

Department of Statistics and Operations Research  
College of Science  
**King Saud University**

STAT 106 Examinations  
Second mid-term exam  
Semester I, 1426/27 H

**Name of Student:** \_\_\_\_\_ **Student's Number:** \_\_\_\_\_

**Teacher's name: Dr.** \_\_\_\_\_ **Section number:** \_\_\_\_\_

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

- ▶▶ Mobile Telephones are not allowed in the classrooms
  - ▶▶ Time allowed is 2 hours
  - ▶▶ Attempt all questions
  - ▶▶ Choose the nearest number to your answer
- ▶▶ For each question, put the code of the correct answer in the following table under the question number.

\*\*The following table is the probability distribution function of a discrete random variable  $X$ . Use the table to answer questions 1-4.

$X$	0	1	3	4	6
$P(X = x)$	k	0.3	0.3	0.2	0.1

1. The value of k is  
 (A) 2.0                      (B) 0.8                      (C) 0.3                      (D) 0.1
2.  $P(1 \leq X \leq 4)$  is  
 (A) 1                      (B) 0.8                      (C) 1.2                      (D) 0.9
3.  $P(X \geq 4)$  is:  
 (A) 0.9                      (B) 0.1                      (C) 0.3                      (D) 0.7
4. The mean of  $X$  ( $E(X)$ ) is :  
 (A) 0.0                      (B) 0.7                      (C) 1                      (D) 2.6

\*\*Let  $Z$  be  $N(0, 1)$ . Use this information to answer questions 5-9.

5.  $P(Z < 0) =$   
 (A) 0                      (B) 0.5                      (C) 0.45                      (D) 1
6.  $P(Z = 1.96) =$   
 (A) 0                      (B) 0.975                      (C) 0.5                      (D) 0.9
7.  $Z_{0.95} =$   
 (A) 1.5                      (B) 1.325                      (C) 1.285                      (D) 1.645
8.  $P(-1.23 < Z < 2.30) =$   
 (A) 0.88                      (B) 0.6895                      (C) 0.9788                      (D) 0.5678
9.  $P(Z \geq 2.35) =$   
 (A) 0.0312                      (B) 0.0012                      (C) 0.0143                      (D) 0.0094

\*\* In a certain hospital, the ages of patients with the AIDS disease are normally distributed with mean 20 years and standard deviation 2 years. Let  $X$  (years) denote the age of an AIDS patient selected at random from the hospital. Use the information to answer questions 10-13.

10.  $P(X < 20) =$   
 (A) 0.65                      (B) 0.54                      (C) 0.5                      (D) 0.34
11.  $P(X > 25) =$   
 (A) 0.0010                      (B) 0.0001                      (C) 0.1023                      (D) 0.062

12. The percentage of AIDS patients in the hospital who are between 19 and 22 years is.  
(A) 65.32% (B) 53.28% (C) 40.123 % (D) 34.43%

13. If the number of patients whose have the AIDS disease in this hospital is  $n = 20$ , then the number of them who are less than or equal to 18 years are:  
(A) 6.5 (B) 2.1 (C) 4 (D) 3.174

\*\* Let  $A$ ,  $B$  and  $C$  be events such that:

$P(A) = 0.5$ ,  $P(B) = 0.3$ ,  $P(C) = 0.4$ ,  $P(A \cup B) = 0.8$ ,  $P(B \cap C) = 0.12$ ,

$P(A \cup C) = 0.7$ . Use this information to answer questions 14-17.

14.  $A$  and  $C$  are  
(A) dependent (B) disjoint (C) independent

15.  $B$  and  $C$  are  
(A) dependent (B) independent (C) disjoint

16.  $P(\overline{C} \cap B) =$   
(A) 0.2 (B) 0.5 (C) 0.18 (D) 0.3

17.  $P(\overline{C} | B) =$   
(A) 0.02 (B) 0.6 (C) 0.18 (D) 0.3

\*\* Let  $A$  and  $B$  be independent events such that :

$P(A) = 0.7$ ,  $P(\overline{B}) = 0.4$  Use this information to answer questions 18-20.

18.  $P(A \cap B) =$   
(A) 0.42 (B) 0.85 (C) 0.48 (D) 0.3

19.  $P(A \cup B) =$   
(A) 0.88 (B) 0.85 (C) 0.18 (D) 0.3

20.  $P(\overline{A} | B) =$   
(A) 0.42 (B) 0.65 (C) 0.48 (D) 0.3

\*\* Suppose that 25% of the people in a certain large population have low blood pressure. Three people are selected at random from this population. Use this information to answer questions 21-23.

