The University of Saskatchewan

Saskatoon, Canada

Department of Computer Science

CMPT 214– Programming Principles and Practice

Assignment 1

Date Due: September 21, 2020

Total Marks: 10

Submission Instructions

- Assignments must be submitted using Canvas.
- Programs must be written in C conforming to the C11 standard.
- Always include the following identification in your solutions: your name, NSID, student ID, instructor's name, course name, and course section number.
- No late assignments will be accepted. See the course syllabus for the full late assignment policy for this class.
- **VERY IMPORTANT**: Canvas is very fragile when it comes to submitting multiple files. We insist that you package all of the files for all questions for the entire assignment into a **ZIP** archive file. This can be done with a feature built into the Windows explorer (Windows), or with the **zip terminal command** (LINUX and Mac). We **cannot accept** any other archive formats. This means no tar, no gzip, no 7zip. Non-zip archives will not be graded. We will not grade assignments if these submission instructions are not followed.
- Instructions on "how to create zip archives" can be found here `https://canvas.usask.ca/courses/9771/pages/how-to-zip-slash-compress-your-files`

Question 1 (3 points):

Purpose: To practice console I/O and use of variables.

Write a story that uses three pieces of numeric data. The story should be entirely your own; there's no reason why two students should hand in the same story.

Now pretend that the pieces of numeric data in your story are "blanks". Write a program that prompts the user to enter the three pieces of numeric data from the console. Print the story to the console with the numeric data read from the console substituted into the appropriate "blanks" in your story.

Sample input and output:

```
Enter an integer: 3
Enter a real number: 2.5
Enter an integer: 9

A young hobbit was walking in the woods about 3 miles from home.
After collecting 2.5 baskets of tasty mushrooms they were beset
upon by 9 restless spirits.  The hobbit took a bite of a mushroom
and offered some to the spirits.  The spirits, their hunger sated,
left the hobbit in peace.
```

Question 2 (3 points):

Purpose: To practice use of variables and operators.

Write a C program that reads the diameter of a circle from the console, and prints to the console its area and circumference with exactly two decimal places. In addition to the code to your program, submit a file called `asn1q2output.txt` which contains copies of the console output of your program with three different diameter values (you can just cut and paste this from the console into a text editor and save it as `asn1q2output.txt`).

Hints: Recall that if r is the circle's radius, then the area of the circle is πr^2, and it's circumference is $2\pi r$. The value of π is 3.14159265.

Sample Output

```
Enter the diameter: 3
The radius of the circle is 1.500000
The area of the circle is 7.06
The circumference is 9.42
```

Question 3 (4 points):

Purpose: To practice use of variables and operators.

Mary lives on a farm and wants to earn some money for her son's birthday party this winter. It costs $300. She decided to raise some free-range chickens to sell.

She made a list of her costs:

- She needs to prepare a proper shelter for the chicks, that will cost her $50
- She will need special food for the chicks that costs $2 per chick.
- She will need to go to hatchery where she can buy the chicks for $1.50 each, and the trip will use $10 worth of gas.
- For the next sixteen weeks, the chicks grow into adulthood. Mary expects to lose 5% of her chicks during the first sixteen weeks.
- She decides that she can charge $4.00 for one full-grown chicken.

Your task is to help Mary to calculate the number of chicks she needs to purchase in order to have enough full-grown chickens to sell to make at least $300? In other words, how many chickens must she initially purchase to make at least a $300 profit. We are looking for the **smallest** number of chickens needed to make $300 profit.

Hint: You don't need to read data from the console. You may just hard-code the values in the question into variables.

Hint: If Mary sells n chickens, the profit would be:

$$p = (n \times u) - (n \times e) - f$$

where p is the profit, u is the unit price charged per chicken, e is the expenses to raise one chicken, and f represents fixed one-time costs that are independent of how many chicken are raised. But this formula fails to take into account the 5% of chickens don't make it to adulthood. You must determine the appropriate modification to the above formula to take these losses into account. Assume that Mary still incurs all costs of purchasing and raising those chickens (because Mary still bought their food and paid the hatchery for them).

Once you have modified the formula, you know that $p = 300$, you can calculate u, f, and e from the information given, and all you have to do then is solve for n.

When implementing this calculation in C, assume that the 5% of chickens that are lost is rounded up if it would result in a fractional number of chickens (which is impossible).

Editor's Note: We realized a few hours after this assignment was posted that we got a bit ahead of ourselves here. To do the rounding, above, you'll need to use either the `floor()` or `ceil()` function from the math library depending on how exactly you modify the formula. The use of these functions from the math library would be done exactly as described in Section 5.2.3 of the textbook. The example there is with `sqrt()`, the square root function, but it works the same way for `floor()` or `ceil()`. You have to include the `math.h` header and make sure you link the math library as described at the end of the section. You can look up the man pages for `floor()` and `ceil()` but they are pretty simple. `floor()` takes one argument of type double, rounds that value down to the nearest integer value, and returns that value as a value of type double. `ceil()` works the same way except it rounds up. For example, `floor(12.8)` would return 12.0 and `ceil(1.2)` would return 2.0.

Your console output should print the following.

```
The total number of chickens that Mary bought to raise $300: ???
The number of chicks that Mary lost during the first sixteen weeks: ???
Total expenses: ???
```

where your results take the place of the ???'s.

What to Hand In

Hand in a `.zip` file archive which contains the following files:

asn1q1.c: Your completed solution for question 1.

asn1q2.c: Your completed solution for question 2

asn1q2output.txt The console output of your three runs for question 2.

asn1q3.c: Your completed solution for question 3.

VERY IMPORTANT: You **must** hand in a ZIP archive containing all of the above files. You may not use any other type of archive (this means no gzip, no 7zip, etc.), and you may not submit the files

individually. We regret this necessary inconvenience but failure to follow these instructions may result in your assignment not being graded. We simply do not have the resources to handle special cases when we have so many students in the class. Instructions on "how to create zip archives" ca be found here `https://canvas.usask.ca/courses/9771/pages/how-to-zip-slash-compress-your-files`.

We will not grade assignments if these submission instructions are not followed.

Grading Rubric

The grading rubric can be found on Canvas.