

Department of Statistics
& Operations Research
College of Science
King Saud University



STAT 324
Final Examination
First Semester
1425 – 1426

Student Name:			
Student Number:		Section Number:	
Teacher Name:		Serial Number	

- ▶▶ Mobile Telephones are not allowed in the classrooms
- ▶▶ Time allowed is 3 hours
- ▶▶ Answer 40 questions only from 44 questions
- ▶▶ Choose the nearest number to your answer
- ▶▶ For each question, put the code of the correct answer in the following table beneath the question number:

1	2	3	4	5	6	7	8	9	10	11
A	E	D	D	C	C	A	B	D	D	D

12	13	14	15	16	17	18	19	20	21	22
D	A	D	D	C	A	D	E	B	B	B

23	24	25	26	27	28	29	30	31	32	33
A	D	C	A	B	C	B	E	B	A	B

34	35	36	37	38	39	40	41	42	43	44
D	E	C	A	D	B	A	C	B	A	D

1. Consider the sample space $S = \{\text{White, Black, Red, Blue, Yellow, Violet, Green}\}$ and the events $A = \{\text{White, Black, Green}\}$, $B = \{\text{Black, Red, Blue}\}$, $C = \{\text{Violet}\}$. Then the list of the elements of the set corresponding to the event $(A \cap B') \cup C'$ is:

- (A) $\{\text{White, Black, Red, Blue, Yellow, Green}\}$, (B) $\{\text{Black, Violet}\}$, (C) $\{\text{White, Black, Red, Blue, Yellow, Violet, Green}\}$, (D) $\{\text{White, Red, Blue, Yellow, Green}\}$, (E) $\{\text{White, Green, Violet}\}$.

2. The number of ways to select 2 computers from 9 computers of the same brand is

- (A) 18 (B) 72 (C) 81 (D) 512 (E) 36

3. Among the 500 first year students of a college, 270 students study computer science, 345 students study mathematics, and 175 students study both computer science and mathematics. If one student is selected at random, then the probability that the student did not take either of these subjects is

- (A) 0.88 (B) 0.65 (C) 0.77 (D) 0.12 (E) 0.35

⇒ **Use the following data to answer questions 4 and 5.** A random sample of 2000 computers are classified according to brands A, B and C and levels of satisfaction of the owner, Good, Average and Poor as shown in the following table:

Level of Satisfaction	Brands		
	A	B	C
Good	200	100	100
Average	400	300	300
Poor	100	200	300

4. If a computer is selected randomly, then the probability that the satisfaction level of the owner of the computer is poor, is:

- (A) 0.428 (B) 0.1429 (C) 0.3333 (D) 0.300 (E) 0.1667

5. If the randomly selected computer gives a satisfaction level good to the owner, then the probability that the computer is of brand C, is:

- (A) 0.35 (B) 0.20 (C) 0.25 (D) 0.10 (E) 0.2858

6. The probability that you will leave home to attend your class on time (A) is 0.75; the probability that you will arrive at your class on time (L) is 0.60

and the probability that you will leave home and arrive on time is 0.45. Then the two events, A and L are:

- (A) Disjoint (B) Dependent (C) Independent
(D) Mutually Exclusive

7. A certain defect (D) is present in about 1 out of 1000 cars during production [$P(D)=0.001$], and a program of testing is to be carried out using a detection device which gives a positive reading with probability 0.99 for a defective car [$P(+/D)=0.99$] and with probability 0.05 for a non-defective car [$P(+/ND)=0.05$]. Then if a randomly selected car has a positive reading then the probability that it actually does have the defect [$P(D/+)$] is:

- (A) 0.0194 (B) 0.05094 (C) 0.00099 (D) 0.04995 (E) 0.99

8. If 50% of the automobiles sold by an agency for a certain car are equipped with diesel engines, let X represent the number of diesel models among the next 5 cars sold by this agency, then the probability distribution of X is

- (A) $f(x) = \frac{\binom{5}{x}}{16}, x = 0,1,2,3,4$. (B) $f(x) = \frac{\binom{5}{x}}{32}, x = 0,1,2,3,4,5$.
(C) $f(x) = \frac{\binom{4}{x}}{16}, x = 0,1,2,3,4$. (D) $f(x) = \frac{\binom{5}{x}}{32}, x = 1,2,3,4$.
(E) $f(x) = \frac{\binom{5}{x}}{64}, x = 0,1,2,3,4$.

