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وقت المحاضرة:  
الرقم الجامعي: ..

الامتحان الأول

مبادئ الإحصاء  
الاسم: ..

Part 1 : Fill in the rectangular box with the correct answer. Show your work. Answers without solution details are not accepted.

1) For all parts of this question, consider the following grouped sample data.

$y_i$	Class	Frequency	$x_i$
25	4-6	3	3
64	7-9	4	1
11	(10-12)	9	4
14	13-15	2	2
	Total	10	

a) (2 marks) The mean of the sample data equals  $\bar{x} = 9.5 = \frac{19}{2}$

$$\text{mean } (\bar{x}) = \frac{\sum x_i f_i}{\sum f_i} = \frac{15 + 8 + 44 + 28}{10} = 9.5$$

b) (2 marks) The variance of the sample data equals  $s^2 = 12.5 = \frac{25}{2}$

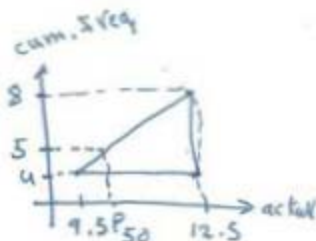
$$s^2 = \frac{\sum x_i^2 f_i - \frac{(\sum f_i)(\bar{x})^2}{n}}{\sum f_i - 1} = \frac{(25 \times 3 + 8^2 \times 4 + 11^2 \times 9 + 14^2 \times 2) - 10 \times 9.5^2}{10 - 1}$$

$$s^2 = \frac{1015 - 902.5}{9} = 12.5$$

c) (2 marks) The median of the sample data equals  $P_{50} = 10.25$

$$\text{median} = P_{50} = \frac{50}{100} = 0.5 \Rightarrow nP = 0.5 \times 10 = 5$$

$$\frac{|12.5 - 9.5|}{|P_{50} - 9.5|} = \frac{(8 - 4)}{(5 - 4)} = \frac{3}{1} \Rightarrow P_{50} = 10.25$$



2) (2 marks) For parts (a) and (b) of this question, consider a sample data with third quartile  $Q_3 = 36$  and first quartile  $Q_1 = 14$ . Each observation in the sample data is multiplied by  $-2$ .

a) the third quartile of the new sample equals  $36 \times (-2) = 72$

b) the interquartile range of the new sample equals  $72 - 14 \times 2 = 44$

$$IQR \text{ of } y = |a| \times IQR \text{ of } x \quad 72 - 14 \times 2 = 44$$

$$IQR = Q_3 - Q_1 = 72 - (14 \times 2) = 44$$

3) (2 marks) Consider a sample data with size 10, mean  $\bar{x} = 40$ . The value of an observation  $x = 34$  is changed to 30. Find the mean of the sample after this change is performed.

$$\text{new } \bar{x} = \frac{\text{old } \sum x - 34 + 30}{\text{old } n} = \frac{400 - 34 + 30}{10} =$$

$$\text{new } \bar{x} = 39.8 = \frac{198}{5}$$

$$\text{old } \sum x = \bar{x} n = 40 \times 10 = 400$$

2

Alaa Awwad

Part 2: Identify the choice that best completes the statement or answers the question.

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
a	a	a	a	a	a	a	a	a	a
b	b	b	b	b	b	b	b	b	b
c	c	c	c	c	c	c	c	c	c
d	d	d	d	d	d	d	d	d	d
e	e	e	e	e	e	e	e	e	e

2

1) The mean of the following sample data equals 6. Find  $a$ .

