AP STATISTICS **Name:** **Per:** ∞

Fall Semester Review

1. A
2. D
3. B
4. A
5. B
6. B
7. E
8. B
9. B
10. A
11. B
12. A
13. D
14. D ← lol at choice "E"
15. A
16. A
17. B
18. B
19. C
20. B
21. B
22. D
23. D
24. B
25. C
26. B
27. C
28. A
29. D
30. B
31. C
32. B
33. A
34. B
35. B
36. C
37. A
38. E
39. F
40. D
41. B
42. C
43. C
44. B
45. E

FREE RESPONSE **Name:** ______ **Per:** ∞

1. The stem-and-leaf display measures the salary of the employees at the MAVS Manufacturing company.

1 | 2578889
2 | 34467889
3 | 034799
4 | 124
5 | 0
6 |
7 | 2
8 | 3.
9 | 4

7 | 2 represents $72,000

$n = 28$ $Q_1 = \frac{19+23}{2} = 21$ med $= 28.5$ $Q3 = \frac{39+41}{2} = 40$

min Q1 med Q3 max

a) State the **5 number summary** 12 - 21 - 28.5 - 40 - 94

b) What **shape** best describes the distribution? unimodal, skewed to the higher #'s

c) Construct a **box plot** for the distribution.

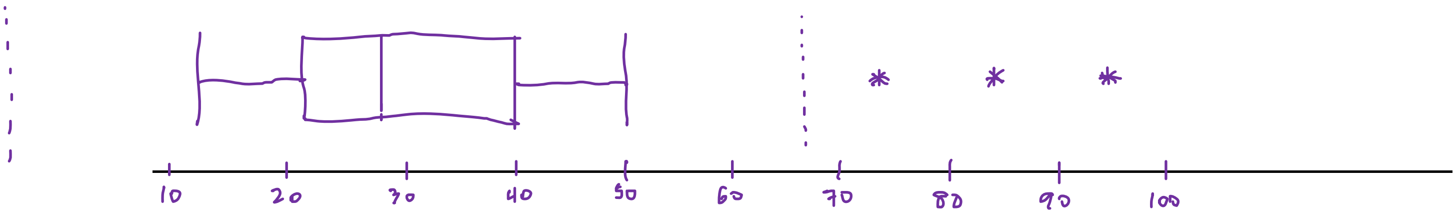
$IQR = 40 - 21 = 19$

$1.5\,IQR = 28.5$

Fences: $Q_1 - \overset{1.5\,IQR}{28.5} = -7.5$

$Q3 + 28.5 = 68.5$

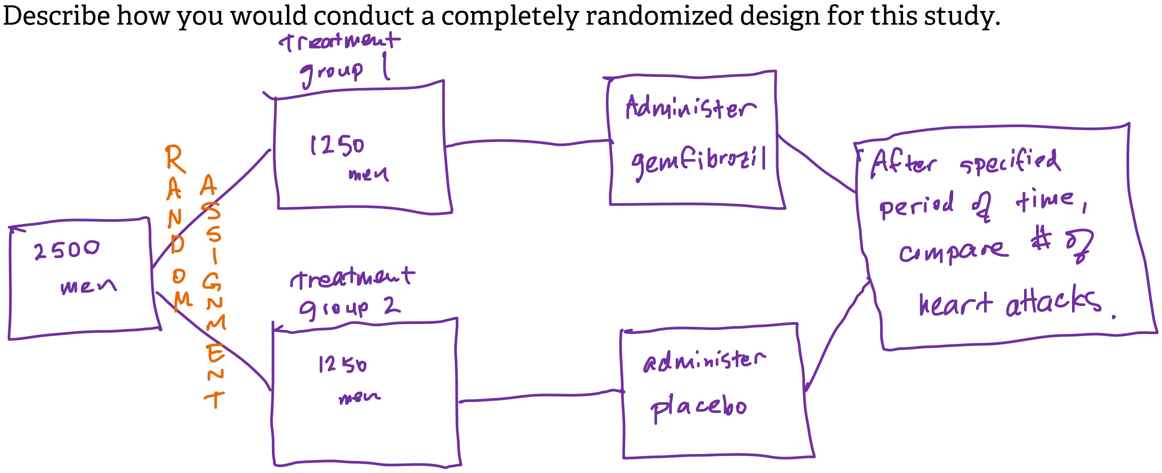
Salaries at MAVS Manufacturing



Salaries (in $10,000's)

