

Math 110

Quiz 3 Sample Solutions

October 14, 2008

Be sure to show the calculations that lead to your answers.

1. At a large university, a group of students took standardized placement exams in both French and Spanish that were scored out of 100 points. The average on each test was 60 and the SD on each test was 10. The correlation coefficient for the data was $r = .7$.

- (a) For all the people who scored 75 on the French test, estimate the average of their Spanish test scores?

The best estimate for the average of their Spanish test scores is the value from the regression line. The formula for the regression line is

$$r \frac{SD_y}{SD_x}(x - \mu_x) + \mu_y = .7 \frac{10}{10}(x - 60) + 60.$$

Evaluating this expression for $x = 75$ get

$$.7 \frac{10}{10}(75 - 60) + 60 = .7 \cdot 15 + 60 = 70.5.$$

So the best estimate for the Spanish test score is 70.5 for a person who scored 75 on the French test.

- (b) For all the people who scored 75 on the French test, estimate the SD of their Spanish test scores?

The estimate for the SD is $\sqrt{1 - r^2} \cdot SD_y = \sqrt{1 - .7^2} \cdot 10 \approx 7.14$.

- (c) Of all the people who scored 75 on the French test, estimate what percentage scored above a 75 on the Spanish test. (*Hint:* You will need to use your answers to (a) and (b).)

First, convert 75 to a z -value for a normal curve with mean located at 70.5 and SD equal to 7.14. This gives $z = \frac{75 - 70.5}{7.14} \approx .64$. This corresponds to an area of 48% from the z -table. We are interested in the right tail that goes with this area. The area of the tail is $\frac{1}{2}(100 - 48)\% = 26\%$.

2. A die is rolled three times. In each part, show the expression for the chance that you get before simplifying.

- (a) What is the chance that on all three rolls, the number on the die is a three or a six?

Since the chance of getting a three or six on one roll is $\frac{1}{3}$, the chance of getting a three or six on three consecutive rolls is $(\frac{1}{3})^3 = \frac{1}{27} \approx .037$.

- (b) What is the chance that on at least one of the rolls, the number on the die is an ace, a two, a four, or a five?

This is the complement or opposite of (a) so the answer is $1 - \frac{1}{27} \approx .963$.

- (c) What is the chance that a three or a six does not appear on any of the rolls?

Not getting a three or six on one roll is the same as getting an ace, a two, a four, or a five. The chance of this occurring is $\frac{2}{3}$. The chance of this happening on three consecutive rolls is the chance of a three or six not appearing on any of the rolls. This is $(\frac{2}{3})^3 = \frac{8}{27} \approx .296$.