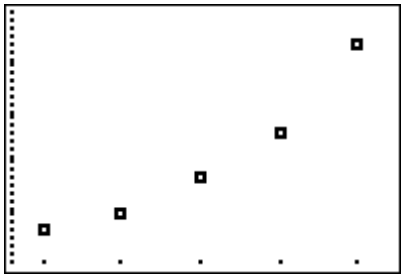
**Elementary Statistics**
**Chapter 4/5 Test Review**

1. Given the following data: (40 points)

| Time (Years) – x | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Profit (thousands) - y | 8 | 10 | 15 | 21 | 33 |

a) Draw the scatter diagram



b) Find the correlation coefficient

r = 0.9583

c) Does a linear relation exist (provide proof)

$|r| = |0.9583| = 0.9583$

and

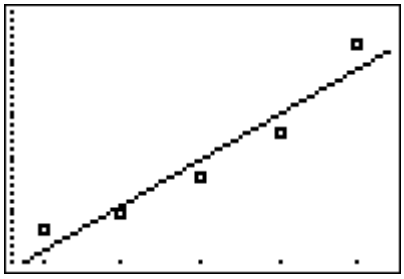
CV from table 1 is 0.878

Since |r| > CV, a linear relation exists

d) Find the least squares regression line

$\hat{y} = 6.1x - 0.9$

e) Draw the scatter diagram again with the least squares regression line graphed on it



f) Predict the profit at eight years

$\hat{y} = 6.1x - 0.9$

$\hat{y} = 6.1(8) - 0.9$

$\hat{y} = 47.9$

g) Compute the sum of the squared residuals

| x | y | $\hat{y} = 6.1x - 0.9$ | $y - \hat{y}$ | $(y - \hat{y})^2$ |
|---|---|---|---|---|
| 1 | 8 | 6.1(1) – 0.9 = 5.2 | 8 – 5.2 = 2.8 | $(2.8)^2 = 7.84$ |
| 2 | 10 | 6.1(2) – 0.9 = 11.3 | 10 – 11.3 = -1.3 | $(-1.3)^2 = 1.69$ |
| 3 | 15 | 6.1(3) – 0.9 = 17.4 | 15 – 17.4 = -2.4 | $(-2.4)^2 = 5.76$ |
| 4 | 21 | 6.1(4) – 0.9 = 23.5 | 21 – 23.5 = -2.5 | $(-2.5)^2 = 6.25$ |
| 5 | 33 | 6.1(5) – 0.9 = 29.6 | 33 – 29.6 = 3.4 | $(3.4)^2 = 11.56$ |
| | | | Sum of Squared Residuals = | 33.1 |

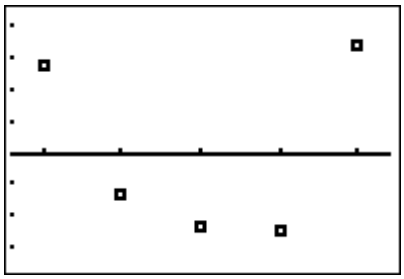
h) Find the residual at year 6 assuming the profit is 50.

$$\hat{y} = 6.1(6) - 0.9 = 35.7$$
$$y = 50$$
$$y - \hat{y} = 50 - 35.7 = 14.3$$

i) Find the coefficient of determination and explain what this means about the variation

$R^2 = 0.9183$. Interpretation: 91.83% of the variation in profit is explained by the least squares regression line and 8.17% of the variation in profit is explained by other factors

j) Draw the residual plot



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2. Given the following data: (5 points)

| | | | | |
|---|---|---|---|---|
| | Arkansas City | Winfield | Totals | Relative Frequency Marginal Distribution |
| Some College, No Degree | 1884 | 1986 | 3870 | 3870/7293 = 0.531 |
| Associate's Degree | 839 | 758 | 1597 | 1597/7293 = 0.219 |
| Bachelor's Degree | 711 | 1115 | 1826 | 1826/7293 = 0.250 |
| Totals | 3434 | 3859 | 7293 | |
| Relative Frequency Marginal Distribution | 3434/7293 = 0.471 | 3859/7293 = 0.529 | | |

Build a relative frequency marginal distribution

3. Given the following data: (5 points)

| | | | | |
|---|---|---|---|---|
| | Arkansas City | | Winfield | |
| Some College, No Degree | 1884 | 1884/3434 = 0.549 | 1986 | 1986/3859 = 0.515 |
| Associate's Degree | 839 | 839/3434 = 0.244 | 758 | 758/3859 = 0.196 |
| Bachelor's Degree | 711 | 711/3434 = 0.207 | 1115 | 1115/3859 = 0.289 |
| | 3434 | | 3859 | |

Build a conditional distribution by city

4. Given the sample space of the gender possibilities for the birth of 3 children. (5 points)

BBB, BBG, BGB, BGG, GGG, GGB, GBG, GBB

5. In Arkansas City, there are 5,534 total housing units of which 241 are mobile homes, if you were to pick a person at random in Ark City, what is the probability that person lives in a mobile home? (5 points)

241/5534 = 0.0435

6. Of all the females (without husbands) with children under 18 in Ark City, it is known that 56.5% of them are living on an income under the poverty level. What is the probability that you will pick 3 females (without husbands) with children under 18 in Ark City and they all are under the poverty level? (5 points)

P(poor and poor and poor)
= (0.565)(0.565)(0.565)
= 0.1804

7. In the United States, 1 out of 37,500 people are bit by venomous snakes each year. If you pick 5 people out at random, what is the probability that at least one was bit by a venomous snake last year? (5 points)

P(at least one bit out of 5)
= 1-P(none bit)
= 1-P(all "not bit")

$$= 1 - \left(\frac{37499}{37500}\right)^5$$
$$= 1.333E-4$$
$$= 0.0001333$$

8. Given the following table: (10 points)

| | Full-Time Students | Part-Time Students | |
|---|---|---|---|
| Female | 500 | 200 | 700 |
| Male | 400 | 100 | 500 |
| Total | 900 | 300 | 1200 |

a) What is the probability of picking a student and they are full-time?

$$\frac{900}{1200} = 0.75$$

b) What is the probability of picking a student and getting a female or part-time student?

$$\frac{700}{1200} + \frac{300}{1200} - \frac{200}{1200} = 0.6667$$

c) What is the probability of picking a student and getting a male student given they are part-time?

$$\frac{100}{300} = 0.3333$$

d) What is the probability of picking a student and getting a student who is female and part-time?

$$\frac{200}{1200} = 0.1667$$

9. Two dice are rolled, find the following probabilities: (5 points)

a) P(sum is 8)

$$\frac{5}{36} = 0.1389$$

b) P(both show odd numbers)

$$\frac{9}{36} = 0.25$$

10. If P(E) = 0.30, P(F) = 0.40, and P(E and F) = 0.20, what is P(E | F)? (5 points)

$$P(E \mid F) = \frac{P(F \quad and \quad E)}{P(F)}$$

$$P(E \mid F) = \frac{0.20}{0.40}$$

$$P(E \mid F) = 0.5$$

11. If two cards are selected from a standard deck of 52 cards without replacement: (5 points)

a) Find the probability they both are hearts

$$\frac{13}{52} \cdot \frac{12}{51} = 0.0588$$

b) Find the probability they both are the same suit

$$\frac{52}{52} \cdot \frac{12}{51} = 0.2353$$

12. If an instructor has 20 students and wants to pick 4 to help him move some books, how many different ways can the students be picked? (5 points)

Order doesn't matter so combination: 20 nCr 4 = 4845