

Math 110

Test 2 Sample

April 1, 2010

Be sure to provide explanations for your answers as indicated.

1. (20 pts.) Short answer.

(a) Figure 1 contains a residual plot of a data set.

i. Based on the residual plot, would you say the correlation coefficient is about (choose one):

.05 .3 .8 .95 can't tell

ii. Based on the residual plot, would you say the slope of the regression line is about (circle one):

.05 .3 .8 .95 can't tell

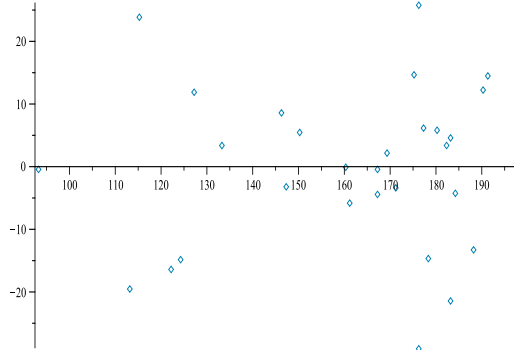


Figure 1:

(b) A club with 15 members has to choose from its membership an executive board consisting of 4 club members. How many ways are there to select the executive board?

(c) Consider a chance process represented by a box model. Fill in the blanks:

i. On average, the absolute value of the observed error for the sum of the draws will _____ as the number of draws increases.

ii. On average, the value for the observed error as a percentage of the sum of the draws will _____ as the number of draws increases.

2. (20 pts.) (Hypothetical) A mathematics department at a small New England College tracks student SAT math scores and first semester calculus grades on a 4.0 scale. For the students who complete first semester calculus, the average SAT math score was 570 with an SD of 100 and the average calculus grade was 2.9 with an SD of .5. The correlation coefficient was found to be $r = 0.6$.
- (a) For a student with an SAT math score of 500, use the regression line to estimate his or her calculus grade on a 4.0 scale.
 - (b) Find the r.m.s. error for the regression line of calculus test grades on SAT math scores.
 - (c) Among first semester calculus students, 25 students scored 500 on their SAT math test. Use the r.m.s. error and regression line to approximate how many of the 25 students obtained a grade of 2.5 or better in their first semester of calculus.
3. (20 pts.) The thirteen hearts from a deck of cards are placed in an upside down hat. (Note: The face cards are the king, queen, and jack.)
- (a) If four cards are drawn at random from the hat with replacement, what are the chances that none of the cards are face cards?
 - (b) If four cards are drawn at random from the hat without replacement, what are the chances that none of the cards are face cards?
 - (c) If four cards are drawn at random from the hat without replacement, what are the chances that only the first and fourth cards are face cards?
4. (20 pts.) A gambler at the Bellagio casino is playing roulette. The gambler's favorite bet is to place \$5 on four adjoining numbers. This bet pays 8 to 1. (See the attached roulette table.)
- (a) On 100 plays of this bet, what is the gambler's chance of winning more than \$20? (*Hint:* What are the box model, EV, and SE for this bet played 100 times?)
 - (b) On 100 plays of this bet, what is the gambler's chance of winning 15 or more times? (*Hint:* What are the box model, EV, and SE for winning in 100 plays?)
5. (20 pts.) (Hypothetical) A large statistics class has 400 students with 100 students from each of the four years, first-year through senior year. The instructor takes a simple random sample of size $N=50$ from the class.
- (a) What are the EV and SE for the percentage of seniors in the this sample? (*Hint:* What is the box model for this question?)
 - (b) What are the chances that the percentage of seniors in the sample will be less than 20%?