

Name: Key

Test #2

STAT 110

Directions: For the problem below conduct a complete and appropriate hypothesis test using a 5% level of significance. (Make sure to include ALL parts of the test)

- 1) A car dealership tells an employee that based on years of data people buy the following colors of cars: 18% Silver, 24% Black, 11% White, 13% Red, 10% Blue and the remaining percentage are categorized as "Other".

At the end of the summer the salesperson believes the dealership was incorrect about the color distribution based on their sales that summer. The colors of 50 randomly selected cars sold were as follows: 2 Silver, 13 Black, 5 White, 9 Red, 4 Blue and 17 "Other".

Does this data support the salespersons claim that the dealership was wrong about the color distribution?

(P-value for the test would be calculated to be 0.117)

Pop: All cars sold by a dealership

Model: 18% Silver, 24% Black, 11% White, 13% Red, 10% Blue, 24% Other

Chi-Squared G.O.F Test

Random Samp ✓

10n < Pop. Size ✓

No exp. counts less than 5 ✓

H<sub>0</sub>: The color distribution of cars sold matches the given model.

H<sub>a</sub>: The color distribution of cars sold does not match the distribution.

	Silver	Black	White	Red	Blue	Other	$\chi^2 = 8.818$
OBS	2	13	5	9	4	17	d.f = 5
EXP	9	12	5.5	6.5	5	12	P-value $\approx .117$
$\frac{(O-E)^2}{E}$	5.44	.083	.045	.962	.2	2.08	

\* Since the p-value is greater than 5% we fail to reject the H<sub>0</sub>, which means we do not have enough evidence to suggest the color distribution of cars sold is different from what was stated.

- 2) The color distribution of M&M candies is advertised to be 13% browns, 20% oranges, 14% yellows, 13% reds, 16% greens and 24% blues. If you conducted a hypothesis test and discovered that the p-value is approximately 0.0083, what would the conclusion of your test state?

(Write the hypothesis and conclusion ONLY for this test)

H<sub>0</sub>: The %'s for the color distribution of m&m's is accurate  
H<sub>a</sub>: " " of m&m's is NOT accurate

Since the p-value is less than 5% we reject H<sub>0</sub> which means the evidence suggests the color distribution of m&m candies does not match the advertised %'s.

- 3) What is the probability of flipping a coin and getting heads and then getting a red marble from a bag that contains 10 red, 7 green, 8 blue and 5 orange marbles?

$$\left(\frac{1}{2}\right)\left(\frac{10}{30}\right) = \frac{10}{60} = \frac{1}{6} = .1\overline{6}$$

- 4) Given you have a bag that contains 100 number tiles numbered 1 – 100:

- a) What would be the probability of selecting one number tile that is either odd or less than 30 on one pull?

$$\frac{50}{100} + \frac{29}{100} - \frac{15}{100} = \frac{64}{100} = .64$$

- b) Are these two events disjoint? (Explain: Why or Why Not)

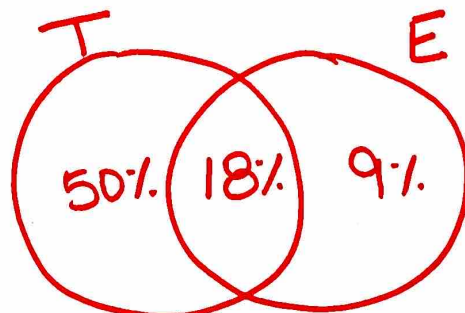
No the events can happen at the same time. (ex: 17 odd & # < 30)

- 5) There is a committee of TWO people that is going to be selected from a pool of politicians. There are 11 Democrats and 7 Republicans, what is the probability that if you randomly select two people for the committee, that they are from the same political party?

$$\begin{array}{c} D \quad D \\ \frac{11}{18} \cdot \frac{10}{17} = \frac{110}{306} \oplus \frac{7}{18} \cdot \frac{6}{17} = \frac{42}{306} \Rightarrow \boxed{\frac{152}{306}} \end{array}$$

↑  
(ADD (DD) + (RR))

