ASSIGNMENT #3

EPsy 8252

This assignment covers vector geometry and matrix algebra. Please submit your responses to each of the questions below in a printed document. Please adhere to the following guidelines for formatting your assignment:

- All graphics should be resized so that they do not take up more room than necessary and all should have an appropriate caption.
- Any typed mathematics (equations, matrices, vectors, etc.) should be appropriately typeset within the document using Equation Editor, Markdown, or LaTeX.
- All syntax included should be typeset in a monospaced font, appropriately commented and follow the Data Camp Style Guide (https://teach.datacamp.com/style-guide).

There are 10 points possible for the assignment. Each question is worth one point, unless otherwise noted.

Regression

Use the following data to answer the questions below.

```
##   Y X1 X2
##  74  3  0
##  57  4  1
##  62  4  1
##  45  2  0
##  54  2  0
```

1. Write out the design matrix for the model `Y ~ 1 + X1 + X2`. Use an equation editor to write that matrix into your word-processed document.
2. What are the dimensions of the design matrix?
3. Use R to compute $(\mathbf{X}'\mathbf{X})^{-1}$. Use an equation editor to write that matrix into your word-processed document.
4. Use matrix algebra and R to compute the **b** vector (vector of the regression coefficients). Use an equation editor to write that vector into your word-processed document.
5. Using matrices, compute the vector of fitted values. Use an equation editor to write that vector into your word-processed document.
6. Draw the model triangle for this model. Label all vectors and compute the values of all of the angles in the triangle. **(2pts.)**

Regression through the Origin

Consider a regression of the same data, but this time, we will force the regression line through the origin.

7. Write out the design matrix for the model `Y ~ X1 + X2 - 1`. Use an equation editor to write that matrix into your word-processed document.

8. Use R to compute $(\mathbf{X}^t\mathbf{X})^{-1}$. Use an equation editor to write that matrix into your word-processed document.

9. Use matrix algebra and R to compute the **b** vector (vector of the regression coefficients). Use an equation editor to write that vector into your word-processed document.