CIS 230 Exam 1

2/19/2020

Name: _____

- Read the questions ***very carefully*** before writing answers.

1. Choose ALL that are TRUE. (8 pts)
   a. `Switch-case` statement is more expressive than `if-else` multi-way branch statement. In other words, any `if-else` multi-way branch can be written into a `switch-case` statement.
   b. An arithmetic expression will result in a *number* after it is evaluated while a Boolean expression results in a true/false value.
   c. `System.out.println("Sum is " + iNum)` and `System.out.printf("Sum is, %d\n", iNum)` print out the same string on the screen.
   d. Any `for` loop can be rewritten into `while` loop and vice versa.

2. Write the following math/Boolean expressions into Java *expressions* (not even a statement). You may use `double Math.sqrt(double)` method to calculate square root. x, y, z, a, b, and c are all variables. (8 pts)
   a. $\frac{x^3-2y+z}{x+xyz}$

   b. $\frac{-b+\sqrt{b^2+4a+c}}{2ab}$

   c. $x \leq 5 \ \wedge \ y \geq 8 \ \vee (6 \leq x + y \leq 20)$
      - $\wedge$ is *logical AND*, $\vee$ is *logical OR*

   d. $(y \ mod \ 4 = 0 \ \wedge y \ mod \ 10 \ \neq 0) \vee (y \ mod \ 400 \ = \ 0)$
      - mod is ***modulo*** – remainder operator, and '=' is a comparison operator not an assignment)

3. Chinese zodiac is a repeating cycle of 12 years, with each year being represented by an animal. In order, the 12 animals are: Rat, Ox, Tiger, Rabbit, Dragon, Snake, Horse, Goat, Monkey, Rooster, Dog, Pig. The person born in 1960 is Rat, 1961 Ox, 1962 Tiger, etc. Write codes (not program but code that goes in the main function) that will prompt a user to enter the *birth year* and print the *animal of the year*. Assume that the year entered will be 1960 or greater. Declare variables that are needed, and use `switch-case` statement for printing the animals. (14 pts)

4. (29 pts) This problem is to write loops for number calculation.
   a. Write a for loop that calculates the following series by adding up ***first n terms***. (6 pts)
   $3 + 7 + 11 + 15 + \cdots$
   (Hint: there are `n` terms to be added. `n` is a variable declared and given a value)

   b. Write a `for` loop that calculates the sum of the series below. It should <u>add `n` terms</u>, where `n` is a variable declared and given a value for the loop to use. (7 pts)
   $1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \cdots$

   c. Write a `while` loop that calculates the sum of even numbers and the sum of odd numbers a user enters. The loop finishes when 0 is entered, then prints the both sums. (8 pts):

d. Write a `for` loop that calculates the sum of the series below. `x` is a variable, and it . Do NOT use *nested* for loops, or calculate i factorial (i!). Instead, use the recurrence relationship $\frac{1}{i!} = \frac{1}{(i-1)!}/i$ to calculate each term. (8 pts)

$$x(1 - \frac{1}{2!} + \frac{1}{3!} - \frac{1}{4!} + \cdots - \frac{1}{100!})$$

5. (15 pts) (Target-Heart-Rate Calculator) While exercising, you can use a heart-rate monitor to see that your heart rate says within a safe range suggested by your trainers and doctors. The formula for calculating your *maximum heart rate* in beats per minute is *220 minus your age* in years. Your *target heart rate* is a range that's *50 ~ 85% of your maximum heart rate* (according to American Heart Association (AHA)). Write a **Java *program*** (i.e. import, class definition, main method, etc.) that

    i) accepts an age and current heart rate from the user and prints out if it's within the target heart rate or not.

    The program should provide the user interface to accept the necessary inputs. Then it should prints output.

6. (26 pts) Let's say a number greater than or equal to 10 that is divided by sum of its digits is called *good number*. For example, 10 is a good number because sum of digits is 1(=1+0), and 10 is divisible by the sum. 12 is also a good number since sum of digits is 3 (=1+2), and 12 is divisible by 3. Write a Java program that prints first 100 good numbers. In addition, print 10 numbers in each line.