50 +3
50

Summer 2018
Math 54: Test 2

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Instruction: ***For each show <u>all</u> <u>necessary work</u> on the space provided. Box or circle your final answer.***

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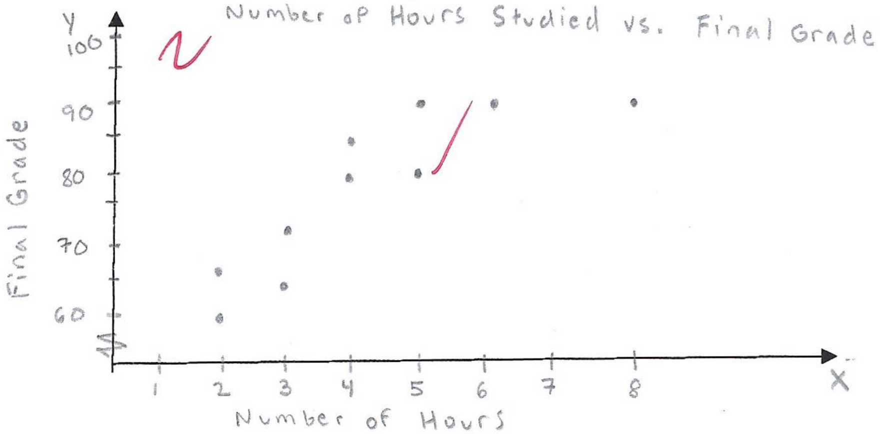
1. **[2 points each]** Given the data set:

The data below are the final exam scores of 10 randomly selected history students and the number of hours they studied for the exam. ~~Number of absences~~, x Final grade, y

X	3	5	2	8	2	4	4	5	6	3
y	65	80	60	88	66	78	85	90	90	71

a. Draw the scatter diagram.



b. **[2 points]** What relation seem to exist between X and Y? (Linear or Nonlinear?)

Linear, there appears to be a positive association. 2

 4

For the data set

x	2	4	8	8	9
y	1.4	1.8	2.1	2.3	2.6

c. *Given* $\bar{x} = 6.2$, $\bar{y} = 2.04$, $s_x = 3.03315$, $s_y = 0.461519$ and $r = 0.957241$,

2 Determine the least-squares regression lines. Find the slope and y-intercept

$b_1 = r \cdot \frac{s_y}{s_x}$

$b_1 = (0.957241) \cdot \frac{(0.461519)}{(3.03315)}$

Slope

$\boxed{b_1 = 0.146}$

$b_0 = \bar{y} - b_1 \bar{x}$

$b_0 = 2.04 - (0.146)(6.2)$

$\boxed{b_0 = 1.135}$

Y-intercept

$\hat{y} = b_1 x + b_0$

$\boxed{\hat{y} = 0.146x + 1.135}$

d. Predict the value at $x = 10$. Find the residual at ~~x~~ y $= 2.3$.

2

$\hat{y} = 0.146(10) + 1.135$

$\boxed{\hat{y} = 2.595}$

At $y = 2.3$, $x = 8$

$\hat{y} = 0.146(8) + 1.135 = 2.303$

Residual $= y - \hat{y} = 2.3 - 2.303 = \boxed{-0.003}$

e. Use calculator to calculate the linear correlation coefficient, r

2

x	-13	-11	-4	-7	-9	-10	-8	-6	-5	-12
y	-12	-10	7	-1	-4	-8	-3	1	4	-10

$\boxed{r = 0.990}$

6

3.[**10 points**] The following data represents the level of satisfaction of the buyer for both new and used cars

	New	*Old*	*Total*
Not too satisfied	12	25	37
Pretty satisfied	75	78	153
Extremely satisfied	120	84	204
Total	207	187	394

a. Fill the table above (Find marginal distribution).

2

b. find relative marginal and conditional distribution.

X

Conditional Distribution of Level of Satisfaction Given New vs. Old Car

	New	Old	Rel. Freq. Marginal Dist.
Not too satisfied	0.058	0.134	0.094
Pretty satisfied	0.362	0.417	0.388
Extremely satisfied	0.580	0.449	0.518
Rel. Freq. Marginal Dist	0.525	0.475	1

c. Find the proportion of consumers extremely satisfied.

2

0.518 of consumers extremely satisfied

or

51.8 %

10

3 [**10 points**] The following represents the result of a survey in which individuals were asked to disclose what they perceive to be the ideal numbers of children

#Children	0	1	2	3	4	5	6	Total
Female	5	2	87	61	28	3	2	188
Male	3	2	68	28	8	0	0	109
Total	8	4	155	89	36	3	2	297

Source: Sulivan Statistics survey (text page 312)

a) What is the probability an individual believes the ideal numbers of children is 2?

