Collecting Baseline Data

Please DO NOT write your name on this

1. $4(2+5) - ((-2)^3 - 4)^2 =$

2. $(2x+y)(3x+2y) =$

3. $(4a+c)^2 =$

4. $\sum_{i=1}^{7} [3i+1] =$

5. Solve for x:

$$21 = \frac{x^2 - 6}{2}$$

6. Solve for y:

$$\frac{e^y}{3} = 15$$

7. What's the area of a right triangle with a base of 2 inches and a height of 6 inches?

8. Matrix multiply:

$$\begin{pmatrix} 0 & 2 & 3 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{pmatrix} \begin{pmatrix} 4 \\ 5 \\ 1 \\ 30 \end{pmatrix} =$$

9.

$$\begin{pmatrix} 0 & 2 & 3 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{pmatrix}^2 =$$

10. For $A = \{1, 2, 6\}, B = \{x | 2 \leq x \leq 10 \text{ and x is an integer}\}, C = \{7, 8, \ldots, 15\}$, what is
    (a) $A \cup B$
    (b) $A \cap B$
    (c) $A \cup C$
    (d) $A \cap C$
    (e) $A \cap B \cap C$

11. What is the probability of a coin landing heads in exactly two out of three coin flips?

12. What is the probability of a coin landing heads in at least two out of three coin flips?

13. Suppose the coin has landed heads in the first two flips. What is the probability that it lands heads in a third flip?

14. Suppose x is the horizontal axis and y is the vertical one. Does a line described by the equation $y = -6 + 4x$ slope upwards or downwards?

15. Calculate the derivative:

$$\frac{d}{dx}(4x + 2xz) =$$

16. You believe that the true model determining the dropout rate in school districts is given by

$$dropout_i = \beta_0 + \beta_1 perpupil_i + \beta_2 povertyrate_i + \beta_3 classsize_i +$$

    where:

    - $dropout_i$ is the dropout rate in the ith district as a percentage of students enrolled;
    - $perpupil_i$ is the per-pupil expenditure in the ith district (in thousands of dollars);
    - $povertyrate_i$ is the percentage of students in the ith district with family incomes below the poverty line; and
    - $classsize_i$ is the average class size (in number of students) in the ith district

    You run OLS and find that

$\hat{\beta}_0 = 5.78$	$\sigma_{\hat{\beta}_0} = 0.96$
$\hat{\beta}_1 = -3.00$	$\sigma_{\hat{\beta}_0} = 0.48$
$\hat{\beta}_2 = 1.00$	$\sigma_{\hat{\beta}_0} = 0.70$
$\hat{\beta}_3 = 0.40$	$\sigma_{\hat{\beta}_0} = 0.84$

Table 1: $R^2 = 0.35$ and $N = 1000$

(a) What is a theoretically justified hypothesis about the relationship between the percentage of a district's students below the poverty line and the dropout rate? Use this hypothesis in a test determining whether you are 95% certain that increases in the poverty rate lead to increases in the attrition rate.

(b) You find that there is a high correlation between the district's poverty rate and average class size. How might this affect your estimates of β_2 and β_3?

(c) Suppose per-pupil expenditures were measured as hundred dollars spent per student (rather than thousand dollars spent). Can you say what $\hat{\beta}_1$ would be? Can you say what the t-statistic associated with $\hat{\beta}_1$ would be?