

**Second Quiz Solution, February 23, 2017**

1. Each statement below is part of a sequence of statements. Give the results for the variable on the left of each statement if the initial value of  $u = 3$ ,  $v = -4$ , and  $w = 9$  before the first statement is executed. These variables are all type Double.

$$u = v + 3 * u \quad \underline{\hspace{2cm}}$$

$$u = -4 + 3(3) = 5$$

$$x = u + v / w - v \quad \underline{\hspace{2cm}}$$

$$x = 5 + (-4/9) - (-4) = 77/9 = 8.555\dots$$

$$y = x * (w - u) ^ 2 \quad \underline{\hspace{2cm}}$$

$$y = 77/9 * (9 - 5)^2 = 221/9 = 24.555\dots$$

$$z = u / v + x * v / w \quad \underline{\hspace{2cm}}$$

$$z = 5 / (-4) + (77/9)(-4)/9 = -1637/324 = -5.0524691358$$

$$p = y * v - x / u \quad \underline{\hspace{2cm}}$$

$$p = 221/9 * (-4) - (77/9) / 5 = -2729/7 = -101.074074\dots$$

2. Each statement below is part of a sequence of statements. Give the results for the variable on the left of each statement if the initial value of  $u = 3$ ,  $v = 4$ , and  $w = 8$  before the first statement is executed. These variables are all type Integer.

$$u = v + 3 \setminus v \quad \underline{\hspace{2cm}}$$

$$u = 4 + 3 \setminus 4 = 4 + 0 = 4$$

$$x = w \text{ Mod } v + u \setminus w \quad \underline{\hspace{2cm}}$$

$$x = 8 \text{ Mod } 4 + 4 \setminus 8 = 0 + 0 = 0$$

$$y = x - (w - u) \text{ Mod } 3 \quad \underline{\hspace{2cm}}$$

$$y = 0 - (8 - 4) \text{ Mod } 3 = 0 - 1 = -1$$

$$z = y ^ (w - u) \text{ Mod } 3 \quad \underline{\hspace{2cm}}$$

$$z = -1^(4 - 4) \text{ Mod } 3 = 1 \text{ Mod } 3 = 1$$

3. The initial value of a program variable  $w$  is 10. After this the statement  $w = w + 2$  is repeated six (6) times. What is the final value of  $w$ ? 22

The value 2 is added to the initial value of  $w$  ( $w = 10$  initially) six times for a total addition of 12 making the final value of  $w$   $10 + 12 = 22$ .

4. What is wrong with the calculation of the volume of a cylinder using the statements below?

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PI = 3.14159265
Area = PI * Radius^2
Volume = Area * Height
Radius = 2
Height = 4
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The error is in the order of the statements. The values of Radius and Height are set after the statements in which they are used.

5. Write each of the equations below as a VBA statement. See the function library on the screen for a list of VBA functions and program variable equivalents of Greek letters.

$$y = e^{ax} \sin(bx)$$

$$y = \exp(a * x) * \sin(b * x)$$

$$p = \frac{1}{\sqrt{2\pi\sigma}} e^{-\frac{x^2}{2\sigma^2}}$$

$$p = \exp(-(x/\sigma)^2/2) / \exp(2 * \pi * \sigma)$$

$$y = \frac{3zq - r^2}{4 \tan^{-1}(1)}$$

$$y = (3 * z * q - r^2) / (4 * \text{atn}(1))$$

6. The two formulas below are said to be equivalent ways of evaluating a fourth-order polynomial.

$$y = a + bx + cx^2 + dx^3 + ex^4$$

$$y = (((ex + d)x + c)x + b)x + a$$

- a. Show that these two formulas are equivalent.  
b. Why do you think that one or the other would be preferred in a computer program?

We can multiply the  $x$  values through each set of parentheses in the second expression to obtain the following results in turn:

$$y = ((ex + d)x + c)x^2 + bx + a$$

$$y = (ex + d)x^3 + cx^2 + bx + a$$

$y = ex^4 + dx^3 + cx^2 + bx + a$ , which is the same as the first expression above.

The second expression is preferred in a computer program because it involves fewer operations.