College of Science.
Department of Statistics & OR

جامعة الملك سعود
King Saud University

كلية العلوم
قسم الإحصاء وبحوث العمليات

Second Midterm Exam

Academic Year 1443-1444 Hijri- SecondSemester

Exam Information معلومات الامتحان			
Course name	Biostatistics (A)		اسم المقرر
Course Code	Stat 109		رمز المقرر
Exam Date	2023-05-18	1444-10-28	تاريخ الامتحان
Exam Time	07:00PM		وقت الامتحان
Exam Duration	90minutes		مدة الامتحان
Classroom No.			رقم قاعة الاختبار
Instructor Name			اسم استاذ المقرر

Student Information معلومات الطالب		
Student's Name		اسم الطالب
ID number		الرقم الجامعي
Section No.		رقم الشعبة
Serial Number		الرقم التسلسلي

General Instructions:	تعليمات عامة:
• Do not copy answers from your neighbors. They have different questions forms.	• لا تنسخ الإجابات من أصدقائك، لديهم نماذج أسئلة مختلفة.
• Choose the nearest number to your answer.	• اختر أقرب رقم لإجابتك.
• Do not use pencils or red pens.	• لا تستخدم أقلام الرصاص أو الأقلام الحمراء.
• Correction will be from cover page **only**.	• يجب نقل الاجابات بدقة ولن ينظر لورقة الأسئلة من الداخل.
• For each question, put the code (Capital Letters) of the correct answer in the following table beneath the question number	• لكل سؤال، ضع رمز (الحروف الكبيرة) للإجابة الصحيحة في الجدول التالي أسفل رقم السؤال.

This section is ONLY for instructor

#	Course Learning Outcomes (CLOs)	Related Questions	Points	Final Score
1	Discrete and Continuous probability distributions		1-15	
2	Sampling distributions		16-30	30

1	2	3	4	5	6	7	8	9	10
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**

Questions (1-6) In a study to make an inference between the proportion of houses heated by gas in city A and city B, the following information was collected:

	Proportion of houses heated by gas	Sample size
City A	43%	90
City B	51%	150

Suppose p_A proportion of city A houses which are heated by gas, p_B proportion of city B houses which are heated by gas. The two samples are independent.

1. The sampling distribution for the sample proportion of city B houses which are heated by gas is:

(A) $\hat{p}_B \sim N(p_B, \frac{p_B q_B}{n_B})$	(B) $\hat{p}_B \sim N(\hat{p}_B, \frac{\hat{p}_B \hat{q}_B}{n_B})$
(C) $\hat{p}_B \sim N(\hat{p}_B, \hat{p}_B \hat{q}_B)$	(D) $\hat{p}_B \sim N(p_B, p_B q_B)$

2. The mean of the sample proportions of city B houses which are heated by gas is:

(A) 0.43	(B) 0.51	(C) 0.49	(D) 0.57

3. The probability that the sample proportion of houses which are heated by gas in city A is less than 0.5 is:

(A) 0.09012	(B) 0.40517	(C) 0.90988	(D) 0.59483

4. The standard error of the difference between the sample proportions of city A and B houses which are heated by gas is:

(A) 0.05219	(B) 0.06625	(C) 0.00439	(D) 0.04082

5. $P(\hat{p}_A - \hat{p}_B > 0.05) =$

(A) 0.0305	(B) 0.9750	(C) 0.9744	(D) 0.0211

6. The sampling distribution of $\hat{p}_A$ is (approximately) normal if

(A) $n_A \geq 30,\ n_A p_A > 5$	(B) $n_A q_A > 5$
(C) $n_A \geq 30, n_A p_A > 5, n_A q_A > 5$	(D) $\frac{p_A}{n_A} > 5$

Questions (7-9) Suppose that in a certain city, the monthly number of infected cases with Coronavirus has a Poisson distribution with an average (mean) of 10 cases.

