Corre: (A)

Great Job!

105

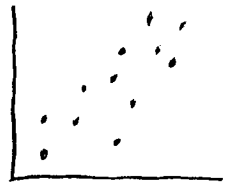
Illowsky – Chapt. 11, 12,&13
Larson – Chapt. 9 & 10

Math 123 Exam 5 SHOW ALL WORK Name

6 1. Make a rough sketch of a scatterplot for which the given r value is reasonable:

a. r = 0.13

b. r = 0.72

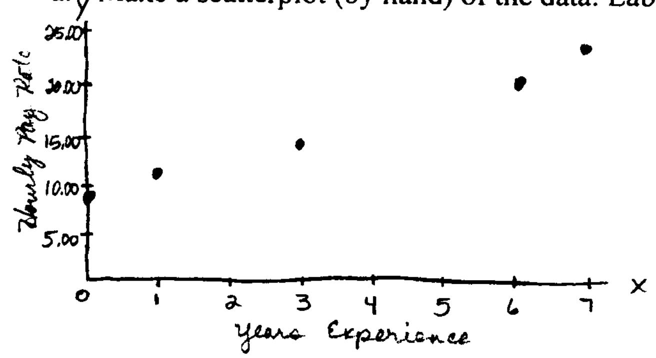


c. r = -0.99

6 2. Use the following data for all the questions on this problem. The table gives x, the number of years of experience and y the hourly pay rate for a random sample of five employees at a company.

x (years)	0	1	3	6	7
y (rate)	\$9.75	\$11.50	\$14.60	\$21.25	\$23.15

a. Make a scatterplot (by hand) of the data. Label carefully.



6 b. Find the equation of the line that best fits the data (regression line). Interpret the slope and the y-intercept of this line.

$y = ax + b$

$\hat{y} = 1.935x + 9.469$

$\text{Slope} = \frac{1.935}{1}$

For every increase of one year's experience the hourly pay rate is increased by \$1.94 or approximately \$2.0 The lowest or beginning hourly pay rate is approximately \$9.47.

6 c. Predict the pay rate for an employee who has 40 years of experience. Discuss this result.

$\hat{y} = 1.935(40) + 9.469$

$y = 86.869$

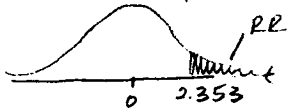
This equation gives an hourly pay rate of \$86.87 for an employee with 40 years experience. This calculation does not make sense because there would be a maximum hourly pay rate.

6 d. What is the value of the linear correlation coefficient for the data on the previous page? Discuss this value in the context of your scatterplot of the data.

$r = .9978892251$

The linear correlation coefficient shows a strong, positive correlation. The scatterplot also shows a strong, positive correlation.

6 e. Test the claim (at alpha = 5%) that there is a positive linear correlation between years of experience and hourly rate in the population. $d.f. = n-2 = 5-2 = 3$



① $H_0: \rho \leq 0 \quad H_a: \rho > 0$ (claim)

② Critical Value: $t_0 = 2.353$

③ STS: $t = \dfrac{r}{\sqrt{\frac{1-r^2}{n-2}}} = \dfrac{0.998}{\sqrt{\frac{1-(.998)^2}{3}}} = 27.345$

④ Reject H_0

Support the claim that there is a positive linear correlation between years of experience and hourly rate in the population at a 5% level of significance.

15 3. Use the following data and an appropriate hypothesis test to test the claim that gender and preferred cold, non-alcoholic drink are dependent. Use alpha = 5%.

Gender	Soda	Milk	Juice	Water	Total
Male	70	30	48	41	189
Female	59	29	40	32	160
Total	129	59	88	73	349 S.S.

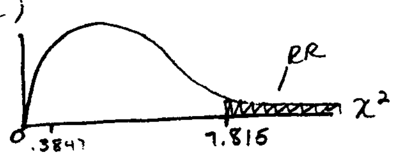
① H_0: Type of drink is independent of gender $\qquad d.f. = (2-1)(4-1) = 3$

H_a: Type of drink is dependent on gender. (Claim)

	Observed	Expected
MS	70	69.86
MM	30	31.95
MJ	48	47.66
MW	41	39.53
FS	59	59.14
FM	29	27.05
FJ	40	40.34
FW	32	33.47

② Critical Value: $\chi^2_c = 7.815$

③ STS: $\chi^2 = \dfrac{(O-E)^2}{E} = 0.3847$



④ Do not reject H_0

Do not support the claim that gender and preferred drink are dependent at a 5% level of significance.

