PALESTINE POLYTECHNIC UNIVERSITY

Faculty of Applied Sciences

Experimental Design and Biostatistics

First Exam (40 points) **Tuesday 13/10/2020** **60 Minutes**

Instructor: *Dr. Monjed H. Samuh*

Name: Key Student ID:

Q1]... [5 points] Which **scale of measurement** is most appropriate for the following variables:

1. Weights of adult women.

   Ratio (+1)

2. Temperature (Measured in Fahrenheit or Celcius).

   Interval (+1)

3. Marital status of nurses in a hospital.

   Nominal (+1)

4. Patient condition (Good, Fair, Serious, Critical).

   Ordinal (+1)

5. Heart rate of runners in a marathon.

   Ratio (+1)

Q2]... [2 points] For each of the following, identify which **sampling method** is used:

1. The names of 30 students are written on 30 cards. The cards are placed in a bag, and three names are selected from the bag.

   Simple random Sampling (+1)

2. Every 5th student entering the university is checked for a high temperature (high temperature is regarded as one of the most common symptoms of Covid-19).

   Systematic Sampling (+1)

Q3]... [18 points] The following data give the LDL cholesterol level in a sample of ten heart patients.

132 139 162 147 133 160 145 150 148 153.

1. (3 points) Calculate the **sample mean**.

$$\bar{X} = \frac{\sum X_i}{n} = \frac{1469}{10} = 146.9$$

(+1) (+1) (+1)

2. (4 points) Calculate the **sample variance**.

(+1) (+1)

$$S^2 = \frac{\sum X_i^2 - \frac{(\sum X_i)^2}{n}}{n-1} = \frac{216725 - \frac{(1469)^2}{10}}{9}$$ (+1)

$$= \frac{929}{9} \approx 103.22$$ (+1)

3. (3 points) Calculate the **coefficient of variation**.

$S = 10.16$.

$$CV = \frac{S}{\bar{X}} \times 100\% = \frac{\sqrt{103.22}}{146.9} 100\%$$ (+1)

(+1)

$$\approx 6.92\%$$ (+1)

4. **(3 points)** Find and **interpret** the **percentile rank** of 145.

$$\frac{\#\text{ of obs's} < 145 \;+0.5}{n} * 100\%. \quad (+1)$$

$$= \frac{3+0.5}{10} * 100\% = 35\% \quad (+1)$$

That is, 35% of heart patients have cholesterol level below 145. (+1)

5. **(5 points)** Identify potential **outliers**, if any.

$Q_2 = 147.5$, $Q_1 = 139$, $Q_3 = 153$. (+1)

$IQR = Q_3 - Q_1 = 153 - 139 = 14$ (+1)

$1.5\,IQR = (1.5)(14) = 21$. (+1)

$Q_1 - 1.5\,IQR = 139 - 21 = 118$

$Q_3 + 1.5\,IQR = 153 + 21 = 174$] (+1)

Any obs. outside the interval (118, 174) is an outlier.

$\Rightarrow$ There is no outlier. (+1)

Q4]... [5 points] In one section of a class of 20 students the mean on an exam was 65 points. In another section of 30 students, the mean on a similar exam was 80 points. What is the mean of the two classes combined?

$n_1 = 20$, $\bar{x}_1 = 65$

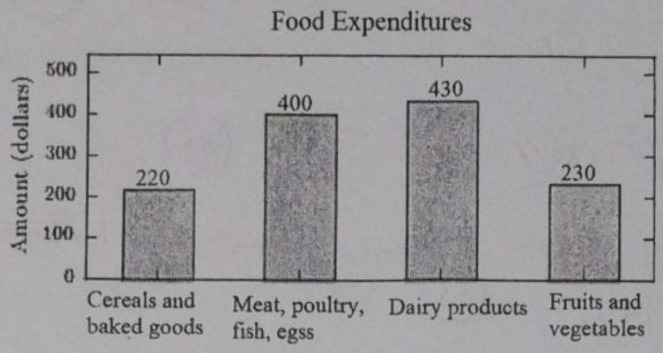
$n_2 = 30$, $\bar{x}_2 = 80$

Combined mean $\bar{x}_c = \frac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2}$ (+2)

$= \frac{(20)(65) + (30)(80)}{20+50} = \frac{3700}{50}$ (+2)

$= 74$ points (+1)

Q5]... [10 points] The following bar graph presents the average amount a certain family spent, in dollars, on various food categories in a recent year.



1. **(1 points)** On which food category was the most money spent?

Dairy products. (+1)

2. **(6 points)** Construct the **relative frequency table.**

food categories	freq.	rel. freq.
Cereals & baked goods	220	0.17
Meat, poultry, fish, eggs	400 (+2)	0.31 (+2)
Dairy products (+2)	430	0.34
Fruits & veg.	230	0.18
	1280	(1)

3. **(3 points)** If we want to use Pie chart, what is the **angle** for the "*Dairy products*" category?

$\frac{430}{1280} * 360^\circ \doteq 120.94^\circ$ (+1)

(+2)

GOOD LUCK