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CSCI165 Module 1 Assignment

1/25/20

1. **Puzzle Problem: Suppose your little sister asks you to show her how to use a pocket calculator so that she can calculate her homework average in her science course. Describe an algorithm that she can use to find the average of 10 homework grades.**

To find an average, she would need to find the sum of all the grades and divide it by the number of individual grades, in this case, 10. SUM(grades) / Number of Assignments = Average

1. **Puzzle Problem: A Caesar cipher is a secret code in which each letter of the alphabet is shifted by N letters to the right, with the letters at the end of the alphabet wrapping around to the beginning. For example, if N is 1, when we shift each letter to the right, the word daze would be written as ebaf. Note that the z has wrapped around to the beginning of the alphabet. Describe an algorithm that can be used to create a Caesar encoded message with a shift of 5.**

To accomplish this, you would have to assign each letter a number based on it’s position in the alphabet. A=0, B=1…Z=25. Given the shift of the string is equal to 5, you would add 5 to each letter’s numerical value. If the number is greater than 25, you would subtract 25 from that sum and the difference would be that letter’s cipher. You would then return the sequence with the new letters assigned.

1. **Puzzle Problem: Suppose you received the message, “sxccohv duh ixq,” which you know to be a Caesar cipher. Figure out what it says and then describe an algorithm that will always find what the message said regardless of the size of the shift that was used.**

Yes, “puzzles ARE fun”! An algorithm to decipher this would involve assigning each letter a number based on it’s position in the alphabet (like above). Once all letters have been assigned a numerical value, you would take the cipher and subtract 1 from each character’s position, return the new sequence and analyze if it is a coherent word or statement, if so, you have your answer. If not, however, you would subtract 2 from each character’s position and check the results again, and continue adding one more to the number you are subtracting until the output is a coherent statement.

1. **Puzzle Problem: Suppose you’re talking to your little brother on the phone and he wants you to calculate his homework average. All you have to work with is a piece of chalk and a very small chalkboard—big enough to write one four-digit number. What’s more, although your little brother knows how to read numbers, he doesn’t know how to count very well so he can’t tell you how many grades there are. All he can do is read the numbers to you. Describe an algorithm that will calculate the correct average under these conditions.**

This problem was talked about in the Discord, and although I can’t get the notion of using Hexidecimal out of my head, I’m going to attempt to think outside of the box. One is using the first digit space as a counter, 0-9, and then using alphabet characters to add on to the counter in a format of a=10, b =11 etc all the way to z, which gives you a counter limit of 36. This also has a limit of 3 characters to add up grades, which becomes an issue if he gets 10 grades of 100, or 12 grades of 90, etc. My thinking would then lead me to keeping a running average that divides by 10 every time the counter resets, completely forgoing the alphabetic code. You would just add the new grade to the current average and divide by the counter +10 each time.

1. **Determine the Output: Suppose N is 15. What numbers would be output by the following pseudocode algorithm?**

**0 => Print N.**

**1 => If N equals 1, stop.**

**2 => If N is even, divide it by 2.**

**3 => If N is odd , triple it and add 1.**

**4 => Go to step 0.**

15, 46, 23, 70, 35, 106, 53, 160, 80, 40, 20, 10, 5, 16, 8, 4, 2, 1

1. **Determine the Output: Suppose N is 6. What would be output by the algorithm in that case?**

6, 3, 10, 5, 16, 8, 4, 2, 1

1. **Draw a UML class diagram representing the following class:**

**1. The name of the class is Circle.**

**2. It has one attribute, a radius that is represented by a double value.**

**3. It has one operation, calculateArea(), which returns a double.**

**4. Its attributes should be designated as private and its method as public**

**A screenshot of a cell phone

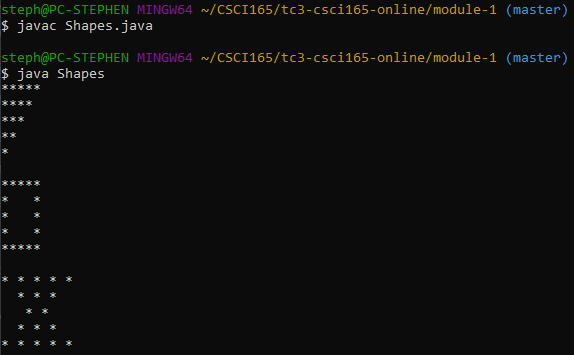
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1. **To represent a triangle we need attributes for each of its three sides and operations to create a triangle, calculate its area, and calculate its perimeter. Draw a UML diagram to represent this triangle.**

**A screenshot of a cell phone

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1. **Write a Java program: This is Shapes.java in my repository.**

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