7. The probability that there will be 2 infected cases this month.

(A) 0.5023	(B) 0.0023	(C) 0.6023	(D) 0.8023

8. The probability that there will be 3 infected case this month.

(A) 0.0076	(B) 0.9075	(C) 0.4075	(D) 0.8075

9. The standard deviation of the number of infected cases this year.

(A) 10.95	(B) 10	(C) 120	(D) 0

Questions (10-14) Let X = number of orders received in a day. Use the following probability distribution table to answer the questions.

x	0	1	2	3
$P(X = x)$	0.15	K	0.40	0.20

10. $P(1.5 < X < 3.5)$

(A) 0.75	(B) 1	(C) 0.60	(D) 0.45

11. $P(X \leq 1) =$

(A) 0.55	(B) 0.36	(C) 0.15	(D) 0.40

12. $P(X = 2.5) =$

(A) 0	(B) 0.20	(C) 1	(D) 0.15

13. The mean of X is

(A) 1.65	(B) 0.9631	(C) 0.9275	(D) 1

14. The variance of X is

(A) 1.65	(B) 0.9631	(C) 0.9275	(D) 1

Questions (15-19) It is known that 45% of the citizens have been immunized with the Coronavirus vaccine. A random sample of 6 persons was selected, and the random variable X was defined as the number of immunized persons among them. Then:

15. The probability distribution of the random variable X is:

(A) Normal	(B) Exponential	(C) Poisson	(D) Binomial

16. The probability that there will be 4 immunized persons in the sample equals:

(A) 0.3456	(B) 0.1861	(C) 0.0102	(D) 0.6544

17. The probability that there will be at least 2 immunized persons in the sample equals:

(A) 0.8364	(B) 0.0870	(C) 0.1636	(D) 0.9130

18. The mean of the number of immunized persons in the sample is approximately:

(A) 2.7	(B) 1.2186	(C) 1.485	(D) 3.3

19. The variance of the number of immunized persons in the sample is approximately:

(A) 2.7	(B) 1.2186	(C) 1.485	(D) 3.3

Questions (20-23) Two normally distributed populations have equal means, and variances of $\sigma_1^2 = 100$ and $\sigma_2^2 = 80$. Assume two samples of size $n_1 = 25$ and $n_2 = 16$ are taken from the populations, then

20. The mean of $\bar{X}_1 - \bar{X}_2$ is

(A) 0	(B) 9	(C) 20	(D) 1

21. The variance of $\bar{X}_1 - \bar{X}_2$ is

(A) 0	(B) 9	(C) 20	(D) 1

22. The probability that $\bar{X}_1 - \bar{X}_2$ is less than 8 is

(A) 0.0354	(B) 0.0038	(C) 0.9962	(D) 0.0321

23. The probability that $\bar{X}_1 - \bar{X}_2$ is greater than 3 is

(A) 0.1587	(B) 0	(C) 0.1222	(D) 0.8413

Questions (24-27)

24. The parameters of the binomial distribution are

(A) μ, σ	(B) μ, q	(C) n, p	(D) λ

25. Suppose that X has a normal distribution, then the mean μ determines the ..... of the curve.

(A) shape	(B) location	(C) variable	(D) population

26. The total area under the normal curve equals:

(A) 1	(B) 0	(C) 0.5	(D) -3.747

27. If a random variable T has a t- distribution, then at ($v = 5$) the value of $t_{0.99} =$

(A) 3.365	(B) -3.365	(C) 3.747	(D) -3.747

Questions (28-30) A medical research has concluded that people experience a common cold roughly two times per year. Assume that the time between colds is normally distributed with a mean of 165 days and a standard deviation of 45 days. Consider the sampling distribution of the sample mean based on samples of size 36 drawn from the population:

28. The mean of sampling distribution $\bar{X}$ is

(A) 210	(B) 36	(C) 45	(D) 165

29. The distribution of the mean of $\bar{X}$ is

(A) $N(165, 2025)$	(B) $N(165, 45)$	(C) T , $with\ df = 30$	(D) $N(165, 7.5)$

30. $P(\bar{X} > 178) =$

(A) 0.0415	(B) 0.615	(C) 0.958	(D) 0.386