BIOS 625: Categorical Data Analysis and Generalized Linear Models
Computing Basics in SAS - Exercise 1

1. Let $a = 3$, $b = -2$, $c = 2$, $\underline{x} = \begin{pmatrix} 1 \\ 4 \\ 2 \\ 5 \\ 3 \end{pmatrix}$, $\underline{y} = \begin{pmatrix} 2 \\ -1 \\ 7 \\ 3 \\ 0 \end{pmatrix}$, $A = \begin{pmatrix} 1 & 0 & 2 & -1 & 0 \\ 1 & 0 & 3 & 0 & 2 \\ 2 & 5 & 4 & 2 & -3 \end{pmatrix}$,

   and $B = diag(3, 4, 0, -1, 2)$.

   (a) Calculate $a\underline{x} + b\underline{y}$.

   (b) Calculate $c\underline{x}^T A^T$.

   (c) Calculate $\underline{y}^T B$.

2. Let $\underline{x} = \begin{pmatrix} 1 \\ 3 \\ 0 \\ 4 \\ 2 \end{pmatrix}$ and $A = \begin{pmatrix} 1 & 4 & 5 & -1 & 3 \\ 2 & 7 & 1 & 3 & 5 \\ -1 & 0 & 6 & 3 & 9 \\ -8 & 1 & 1 & 0 & 2 \\ 3 & 2 & -4 & 6 & 1 \end{pmatrix}$.

   (a) Calculate $\underline{x}^T \underline{1}_5$.

   (b) Calculate $J_5 A$.

   (c) Solve the following expression for $\underline{y}$: $A\underline{y} = \underline{x}$.

   (d) Say we have the following three equations.

$$\begin{aligned} 2x_1 - x_2 + 3x_3 &= 17 \\ 3x_1 + 2x_2 - 3x_3 &= -1 \\ x_1 + 3x_2 + 4x_3 &= 8 \end{aligned}$$

   Solve for $\underline{x} = (x_1, x_2, x_3)^T$.

   - *Hint*:

```
v=j(a,b,c);
```

$\Rightarrow$ Creates a matrix (vector) v with a rows, b columns, each with element c.

- *Hint*:

```
b=inv(A);
```

$\Rightarrow$ Returns the inverse of matrix A.

3. Find an the smallest integer c such that $\sum_{i=1}^{c} \frac{i+1}{i} > 100$.

   - *Hint*:

```
do until(x);...end;
```

$\Rightarrow$ Creates a loop that repeats until "x" is satisfied.

4. Calculate 11!.

   - *Hint*:

```
do i=1 to n;...end;
```

$\Rightarrow$ Creates a loop that repeats "n" times. "i" takes the value of current iteration.

5. Create a function for $\begin{pmatrix} a \\ b \end{pmatrix} = \frac{a!}{b!(a-b)!}$.

   (a) Calculate when $a = 10$ and $b = 3$.

   (b) Calculate when $a = 15$ and $b = 7$.

   - *Hint*: To create a function that can be "called", use the following format:

```
start name(x,y,etc.); ... f=func(x,y,etc.); ... return(f);end;
```

Provided you have defined x, y, etc., you can then define $c = name(x, y, etc.)$.