P-value $= 0.943 \qquad 0.943 > 0.05$

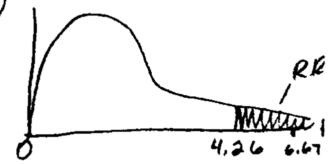
P-value $> \alpha$ ✓

15 4. It is claimed the population mean hourly rate ~~for~~ is the same for student employees at Cuesta, AHC and SBCC. Using the data below, test the claim at a 5% level of significance. ANOVA

$N = 12$
$K = 3$
$df_n = K-1$
$3-1=2$
$df_D = N-K$
$12-3=9$

Cuesta	AHC	SBCC
9.42	9.98	11.14
9.32	9.35	12.67
9.89	10.90	15.00
10.01	12.13	17.89

① $H_0: \mu_1 = \mu_2 = \mu_3$ (claim)
H_a: not all means are equal
② Critical Value: $f_0 = 4.26$
③ STS: 6.67
④ Reject H_0
Reject the claim that the population mean hourly rate is the same for student employees at these 3 colleges at 5% level of significance



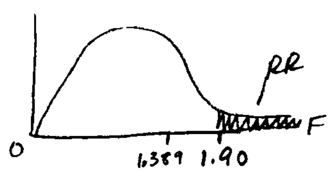
15 5. A researcher claims that there is a lower variance in product life (in months) for ACME electronics products as compared to XYZ electronic products. Independent samples from both companies are randomly selected, with these results: ACME products had n = 16 with sample variance $s^2 = 5.4$, and for XYZ it was n = 25 with sample variance $s^2 = 7.5$. At alpha = 10%, test the researcher's claim.

$n_1 = 25$
$n_2 = 16$
$s_1^2 = 7.5$
$s_2^2 = 5.4$

$\sigma_1 = XYZ$
$\sigma_2 = Acme$

$df_n = n_1 - 1$
$= 25-1$
$= 24$
$df_D = n_2 - 1$
$= 16-1$
$= 15$

① $H_0: \sigma_1 \le \sigma_2$
$H_a: \sigma_1 > \sigma_2$ (claim)
② Critical Value: $f_0 = 1.90$
③ STS: $f = \frac{s_1^2}{s_2^2} = \frac{7.5}{5.4} = 1.389$



④ Do not reject H_0
Do not support the claim that there is a lower variance in product life for ACME products compared to XYZ products at a 10% level of significance.

15 6. To test the claim that the distribution of coffee orders at a coffee company is 20% regular coffee, 25% decaf coffee, 45% regular espresso drinks and 10% decaf espresso drinks. You take a random sample of recent orders and get the following: 39 regular coffee, 21 decaf coffees, 63 regular espresso drinks and 19 decaf espresso drinks. Use a 1% level of significance. χ^2 Goodness of Fit

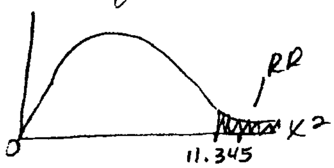
① H_0: Observed distribution fits the distribution at a coffee company of 20% regular coffee, 25% decaf. coffee, 45% regular espresso drinks and 10% decaf. espresso drinks. (Claim)

H_a: Observed distribution does not fit the above expected distribution.

② d.f. = 3; $\chi^2_0 = 11.345$

③ STS: $\chi^2 = 11.51$

④ Reject H_0



Category	Observed (L_1)	Expected (L_2)
Reg. coffee	39	28.4
Decaf. coffee	21	35.5
Reg. Espresso	63	63.9
Decaf. Espresso	19	14.2
	Σ 142	

Reject the claim that the distribution of coffee orders observed fits the expected distribution at 1% level of significance.

P-value = 0.0093

0.0093 ≤ 0.01

P-value ≤ α ✓

4 7. Give an example of when you would need to use a nonparametric hypothesis test.

You use a non-parametric hypothesis test when you cannot verify that you have normally distributed data and you have a small sample of data.

(Ex) Comparing the speed of waxless or waxable skis. You get 6 speeds of waxless skis and 6 speeds of waxable skis. The STS is based on ranks of data not actual data values. For this particular example you would use the Rank Sum Test.