21. The probability that exactly 1 of the 3 people has low blood pressure is  
(A)  $27/64$       (B)  $15/64$       (C)  $12/46$       (D)  $27/46$
22. The probability that 2 or more of the 3 people have low blood pressure is.  
(A)  $1/32$       (B)  $1/23$       (C)  $7/23$       (D)  $5/32$
23. How many of the 3 people are expected to have low blood pressure  
(A) 4      (B)  $4/15$       (C)  $3/4$       (D) 3.0

\*\* Let X be a continuous random variable for which  $P(X < 3.5) = 0.7$ ,  $P(X < 2.8) = 0.4$  and  $P(X > 4.9) = 0.1$ ; Use the information to answer questions 24-26.

24.  $P(X > 3.5)$   
(A) 0.3      (B) 0.7      (C) 0.2      (D) 0.4
25.  $P(3.5 < X < 4.9)$   
(A) 0.1      (B) 0.2      (C) 0.7      (D) 0.4
26.  $P(2.8 < X < 3.5)$   
(A) 0.3      (B) 0.2      (C) 0.7      (D) 0.4

\*\* In a certain hospital, the mean number of children born per day is 6. The number of children born in a day in this hospital has the Poisson distribution. Use this information to answer questions 27-30.

27. The probability that 2 children are born in a day is  
(A) 0.0249      (B) 0.0446      (C) 0.149      (D) 0.249
28. The probability that no child is born in a day is  
(A) 0.0025      (B) 0.25      (C) 0.28      (D) 0.0028
29. The probability that at least one child is born a day is?  
(A) 0.0025      (B) 0.75      (C) 0.9975      (D) 0.9972
30. The number of children expected to be born in 12 hours in the hospital is;  
(A) 3      (B) 2      (C) 1      (D) 6

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STAT 106 Examinations  
Second mid-term exam  
Semester I, 1426/27 H

**Name of Student:** \_\_\_\_\_ **Student's Number:** \_\_\_\_\_

**Teacher's name: Dr.** \_\_\_\_\_ **Section number:** \_\_\_\_\_

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

- ▶▶ Mobile Telephones are not allowed in the classrooms
  - ▶▶ Time allowed is 2 hours
  - ▶▶ Attempt all questions
  - ▶▶ Choose the nearest number to your answer
- ▶▶ For each question, put the code of the correct answer in the following table under the question number.



\*\* Suppose that 25% of the people in a certain large population have low blood pressure. Three people are selected at random from this population. Use this information to answer questions 11-13

11. The probability that exactly 1 of the 3 people has low blood pressure is  
(A)  $12/46$       (B)  $15/64$       (C)  $27/64$       (D)  $27/46$
12. The probability that 2 or more of the 3 people have low blood pressure is.  
(A)  $1/32$       (B)  $1/23$       (C)  $7/23$       (D)  $5/32$
13. How many of the 3 people are expected to have low blood pressure  
(A) 4      (B)  $4/15$       (C)  $3/4$       (D) 3.0

\*\*In a certain hospital, the mean number of children born per day is 6. The number of children born in a day in this hospital has the Poisson distribution. Use this information to answer questions 14-17.

14. The probability that 2 children are born in a day is  
(A) 0.0249      (B) 0.249      (C) 0.149      (D) 0.0446
15. The probability that no child is born in a day is  
(A) 0.0028      (B) 0.25      (C) 0.28      (D) 0.0025
16. The probability that at least one child is born a day is?  
(A) 0.0025      (B) 0.75      (C) 0.9975      (D) 0.9972
17. The number of children expected to be born in 12 hours in the hospital is;  
(A) 3      (B) 2      (C) 1      (D) 6

\*\*Let  $Z$  be  $N(0, 1)$ . Use this information to answer questions 18-22.

18.  $P(Z < 0) =$   
(A) 0      (B) 0.5      (C) 0.45      (D) 1
19.  $P(Z = 1.96) =$   
(A) 0      (B) 0.975      (C) 0.5      (D) 0.9
20.  $Z_{0.95} =$   
(A) 1.5      (B) 1.325      (C) 1.285      (D) 1.645
21.  $P(-1.23 < Z < 2.30) =$   
(A) 0.88      (B) 0.6895      (C) 0.9788      (D) 0.5678
22.  $P(Z \geq 2.35) =$   
(A) 0.0312      (B) 0.0012      (C) 0.0143      (D) 0.0094

\*\* In a certain hospital, the ages of patients with the AIDS disease are normally distributed with mean 20 years and standard deviation 2 years. Let  $X$  (years) denote the age of an AIDS patient selected at random from the hospital  
Use the information to answer questions 23-26.