⇒ **For question 9, 10 and 11** . Let X be a random variable with the following probability distribution function

x	-1	0	1	2
P(X=x)	0.3	0.35	0.1	0.25

9. the mean of X (E(X)) =

- (A) 1.31 (B) 0.2 (C) 1.4 (D) 0.3 (E) 2.0

10. the variance of X =

- (A) 1.4 (B) 0.2 (C) 2.4 (D) 1.3 1 (E) 2.0

11. $P(X > -1) =$

- (A) 0.2 (B) 0.75 (C) 0.65 (D) 0.7 (E) 0.12

⇒ **For question 12, 13 and 14** . Consider a continuous random variables X with the following probability density function

$$f(x) = \frac{x^2}{9}, 0 < x < k,$$

12. the value of k is :

- (A) 0.33 (B) 3.112 (C) 3.334 (D) 3.0 (E) 0.22

13. $P(X < 1) =$
 (A) 0.03704 (B) 0.02223 (C) 0.6555 (D) 0.254 (E) 0.9
14. $E(X) =$
 (A) 2.20 (B) 2.22 (C) 2.65 (D) 2.25 (E) 1.0
- \Rightarrow **Answer for question 15, 16 and 17.** A random variables X has a mean $\mu = 6$ and a variance $\sigma^2 = 4$.
15. $E(3X+4) =$
 (A) 24.0 (B) 14.0 (C) 36.0 (D) 22.0 (E) 25.0
16. $\text{Var}(3X+5) = \sigma_{3X+5}^2 =$
 (A) 41.0 (B) 17.0 (C) 36.0 (D) 22.0 (E) 14.0
17. $P(-4 < X < 16)$
 (A) $\geq 24/25$ (B) $< 24/25$ (C) $\geq 1/5$ (D) $< 1/5$ (E) $\geq 15/16$

\Rightarrow **Answer for question 18, 19, 20 and 21.** A manufacture plant received a shipment of circuit boards from a manufacturer, 5 boards randomly chosen for inspection and determine whether they are defective or not. It is known that 8% of the boards in the shipment are defective.

18. The probability of no defective circuit boards is :
 (A) 0.0544 (B) 0.3409 (C) 0.9456 (D) 0.6591 (E) 0.5
19. The probability that more than 1 of the circuit boards is defective is:
 (A) 0.7865 (B) 0.9456 (C) 0.6591 (D) 0.1039 (E) 0.0543
20. The variance of the number of defective boards is:
 (A) 0.2135 (B) 0.368 (C) 0.5767 (D) 0.2052 (E) 0.2152
21. Suppose in this experiment, a shop receives 20 circuit boards out of which 6 are defective boards. If we buy 4 boards, then the probability that we will find 2 defectives boards is:
 (A) 0.2135 (B) 0.2817 (C) 0.5858 (D) 0.1039 (E) 0.1139

- \Rightarrow **Answer for question 22 and 23.** In a certain industrial facility accidents occur. If the average number of accident per a month is 2, then
22. probability that within a month there will be at most two accidents is:
 (A) 0.7865 (B) 0.6767 (C) 0.4060 (D) 0.3233 (E) 0.334

23. probability that within a month there will be at least one accidents is:
 (A) 0.8647 (B) 0.2135 (C) 0.5767 (D) 0.1353 (E) 0.11
24. Given a standard normal distribution, then $Z_{0.75}$ is
 (A) 0.75 (B) 0.7734 (C) 0.25 (D) 0.675 (E) 0.251
25. If the variable X has normal with $\mu = 10$ and $\sigma^2 = 25$, then the probability that X-values exceeds 8 is:
 (A) 0.80 (B) 0.20 (C) 0.6554 (D) 0.10 (E) 0.3446

⇒ **Answer for question 26 and 27.** Suppose that X has the exponential density
 $f(x) = 0.25 e^{-0.25x}$, then

26. the mean of X ($E(X)$) is:
 (A) 4 (B) 0.25 (C) 1.0 (D) 0.25 (E) 2.0
27. the probability $P(X \leq 4)$ is:
 (A) 0.3679 (B) 0.6321 (C) 0.5 (D) 0.0 (E) 0.71
28. If the mean and the variance of weights of students in certain school is 35 kg and 25 kg^2 . Then the probability that the average mean of weights will be greater than 34 kg in a sample of size 64 students:
 (A) 0.0548 (B) 0.9542 (C) 0.9452 (D) 0.0450 (E) 0.123

⇒ **For question 29, 30, 31 and 32.** Consider following information. A sample of 25 men has a mean weight of 65 kg with a standard deviation of 8 kg. Suppose that the weight of men follows normal distribution with a standard deviation of 10 kg.