2. You are asked to **design a randomized comparative experiment** which studies the effect of the drug gemfibrozil *in preventing heart attacks* in middle-aged men with high blood cholesterol. There are a total of 2500 men and both the drug gemfibrozil and a placebo will be used.

a) Describe how you would conduct a completely randomized design for this study.



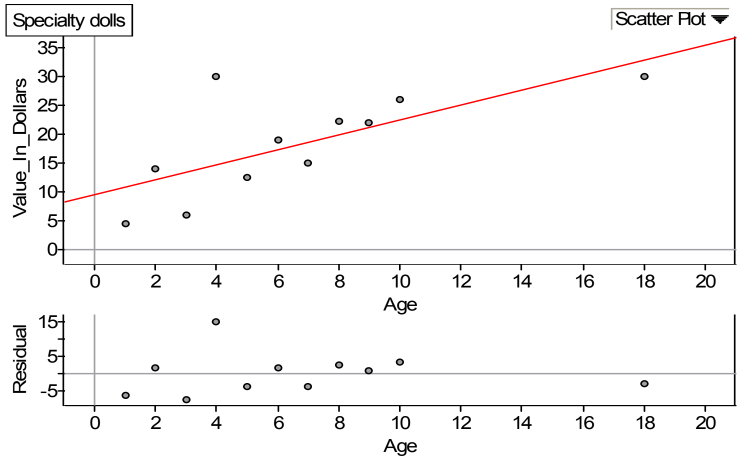
b) About half of the 2500 men in the study participate in regular exercise. Let us suppose that regular exercise is known to have an association with the effectiveness of the drug gemfibrozil. Describe the changes you would make to your design in part (a) if you wish to incorporate blocking.

Separate the men into two blocks, blocking by level of exercise. Then within each block, randomly assign the subjects to one of the two groups.

3. A doll enthusiast owns a collection of specialty dolls, and the age and value of each is noted in the chart below.

Specialty dolls

	Age	Value_In_Dollars
1	1	4.6
2	2	14
3	3	6.1
4	4	30
5	5	12.5
6	6	19
7	7	15
8	8	22.4
9	9	22
10	10	26
11	18	30



a) If the least squares regression equation is $\hat{y} = 9.7 + 1.3x$, state the equation in *context*.

$\widehat{\text{value (in \$)}} = 9.7 + 1.3(\text{age of doll})$

b) What does the residual plot tell you about the appropriateness of a linear model for this data?

Due to the lack of a distinct pattern in the residual plot (along with the fairly linear scatterplot), the linear models appears to be appropriate.

c) State the value of the slope and interpret the slope in context.

slope = 1.3 \$/unit of age

For each increase of 1 unit (year?) in age, we predict an increase in value of about \$1.30

d) For the value (4, 30), what is the *residual* for that value?

$\hat{y} = 9.7 + 1.3(4) = 14.9$

$y = 30$

$e = y - \hat{y} = \boxed{15.1}$

4. A random sample of 11 high school students produced the following results for number of hours of television watched per week and GPA. A computer printout of the regression analysis is shown below.

Predictor	**Coef**	**StdDev**	**T**	**P**
Constant	3.8	2.0426	1.86	0.05
Hours	-0.0558	0.01769	-3.154	0.012

s = 0.355 R-sq = 53%

What is the least squares regression equation in context?

$\widehat{GPA} = 3.8 - 0.0558(\text{hours of TV})$

5. A die is weighted so that the probability of rolling a "6" is 0.48. The die is rolled 18 times.

a) Find the probability that the die lands on a "6" exactly 11 times.

