Math 10 - Exercises for Lecture 14

Disclaimer: these are much more terse than the questions you will see in the exam. In the final exam, we will walk you through each step of the question in order to award as much partial credit, and to give as much hints as possible.

Regression

1) You are given these summary statistics: $r = 0.60$, $s_y = 10$, $s_x = 2$, $\bar{X} = 10$, $\bar{Y} = 5$. Write down the regression line.

2) Predict the value of Y when $X = 10$.

3) Predict the increase in Y when X is increased by 5.

Power

4) Suppose the sampling distribution is normally distributed with standard error 1. The one-tailed test null hypothesis is that the mean is $\mu = 0$ and that the alternative hypothesis is $\mu > 0$. Significance level is $\alpha = 0.10$ and $P(Z \geq 1.28) = 0.10$. Suppose that the true mean is $\mu_{true} = 2.28$.

Recall that power is the probability of rejecting a false null hypothesis. What is the power of this hypothesis test?

Answers

1) Slope coefficient $b = r\frac{s_y}{s_x} = 0.60 \cdot (10/2) = 3$. Intercept $a = 5 - 3 \cdot 10 = -25$. So, $\hat{Y} = 3X - 25$.
2) $\hat{Y} = 30 - 25 = 5$.
3) $b = $ increase in Y for every 1 increase in X. So, answer is $5b = 15$.
4) Draw the normal distribution with mean $\mu_{true} = 2.28$. Mark 1.28 and see that it is 1 standard error to the left of this true mean. The area $P(Z \geq -1) = 1 - 0.1587 = 0.8413$ is the power.