3

$P(\text{2 children}) \approx \frac{155}{297} = \boxed{0.522}$ ✓

b) What is the probability an individual is female and believes the ideal number of children is 2?

3

$P(\text{female and 2 children}) \approx \frac{87}{297} = \boxed{0.293}$ ✓

c) What is the probability a randomly selected individual who took this survey is male or believes the ideal number of children is 3?

4

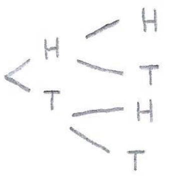
$P(\text{male or 3 children}) = P(\text{male}) + P(\text{3 children}) - P(\text{male and 3 children})$

$= \frac{109}{297} + \frac{89}{297} - \frac{28}{297}$

$= \boxed{0.572}$

10

4. **[10 points]** a. A fair coin is tossed two times in succession. Use tree to find the sample space. Find the probability of getting exactly **two heads.**



3

$S = \{HH, HT, TH, TT\}$

$E = \text{"two heads"} = \{HH\}$

$P(E) = \frac{N(E)}{N(S)} = \frac{1}{4} = \boxed{0.25}$ ✓

b. Given that P(A or B) = 0.65, P(B) = 0.30, and P(A and B) = 0.15, find P(A).

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

$0.65 = P(A) + 0.30 - 0.15$

3

$P(A) = \boxed{0.5}$ ✓

c. A standard deck of cards contains 52 cards. One card is randomly selected from the deck. Compute the probability of randomly selecting an **King or heart** from a deck of cards.

$P(\text{King or heart}) = P(\text{king}) + P(\text{heart}) - P(\text{king and heart})$

4

$= \frac{4}{52} + \frac{13}{52} - \frac{1}{52}$

$= \frac{16}{52}$

$= \boxed{0.308}$ ✓

10

5. [**10 points**]a. In how many ways can a board of supervisors choose a president, a treasurer, and a secretary from its 10 members?

$_{10}P_3 = \frac{10!}{(10-3)!} = \frac{10\cdot 9\cdot 8\cdot \cancel{7!}}{\cancel{7!}} = \boxed{720}$ ✓

2

b. How many different simple random samples of size 4 can be selected from a population of size 50?

$_{50}C_4 = \frac{50!}{4!(50-4)!} = \frac{50\cdot 49\cdot 48\cdot 47\cdot \cancel{46!}}{4\cdot 3\cdot 2\cdot 1\cdot \cancel{46!}} = \boxed{230,300}$ ✓

2

c. Suppose that Events E and F are independent such that $P(E) = 0.25$ and $P(F) = 0.4$. Then find $P(E\ and\ F)$.

2

$P(E \text{ and } F) = P(E)\cdot P(F)$

$= 0.25 \cdot 0.4$

$= \boxed{0.1}$ ✓

d. E, F, G, H and I are the only out comes of probability experiment, find the probability of G.

2

Outcome	E	F	G	H	I
Probability	$\frac{1}{11}$	$\frac{3}{11}$		$\frac{3}{11}$	$\frac{2}{11}$

$P(E) + P(F) + P(G) + P(H) + P(I) = 1$

$P(G) = 1 - P(E) - P(F) - P(H) - P(I)$

$P(G) = 1 - \frac{1}{11} - \frac{3}{11} - \frac{3}{11} - \frac{2}{11} = \boxed{0.182}$ ✓

e. Suppose E and F are two events and that N(E and F) = 420 and N(E) = 740. What is P(F|E).

2

$P(F|E) = \frac{N(E \text{ and } F)}{N(E)} = \frac{420}{740} = \boxed{0.578}$ ✓

10

Extra Credit:[3 points]

The grade appeal process at a university requires that a jury be structured by selecting five individuals randomly from a pool of 8 students and 10 faculty. Total = 18

a. What is the probability of selecting a jury of all students?

$P(\text{all students}) = \frac{8}{18} \cdot \frac{7}{17} \cdot \frac{6}{16} \cdot \frac{5}{15} \cdot \frac{4}{14} = \boxed{0.007}$

1/2

by the General Multiplication rule

b. What is the probability of selecting a jury of all faculty?

$P(\text{all faculty}) = \frac{10}{18} \cdot \frac{9}{17} \cdot \frac{8}{16} \cdot \frac{7}{15} \cdot \frac{6}{14} = \boxed{0.029}$

1/2

by the Gen. Mult. Rule

c. What is the probability of selecting a jury of 2 students and 3 faculty?

$P(\text{2 students, 3 faculty}) = \frac{8}{18} \cdot \frac{7}{17} \cdot \frac{10}{16} \cdot \frac{9}{15} \cdot \frac{8}{14} = \boxed{0.039}$

1/2

by the Gen. Mult. Rule

2 3