29. The population variance of sample means ($\sigma_{\bar{X}}^2$) is:
 (A) 2 kg^2 (B) 4 kg^2 (C) 1.6 kg^2 (D) 2.56 kg^2 (E) 0.4 kg^2
30. The point estimate of μ is
 (A) 10 kg (B) 8 kg (C) 25 kg (D) 9 kg (E) 65 kg
31. The lower 95% confidence limit for a population mean μ is
 (A) 64.671 kg (B) 61.08 kg (C) 61.864 kg (D) 61.698 kg (E) 63.0 kg
32. The upper 95% confidence limit for a population mean μ is
 (A) 68.92 kg (B) 68.3024 kg (C) 68.29 kg (D) 72.84 kg (E) 70.1 kg
33. In a sample of 100 items, 8 were found defective. The lower 98% confidence limit for the population proportion is:
 (A) 0.08 (B) 0.0168 (C) 0.024 (D) 0.075 (E) 0.089

⇒ **For question 34 ,35 and 36.** Consider following

Let $n_1 = 100$, $\bar{X}_1 = 12.2$ and $S_1 = 1.1$ for sample 1 and $n_2 = 200$, $\bar{X}_2 = 9.1$ and $S_2 = 0.9$ for sample 2. Suppose that the samples are drawn from two independent populations.

34. The point estimate of the difference of two population means ($\mu_1 - \mu_2$) is
(A) 12.2 (B) 9.1 (C) 0.2 (D) 3.1 (E) 4.1

35. The lower 90% confidence limit for the difference of two population means ($\mu_1 - \mu_2$) is:
(A) 3.973 (B) 3.084 (C) 3.948 (D) 2.904 (E) 2.8909

36. The upper 90% confidence limit for the difference of two population means ($\mu_1 - \mu_2$) is:
(A) 3.227 (B) 3.116 (C) 3.3091 (D) 3.252 (E) 3.296

⇒ **For answering Questions 37, 38, 39 and 40** .Use the following information.

It is claimed that an automobile is driven on the average more than 20,000 kilometres per year. To test this claim at the 0.05 level of significance, a random sample of 10 automobile owners are asked to keep a record of the kilometres they travel. If the sample mean and standard deviation of automobile driven are 23,500 kilometres and 3900 kilometres respectively, assuming that the kilometres they travel is normally distributed. Then to test for $H_0 : \mu = 20,000$ kilometres against $H_1 : \mu > 20,000$ kilometres:

37. Test statistic is:

(A) $t = \frac{\bar{x} - \mu_0}{s / \sqrt{n}}$ (B) $z = \frac{\bar{x} - \mu_0}{\sigma / \sqrt{n}}$ (C) $t = \frac{\bar{d}}{s_d / \sqrt{n}}$ (D) $t = \frac{\bar{x} - \mu}{s}$ (E) $z = \frac{\bar{x} - \mu}{\sigma}$

38. Critical region (rejection area) is:
(A) $z < -1.645$ (B) $z > 1.645$ (C) $t < -1.833$ (D) $t > 1.833$ (E) $z > 1.96$

39. Computed value of test statistic is:
(A) 2.6923 (B) 2.838 (C) 0.8974 (D) 177.2295 (E) 3.12

40. Your decision is:
(A) reject H_0 (B) accept H_0 (C) reject H_1 (D) no decision

⇒ **For answering Questions 41, 42 and 43** . Consider the following

Two samples are drawn from $N(\mu_1, \sigma_1^2)$ and $N(\mu_2, \sigma_2^2)$ giving the following information: First sample: $\bar{x}_1 = 21$, $s_1 = 11$ and $n_1 = 36$ and

Second sample: $\bar{x}_2 = 31$, $s_2 = 16$ and $n_2 = 32$.

Then to test $H_0 : \mu_1 = \mu_2$ versus $H_1 : \mu_1 \neq \mu_2$ at $\alpha = 0.05$

41. The critical region (rejection area) is :

(A) $z > 1.645$ and $z < -1.645$ (B) $z < 1.645$ (C) $z < -1.96$ and $z > 1.96$
(D) $z < -1.645$ (E) $t < -1.833$ and $t > 1.833$

42. The Computed value of test statistic is:
(A) 2.6923 (B) -2.9668 (C) 0.8974 (D) -17.2295 (E) 0.992
43. Your decision is:
(A) reject H_0 (B) reject H_1 (C) no decision
44. A certain geneticist is interested in the proportion of males and females in the population that have a certain minor blood disorder. In a random sample of 1500 males, 75 are found to have disorder, whereas 80 of 2000 females appear to have disorder. Then the 90% confidence intervals for the difference between the proportions of males and females that have blood disorder is :
(A) (0.001, 0.0445) (B) (-0.0167, 0.0223) (C) (0.0112, 0.0223)
(D) (-0.0017, 0.0217)