23.  $P(X < 20) =$   
 (A) 0.65 (B) 0.54 (C) 0.5 (D) 0.34
24.  $P(X > 25) =$   
 (A) 0.0010 (B) 0.0001 (C) 0.1023 (D) 0.062
25. The percentage of AIDS patients in the hospital who are between 19 and 22 years is.  
 (A) 65.32% (B) 53.28% (C) 40.123 % (D) 34.43%
26. If the number of patients who have the AIDS disease in this hospital is  $n = 20$ , then the number of them who are less than or equal to 18 years are:  
 (A) 6.5 (B) 2.1 (C) 4 (D) 3.174

\*\*The following table is the probability distribution function of a discrete random variable  $X$ . Use the table to answer questions 27-30

$X$	0	1	3	4	6
$P(X = x)$	k	0.3	0.3	0.2	0.1

27. The value of  $k$  is  
 (A) 0.1 (B) 0.8 (C) 0.3 (D) 0.1
28.  $P(1 \leq X \leq 4)$  is  
 (A) 1 (B) 0.9 (C) 1.2 (D) 0.8
29.  $P(X \geq 4)$  is:  
 (A) 0.9 (B) 0.1 (C) 0.3 (D) 0.7
30. The mean of  $X$  ( $E(X)$ ) is :  
 (A) 0.0 (B) 0.7 (C) 1 (D) 2.6

**Department of Statistics and Operations Research**  
 College of Science  
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STAT 106 Examinations  
 Second mid-term exam  
 Semester I, 1426/27 H



Name of Student: \_\_\_\_\_ Student's Number: \_\_\_\_\_

Teacher's name: Dr. \_\_\_\_\_ Section number: \_\_\_\_\_

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

- ▶▶ Mobile Telephones are not allowed in the classrooms
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  - ▶▶ Attempt all questions
  - ▶▶ Choose the nearest number to your answer
- ▶▶ For each question, put the code of the correct answer in the following table under the question number.

\*\* Suppose that 25% of the people in a certain large population have low blood pressure. Three people are selected at random from this population. Use this information to answer questions 1-3

1. The probability that exactly 1 of the 3 people has low blood pressure is  
(A)  $15/64$       (B)  $27/64$       (C)  $12/46$       (D)  $27/46$
2. The probability that 2 or more of the 3 people have low blood pressure is.  
(A)  $1/32$       (B)  $1/23$       (C)  $5/32$       (D)  $7/23$



12.  $P(1 \leq X \leq 4)$  is  
(A) 1 (B) 0.1 (C) 1.2 (D) 0.8

13.  $P(X \geq 4)$  is:  
(A) 0.9 (B) 0.3 (C) 0.1 (D) 0.7

14. The mean of  $X$  ( $E(X)$ ) is :  
(A) 0.0 (B) 0.7 (C) 1 (D) 2.6

\*\*In a certain hospital, the mean number of children born per day is 6. The number of children born in a day in this hospital has the Poisson distribution. Use this information to answer questions 15-18.

15. The probability that 2 children are born in a day is  
(A) 0.0249 (B) 0.149 (C) 0.0446 (D) 0.249

16. The probability that no child is born in a day is  
(A) 0.0025 (B) 0.25 (C) 0.28 (D) 0.0028

17. The probability that at least one child is born a day is?  
(A) 0.0025 (B) 0.75 (C) 0.9972 (D) 0.9975

18. The number of children expected to be born in 12 hours in the hospital is;  
(A) 2 (B) 3 (C) 1 (D) 6

\*\* Let  $X$  be a continuous random variable for which  $P(X < 3.5) = 0.7$ ,  $P(X < 2.8) = 0.4$  and  $P(X > 4.9) = 0.1$ ; Use the information to answer questions 19-21.

19.  $P(X > 3.5)$   
(A) 0.3 (B) 0.7 (C) 0.2 (D) 0.4

20.  $P(3.5 < X < 4.9)$   
(A) 0.1 (B) 0.2 (C) 0.7 (D) 0.4

21.  $P(2.8 < X < 3.5)$   
(A) 0.3 (B) 0.2 (C) 0.7 (D) 0.4

\*\*Let  $Z$  be  $N(0, 1)$ . Use this information to answer questions 22-26

22.  $P(Z < 0) =$   
(A) 0 (B) 0.45 (C) 0.5 (D) 1

23.  $P(Z = 1.96) =$

- (A) 0.975                      (B) 0                      (C) 0.5                      (D) 0.9
24.  $Z_{0.95} =$   
 (A) 1.5                      (B) 1.325                      (C) 1.285                      (D) 1.645
25.  $P(-1.23 < Z < 2.30) =$   
 (A) 0.88                      (B) 0.6895                      (C) 0.9788                      (D) 0.5678
26.  $P(Z \geq 2.35) =$   
 (A) 0.0312                      (B) 0.0012                      (C) 0.0143                      (D) 0.0094