☆ Binomial probability

$p = 0.48 \quad n = 18$

X = # of die rolls that land "6"

$$P(X=11) = \binom{18}{11}(0.48)^{11}(0.52)^{7}$$

① Show "work"

$$= \boxed{0.1020}$$

② Use "BinomPDF(18, 0.48, 11)"

b) Find the probability that the die lands on a "6" either 7 or 8 times.

$$P(X=7 \text{ or } 8) = P(X=7) + P(X=8)$$

$$= \binom{18}{7}(0.48)^{7}(0.52)^{11} + \binom{18}{8}(0.48)^{8}(0.52)^{10}$$

$$= 0.14044 + 0.17825 = \boxed{0.3187}$$

c) Find the probability that the die lands on a "6" no more than 5 times *(this means 5 times or fewer)*.

$$P(X \le 5) = P(X=0) + P(X=1) + P(X=2) + \cdots + P(X=5)$$

$$= \binom{18}{0}(0.48)^{0}(0.52)^{18} + \binom{18}{1}(0.48)^{1}(0.52)^{17} + \cdots + \binom{18}{5}(0.48)^{5}(0.52)^{13}$$

$$= \boxed{0.0676}$$

Again... ① Show "work"

② Use "BinomCDF(18, 0.48, 5)"

d) Find the probability that the die lands on a "6" at least 4 times.

$$P(X \ge 4) = P(X=4) + P(X=5) + \cdots + P(X=18)$$ ← UGH!!!

$$= 1 - [P(X \le 3)]$$

$$= 1 - \left[\binom{18}{0}(0.48)^{0}(0.52)^{18} + \cdots + \binom{18}{3}(0.48)^{3}(0.52)^{15}\right]$$

$$= 1 - [0.0061] = \boxed{0.9939}$$

BinomCDF(18, 0.48, 3)

6. X and Y are two independent random variables with the following attributes:

E(X) = 13 SD(X) = 4 E(Y) = 22 SD(Y) = 6

Find the mean and standard deviation of each of these random variables:

a) 3Y

$E(3Y) = \boxed{66}$ $SD(3Y) = \boxed{18}$

b) $X_1 + X_2 + X_3$

$\sqrt{4^2 + 4^2 + 4^2} = \sqrt{3 \cdot 4^2} = 4 \cdot \sqrt{3}$

$E(X_1 + X_2 + X_3) = \boxed{39}$

$SD(X_1 + X_2 + X_3) = \sqrt{3} \cdot SD(X) = \sqrt{3} \cdot 4 \approx \boxed{6.9282}$

c) 3X + Y

$E(3X + Y) = 3(13) + 22 = \boxed{61}$

$SD(3X + Y) = \sqrt{(3 \cdot 4)^2 + (6)^2} = \sqrt{144 + 36} = \sqrt{180} \approx \boxed{13.4164}$

7. At a charity fundraiser, a game of chance is designed such that the average payout on each play of the game has an average of \$1.52, with a standard deviation of \$8. The charity decides to charge \$2.00 to play the game each time. Based on last year's event, the charity anticipates that this game will be played 1000 times.

a) If the game is played exactly 1000 times, what are the mean and standard deviation of the charity's **profits** from this game?

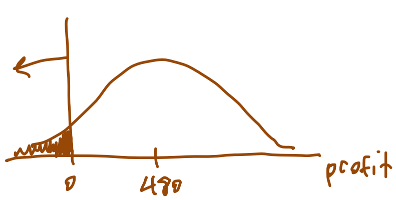
X = profit for ONE play $E(X) = \$0.48$ $SD(X) = \$8.00$

$E(X_1 + X_2 + \ldots + X_{1000}) = \$480$

$SD(X_1 + X_2 + \ldots + X_{1000}) = \sqrt{1000} \times 8 = \$252.9822$

b) Based on the mean and standard deviation calculated in part (a), what is the probability that the charity will NOT make a profit from this game for 1000 plays? Assume that the profits for 1000 plays of this game are normally distributed.

$N(480, 252.9822)$



$P(\text{total profit} < 0) = P(z < -1.897) = \boxed{0.0289}$

$z = \dfrac{\text{obs} - \text{exp}}{SD} = \dfrac{0 - 480}{252.9822} = -1.897$