somewhere in the file name.

**b)** Type/paste your answers into the document.

**c)** Submit this document to the Canvas item where you downloaded this document.

**1) [4 points]** Using information from the Internet or a textbook, list any four facts about the history of programming languages. Include your sources in the form of hyperlinks or book citations.

| # | Fact | Source |
| --- | --- | --- |
| 1 | The first programming language was FORTRAN, for scientific computing | https://cs.brown.edu/~adf/programming\_languages.html |
| 2 | C# was created by Microsoft in 1988, name is a play on the sharp symbol in music notation | https://en.wikipedia.org/wiki/C\_Sharp\_(programming\_language)#Name |
| 3 | “The first computer programmer was a female, named Ada Lovelace.” | https://www.improgrammer.net/programming-facts/ |
| 4 | The first reported bug was actually a moth stuck inside a computer | https://www.google.com/search?q=1st+computer+bug&oq=1st+computer+bug&aqs=chrome..69i57.3643j0j4&sourceid=chrome&ie=UTF-8 |

**2) [4 points]** Write an algorithm to describe how to convert a user input from Fahrenheit to an output of Celsius. Use enough detail that you have between five and ten steps. List any assumptions.

1. Assumptions

1) User prefers paper to electronic devices

2)user knows the temperature that needs converted

3)user can perform basic arithmetic

b) Steps

1) Prepare a pencil and paper

2) write down temperature in degrees Fahrenheit.

3) subtract 32 away from original temperature

4) multiply resulting number by 5

5) divide new number by 9

6) write the desired units, ℃, after the quotient

**3)** **[2 points]** How many bits are in five gigabytes? Show your work.

8 bits = 1 byte

1000 bytes = 1 kilobyte

1000 kilobytes = 1 megabyte

1000 megabytes = 1 gigabyte

* 5000 megabytes = 5 gigabytes
* 1,000,000 kilobytes in 1000 megabytes (1 gigabyte)
* 1,000 \* 1,000,000 = 1,000,000,000 bytes in 1,000,000 kilobytes
* 8\*1 trillion = 8 trillion bits in 1,000,000,000 bytes
* 8 trillion bits in 1 gigabyte
* 5\*8trillion bits = 40 trillion bits
* 40 trillion bits in 5 gigabytes

**4) [4 points]**

a) What is explicit casting?

Explicit casting happens when a value of one data-type needs to be converted to another data-type, so we explicitly tell the program to covert it.

b) What are essentially the only two explicit casts that are needed in C++?

1) Adding a decimal to an integer

2) writing the data-type we are converting to in a parenthetical before the value

c) Give examples of each one and describe what they do.

y = 4 / 5.

The ‘/’ operator tries to take 2 non-integers (i.e rationals/decimals) and divide them, but if both operands are integers it will not output a precise value, and will instead be rounded to the nearest integer. So to get around this, we can use explicit casting to convert one of the operands to a float or double by adding a decimal point after one of the integers, and it will give you a more precise, non-integer answer.

y = (double)4 / 5

To solve the same problem, we can also explicitly tell the program to convert an integer to a double by writing (double) before one of the integer operands.

**5)** **[3 points]** List three techniques for making code (in any programming language) more readable:

1) Putting neat comments where-ever they could make the code more understandable

2) Putting a space between each token

3) Using understandable variable/constant names, following naming conventions

**6) [2 points]** Why can't many real numbers be represented precisely by a computer?

Because there are a finite amount of bits, so it can only store up to a certain amount of digits from a number.

**7) [2 points]** What are the results of the following mod operations? Show your work for each calculation.

1. 111 % 4

111 / 4 = 27.75 = 27¾

Numerator is 3 => remainder is 3

b) 278 % 17

278 / 17 = 16

17 | 278 17\*16=272  
 272

6

Remainder is 6

**8) [4 points]** What happens when the given expressions are evaluated and assigned to the given variable types? Use the assignment statement table provided in the session notes.

a) An **int** expression is assigned to a **string** variable.

It will be treated as a string and a string will be stored.

b) A **float** expression is assigned to an **int** variable.

The float expression will round down to an int and an integer will be stored

c) A **string** expression is assigned to a **double** variable.

The program will not function properly, double variables can’t store strings

d) A **char** expression is assigned to a **char** variable.

A char expression will be stored