

نموذج إجابة  
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المادة/ إحصاء حيوي  
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**Biostatistics**

المستوى / الرابع  
المستوى / الرابع

كلية / التمريض  
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الفصل الدراسي الثاني

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العام الدراسي / 2020-2021

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## The Final Exam of the Second Semester 2020/2021

### The First Question: - (20 degree)

1) Fill in the table given below. Answer the following questions.

- Find the values: A, B, C, D.
- Find the true class interval for the first class.
- Find the number of observations less than 19.5

Class Interval	Frequency	Cumulative Frequency	Relative Frequency	Cumulative Relative Frequency
5 - 9	8			
10 - 14	15		C	
15 - 19	11	B		D
20 - 24	A	40	0.15	

2) A company has two sections with 40 and 65 employees respectively. Their average weekly wages are \$450 and \$350. The standard deviation are 7 and 9. Which section has larger variability in wages?

### The Second Question: - (20 degree)

Suppose that we have two events  $A$  and  $B$  such that,  $P(A) = 0.4$ ,  $P(B) = 0.5$ ,  $P(A \cap B) = 0.2$ . Find:

$$P(A \cup B), P(A^c \cap B), P(A^c \cap B^c), P(A^c | B), P(B | A).$$

### The Third Question: (20 degree)

Suppose that 25% of the people in a certain population have low hemoglobin levels. The experiment is to choose 5 people at random from this population. Let  $X$  be the number of people out of 5 with low hemoglobin levels. Find:

- The probability distribution of  $X$ .
- The probability that at least 2 people have low hemoglobin levels.
- The probability that at most 3 people have low hemoglobin levels.
- The probability that more than 5 people have low hemoglobin levels.
- The expected number and the variance of people with low hemoglobin levels.

Ended questions ... With my best wishes  
Dr. Khaled Mahfouz

The Model Answer of the Final Exam 2020/2021  
Biostatistics - 4th

The First Question:

① a.  $A = 6$ ,  $B = 29$   
 $C = 0.375$ ,  $D = 0.725$

② b] The class Interval  $4.5 - 9.5$

③ c] The number of observation  $\leq 19.5 = 29$

class Interval	F	CF	RF	CRF
5-9	8	8	0.2	0.2
10-14	15	23	C	0.575
15-19	11	B	0.775	D
20-24	A	40	0.85	1

④ C.V<sub>1</sub> =  $\frac{\sigma_1}{\bar{X}_1} \times 100 = \frac{7}{450} \times 100 = 1.56\%$

C.V<sub>2</sub> =  $\frac{\sigma_2}{\bar{X}_2} \times 100 = \frac{9}{350} \times 100 = 2.57\%$

The Second Question:

\*  $P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.4 + 0.5 - 0.2 = 0.7$

\*  $P(A^c \cap B) = P(B) - P(A \cap B) = 0.5 - 0.2 = 0.3$

\*  $P(A^c \cap B^c) = P(A \cup B)^c = 1 - P(A \cup B) = 1 - 0.7 = 0.3$

⑤ P(A<sup>c</sup>/B) =  $\frac{P(A^c \cap B)}{P(B)} = \frac{0.3}{0.5} = 0.6$

\* P(B/A) =  $\frac{P(A \cap B)}{P(A)} = \frac{0.2}{0.4} = 0.5$

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### The Third Question:

Let  $X$ : the number of people with low hemoglobin levels.

$\Rightarrow X \sim$  Binomial distribution with  $p=0.25$ ,  $n=5$ ,  $q=0.75$

$$\textcircled{1} P(x) = \binom{5}{x} (0.25)^x (0.75)^{5-x}, \quad x=0, 1, 2, \dots, 5$$

$$\textcircled{2} P(X \geq 2) = 1 - (P(0) + P(1)) = 1 - ((0.75)^5 + 5(0.25)(0.75)^4) = \boxed{0.367}$$

$$\textcircled{3} P(X \leq 3) = 1 - (P(4) + P(5)) = 1 - [5(0.25)^4(0.75) + (0.25)^5] = \boxed{0.984}$$

$$\textcircled{4} P(X > 5) = \boxed{0}$$

$$\textcircled{5} E(X) = np = 5\left(\frac{1}{4}\right) = \boxed{1.2}$$

$$\text{Var}(X) = npq = 5\left(\frac{1}{4}\right)\left(\frac{3}{4}\right) = \frac{15}{16} = \boxed{0.9375}$$