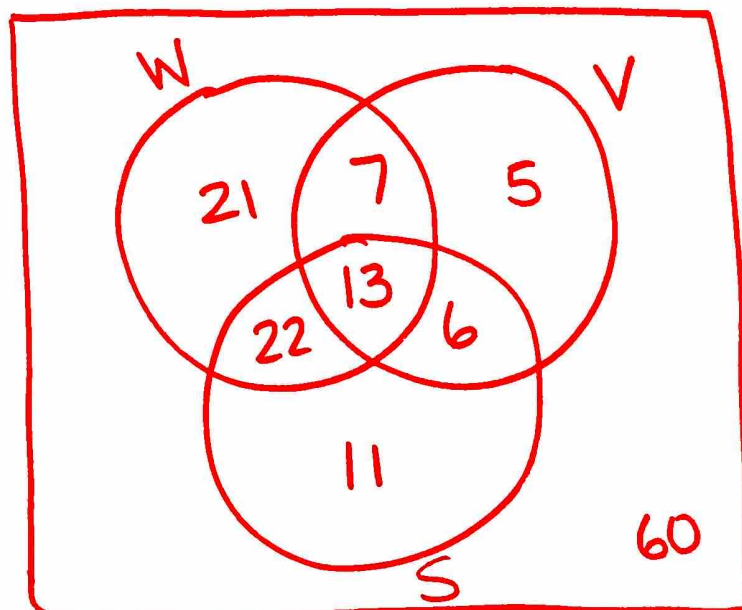
- 6) A college RA says that 68% of all college students have skipped a class because they were too tired to go, 27% have skipped class to go get something to eat and 18% have done both things. What is the probability that if you select one college student at random, they have skipped class because they were tired, but never skipped class to go get something to eat?



$$\boxed{50\%}$$

- 7) At a school there are 145 students in the Senior Class and:
- 63 Students Work
  - 52 Students play Sports
  - 31 Students Volunteer in the Community
  - 35 Students Work and play Sports
  - 20 Students Work and Volunteer in the Community
  - 19 Students Volunteer and play Sports
  - 13 Students do ALL three of these activities

- Draw a complete Venn diagram to represent this scenario.



- What is the probability that you randomly select one student and they do not participate in any of these activities?

$$\frac{60}{145}$$

- What is the probability of selecting one student at random that ONLY plays a sport?

$$\frac{11}{145}$$

- What is the probability that if you select two students, they do EXACTLY ONE of these activities?

$$\frac{37}{145} \cdot \frac{36}{144} = \frac{1332}{20880} \approx .064$$

8) You draw two marbles at random from a jar that has 15 red marbles, 10 white and 25 blue marbles without replacement. What is the probability that both marbles are blue?

$$\frac{25}{50} \cdot \frac{24}{49} = \frac{600}{2450} = .2449$$

9) Using the table shown for Hours studied and test score, answer the following three questions.

The equation for the least squares regression line is:

$$\hat{y} = 4.14x + 53.8$$

Hours	Score
0	46
2	71
3	68
6	78
9	89

a) What type of correlation does the data show?

Positive Correlation  
 $x \rightarrow \text{up}$      $y \rightarrow \text{up}$

b) Using the graph below, which one of these values would most likely be the value of "r"?

$r = 0.12$

$r = -0.89$

$r = 0.33$

$r = -0.23$

$r = 0.92$

c) Using the prediction equation, what test score would you predict for someone who studied 8 hours?

$$\hat{y} = 4.14(8) + 53.8$$

$$\hat{y} = 86.92$$

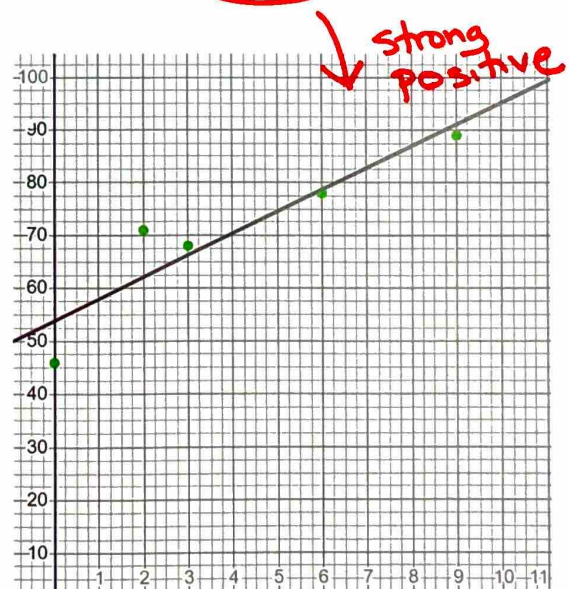
d) Using the equation given and the table, calculate the residual for someone who studied 3 hours.

$$\text{resid} = \text{obs} - \text{pre}$$

$$= y - \hat{y}$$

$$\text{resid} = 68 - 66.22$$

$$\text{resid} = 1.78$$



$$\hat{y} = 4.14(3) + 53.8$$

$$\hat{y} = 66.22$$

**Bonus Question:** What is the most amount of money you can have in change (pennies, nickels, dimes, quarters) and not be able to give someone EXACTLY \$1.00 in change?

$$\begin{array}{r} 3 (25¢) = 75¢ \\ 4 (10¢) = 40¢ \\ 4 (1¢) = \underline{4¢} \\ \$ 1.19 \end{array}$$

**Bonus Question #2:** What is the first whole number then when you spell it out you would need to use the letter "A" to spell it?

One Thousand

### Formulas

General Multiplication Rule:

$$P(A \text{ and } B) = P(A) P(B)$$

General Addition Rule:

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

Chi-Squared Value:

$$X^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$$