

Excellent
30

(Handwritten mark)

BIRZEIT UNIVERSITY
MATHEMATICS DEPARTMENT

First Exam Stat 236 Summer 2013/2014

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Remarks:

- ★ Cell phones must be off.
- ★ Borrowing calculators is not allowed.
- ★ Show all your work.
- ★ Whenever there is a space specified for an answer, write your answer in it.
- ★ Approximate all your answers to 2 decimal places. i.e (1.3333=1.33, 1.666=1.67, 1.035=1.04).

(Faint handwritten sketches and scribbles)

Q11B

1. A statistical study on a sample of 200 BZU's students was selected and produced the following data set

Students	Gender	Cumulative Grade Ave	Hours of study/week
1	Female	73	13
2	Female	67	11
3	Male	69	9
...
200	Female	72	14

(a) What is the level of measurement for the variable Hours of study

- 1 (i) Nominal (ii) Ordinal (iii) Ratio (iv) Interval

(b) The appropriate graphical summary for the relationship between Hours of study and Cumulative Grade Ave is

- 1 (i) Covariance (ii) Scatter diagram (iii) Correlation coefficient α (iv) Cross tabulation α

(c) If $X = \text{Hours of study}$, $Y = \text{Cumulative Grade Average}$, $S_x = 7$, $S_y = 5$, $\sum (x_i - \bar{x})(y_i - \bar{y}) = 6368$, then

i. Find and interpret the Covariance

$n = 200$

3 $S_{xy} = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{n-1} = \frac{6368}{199} = 32 \Rightarrow$ Positive value the relationship between the two variables is positive, do not tell us about the strength of it.

ii. Find and interpret the Correlation coefficient

479 $r = \frac{S_{xy}}{S_x S_y} = \frac{32}{(7)(5)} = \frac{32}{35} = 0.914 \Rightarrow$ is positive and near to 1 that mean a strong positive linear relationship between Hours of study and Cumulative Grade

(d) To study the relationship between Gender and Cumulative Grade Average, the following summary was constructed

Gender \ Cum. Gr. Ave	60-69.9	70-79.9	80-89.9	90-99.9	Total
Male	6	12	24	18	60
Female	21	35	49	35	140
Total	27	47	73	53	200

1 i. Complete the summary

1 ii. What is the name of the summary? Cross tabulation

iii. use the summary to construct a Row percentage distribution

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Gender \ cumulative Gr. Ave	60-69.9	70-79.9	80-89.9	90-99.9	Total
male	10	20	40	30	%100
Female	15	25	35	25	%100

1 iv. What is the percentage of Male students whose Cumulative Grade Average is at least 80? 70%

1 v. Which Gender is more likely to have higher Cumulative Grade Average? Male

vi. Construct a frequency distribution of the variable Cumulative Grade Average and find its mean

Frequency distribution for the Cumulative Grade Average

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Class	Frequency	Mid Point	$f_i \times M_i$
60-69.9	27	64.95	1753.65
70-79.9	47	74.95	3522.65
80-89.9	73	84.95	6201.35
90-99.9	53	94.95	5032.35
Total	200		16510

$\bar{x} = \frac{\sum M_i \times f_i}{n} = \frac{16510}{200}$

EXC = 82.55 gr
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2. A jewelry craftsman shop conducted a study on the weights of gold earrings sold. The sample data (in grams) were as follow

16.4 16.4 17.4 20.8 17.7 18.1 17.3 16.4 19 17.1 18.1 Find the following.

(a) Find the mean and standard deviation for the weights of gold earrings sold

* $\bar{x} = \frac{\sum x_i}{n} = \frac{194.7}{11} = 17.7$

* $s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}} = 1.32$

from the calculator "CASIO"

IQR

(b) Find the inter-quartile range

$\frac{P}{100} \times n = \frac{25}{100} \times 11 = 2.75 \Rightarrow$ 3th Position = 16.4

$\frac{75}{100} \times 11 = 8.25 \Rightarrow$ 9th Position = 18.1

IQR = $Q_3 - Q_1 = 18.1 - 16.4 = 1.7$

(c) According to the upper limit rule, is the data value 20.9 gram an outlier (Yes, NO, and Why)

Upper limit = $Q_3 + (1.5)(IQR)$
 $= 18.1 + (1.5)(1.7)$
 $= 20.65$
 $\Rightarrow 20.9 > \text{upper limit } (20.65)$
 thus, this value is an outlier

(d) Construct a Steam-and-Leaf display for the data

unit = 0.1 leaf unit = 0.1

16	4 4 4
17	1 3 4 7
18	1 1
19	0
20	8

(e) what is the distribution shape for the data? right skewed \Rightarrow skewedness is positive

(f) The craftsman shop wants to produce new gold earrings styles. Based on your analysis, should it produce more of low weight styles or high weights styles?

he should produce low weight styles

\Rightarrow mode = 16.4 low weight style

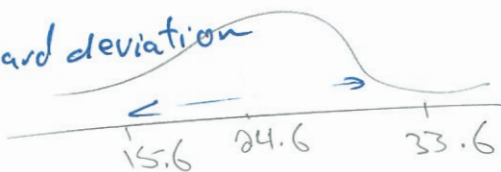
to sell more \Rightarrow more profit

he must produce the most sold weights. Excellent

3. According to the PCBS, the average daily wage of workers in the palestinians territories is \$24.6 = \bar{x}

(a) If the standard deviation of the daily wage is \$5, then what is the percentage of workers whose daily wage is between \$15.6 and \$33.6? $\bar{x} = 24.6$ $s = 5$

$$z_i = \frac{x_i - \bar{x}}{s} = \frac{33.6 - 24.6}{5} = \frac{9}{5} = 1.8 \text{ standard deviation}$$



at least $1 - \frac{1}{2} \cdot 2 = 1 - \frac{1}{(1.8)^2} = 69.13\%$

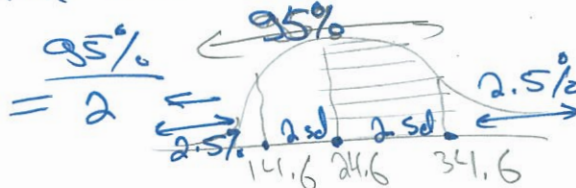
at least \approx of the ~~100~~ worker have daily wage between 15.6 and 33.6

(b) Suppose that the daily wage distribution is normal, then what is the percentage of worker whose daily wage is between \$24.6 and \$34.6?

$$z_i = \frac{x_i - \bar{x}}{s} = \frac{34.6 - 24.6}{5} = 2 \text{ Standard deviation}$$

according to the Empirical rule, 95% of the data are between 14.6 and 34.6

Ans. \Rightarrow approximately 47.5% of the Data



(c) Assuming normality again. In a random group of 300 palestinian workers, how many of them have a daily wage of no more than \$14.6? according to the part (b) we can see that approximately 2.5% of the Data are less than 14.6

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of worker have wage less than 14.6 = $\frac{2.5}{100} \times 300 = 7.5 \approx 8$ worker

4. A car dealer manager was very optimistic about this week's sales. He wished to sell more than 12 cars this week. For the first 6 days of the week he sold an average of 1.5 cars per day. How many cars should he sell on the last day of the week so that his wish becomes true.

Sales first 6 days = $6 \times 1.5 = 9$ $\Rightarrow 12 - 9 = 3$

he $\frac{\# \text{ of cars}}{\text{day}} \text{ Avg.}$

Sales last day ≥ 4
or > 3

\Rightarrow he should sell more than 3 cars.

\Rightarrow 4 cars or more

excellent
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