x	frequency
2	2
a	5
5	2
6	1

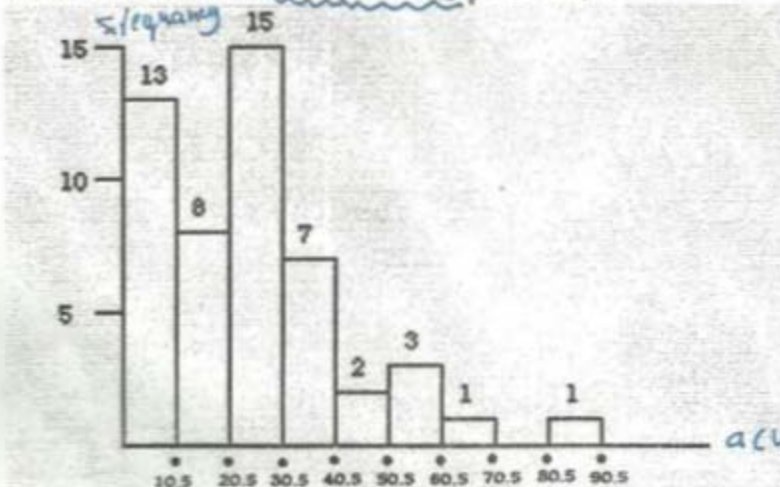
$$\bar{x} = \frac{\sum x_i f_i}{\sum f_i} = \frac{4 + 5a + 10 + 6}{10}$$

$$\Rightarrow 60 = 20 + 5a$$

$$\Rightarrow a = 8$$

- a) 6      b) 4      c) 10      d) 8      e) 3

2) The following is the frequency histogram of a certain sample data with size 50. Which class contains the third quartile  $Q_3$  of this sample data?



$$Q_3 = P_{75} = 0.75 \times 50 =$$

actual limit

- a) 10.5-20.5    b) 50.5-60.5    c) 20.5-30.5    d) 40.5-50.5    e) 30.5-40.5

mean > median > mode



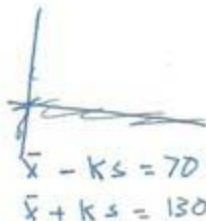
If the distribution of a sample data is skewed to the right then, for this sample data,

- a) the median < the mean < the mode
- b) the median < the mode < the mean
- c) the mode < the median < the mean
- d) the mode < the mean < the median
- e) the mean < the median < the mode

A sample data with size 90 has mean  $\bar{X} = 100$  and standard deviation  $S = 20$ .

At least how many observations in the sample data are between 70 and 130?

- a) 50
- b) 68
- c) 62
- d) 40
- e) 42



If your grade in a Math test is the percentile  $P_{60}$  (the 60th percentile), then this means

- a) your grade is greater than the 3rd quartile  $Q_3$  of the grades
- b) about 40% of the students did better than you in this test.
- c) you did better than (about) 40% of the students in this test
- d) your grade is less than the median grade
- e) about 60% of the grades are greater than your grade

$\Rightarrow 100 - k \cdot 20 = 70$   
 $\Rightarrow k - \frac{3}{2} = 1.5$

$1 - \frac{1}{k^2} = \frac{6}{9}$

$nP = \frac{5}{2} \times 90 = 202.5$

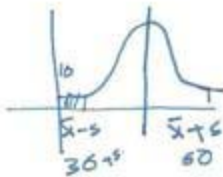
Find the 60th percentile  $P_{60}$  of the following sample data.

x	1	3	5	7	9	Total
frequency	20	30	10	30	10	100

- a) 4
- b) 5
- c) 8
- d) 6
- e) 7

The grades of a Math test are bell shaped. If the percentiles  $P_{16}$  and  $P_{84}$  of the grades equal 36 and 60, respectively, then the standard deviation  $S$  of the grades equals

- a) 18
- b) 14
- c) 12
- d) 16
- e) 24



Find the mode(s) of the sample represented by following relative frequency table

x	relative frequency	
1	0.20	20%
2	0.45	45%
3	0.20	20%
4	0.15	15%

- a) there is no mode for the data
- b) 0.45
- c) a mode can not be found from a relative frequency table
- d) both 1 and 3 are modes

$36 + S + S = 60$   
 $2S = 24 \Rightarrow S = 12$

In a sample data, the minimum observation is 30 and the maximum observation is 73. If we want to put the observations in 6 classes of equal widths, then the class width will be

- a) 8
- b) 9
- c) 10
- d) 5
- e) 6

Three numbers are randomly selected from the set {1, 2, 3, 4, 5, 6}. Find the probability that the sum of the selected numbers is less than 8.

- a) 0.5
- b) 0.1
- c) 0.2
- d) 0.3
- e) 0.4

class width  $d = \frac{R}{k} = \frac{\max - \min}{6} = \frac{73 - 30}{6} = 7.167 \approx 8$

~~Handwritten scribbles and calculations at the bottom of the page.~~

$\frac{5+5+4}{36}$