\*\* In a certain hospital, the ages of patients with the AIDS disease are normally distributed with mean 20 years and standard deviation 2 years. Let X (years) denote the age of an AIDS patient selected at random from the hospital  
 Use the information to answer questions 27-30

27.  $P(X < 20) =$   
 (A) 0.65                      (B) 0.54                      (C) 0.34                      (D) 0.5
28.  $P(X > 25) =$   
 (A) 0.0010                      (B) 0.0001                      (C) 0.1023                      (D) 0.062
29. If the number of patients who have the AIDS disease in this hospital is  $n = 20$ , then the number of them who are less than or equal to 18 years are:  
 (A) 6.5                      (B) 2.1                      (C) 3.174                      (D) 2.223
30. The percentage of AIDS patients in the hospital who are between 19 and 22 years is.  
 (A) 65.32%                      (B) 53.28%                      (C) 40.123 %                      (D) 34.43%

Department of Statistics and Operations Research  
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**STAT 106 First Mid-term Examination**  
**Semester 2, 1426/27 H**

Name of Student: \_\_\_\_\_ Student's Number: \_\_\_\_\_

Teacher's name: Dr. \_\_\_\_\_ Section number: \_\_\_\_\_

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

31	32	33	34	35	36	37	38	39	40

Marks for final exam	
Marks for the term	
Total	

- ▶▶ Mobile Telephones are not allowed in the classrooms
  - ▶▶ Time allowed is 3 hours
  - ▶▶ Attempt all questions
  - ▶▶ Choose the nearest number to your answer
- ▶▶ For each question, put the code of the correct answer in the above table under the question number

\*\*In a certain study, 800 students of KSU were selected and their blood groups were determined. Use this information to answer Questions 1 & 2

1. The population in the study is:

- (A) 800 KSU students      (B) All KSU students      (C) Blood groups  
 (D) Any KSU student

2. The variable in the study is:

- (A) discrete                      (B) continuous                      ( C) quantitative                      (D) qualitative

\*\*The sample mean of the observations  $x_1, x_2, x_3, \dots, x_n$  is 10. Use the information to answer Question 3.

3. The sample mean of  $2x_1 + 4, 2x_2 + 4, 2x_3 + 4, \dots, 2x_n + 4$  is  
 (A) 20                      (B) 24                      (C) 2                      (D) 4

\*\* The following table gives the distribution of the ages of a sample of 50 patients who attend CLINIC A. Use the table to answer Questions 4 – 6.

Age (years)	Frequency	Cumulative Frequency	Relative frequency
10 - 15	4	-	-
16 - 21	8	y	-
22 - 32	z	-	0.32
33 - 43	-	-	-
44 - 60	10	x	-

4. The value of  $x$  is:

- (A) 22                      (B) 50                      (C) 28                      (D) 10

5. The value of  $y$  is:

- (A) 12                      (B) 8                      (C) 50                      (D) 14

6. The value of  $z$  is:

- (A) 14                      (B) 12                      (C) 50                      (D) 16

\*\* The following are the masses (in kg) of 10 patients who attend CLINIC B: 78, 90, 102, 92, 100, 90, 96, 80, 79 and 110. Use the information to answer Questions 7 - 9

7. The modal mass is:

- (A) 78 kg                      (B) 90 kg                      (C) 110 kg                      (D) 32 kg

8. The median mass is:

- (A) 90 kg                      (B) 100 kg                      (C) 92 kg                      (D) 91 kg

9. The mean mass is:

- (A) 91.6 kg (B) 91.7 kg (C) 92.5 kg (D) 110 kg

\*\* The following table gives the blood glucose levels (in mg/dl) of a sample of 10 patients. Use the table to answer Questions 10 -12

Blood glucose level	60 - 64	65 -69	70 - 74	75 - 79	80 - 84
Frequency	2	2	3	2	1

10. The mean blood glucose level is:

- (A) 69 mg/dl (B) 70 mg/dl (C) 71 mg/dl (D) 72 mg/dl

11. The modal class interval is:

- (A) 75 – 79 (B) 70 – 74 (C) 80 – 84 (D) 60 – 64

12. The modal blood glucose level is.

- (A) 62 mg/dl (B) 67 mg/dl (C) 72 mg/dl (D) 84 mg/dl

\*\*\* The following frequency table gives the heights (in cm) of 12 children. Use the information to answer Questions 13 – 15.

Height (cm)	55	57	59	61	63
Frequency	2	1	2	4	3

13. The mean height is:

- (A) 59.70 cm (B) 61.2 cm (C) 58.9 cm (D) 57.3 cm

14. The median height is:

- (A) 66 cm (B) 59 cm (C) 63 cm (D) 57 cm

\*\*\*\*\*

	B	B <sup>c</sup>	
A	5	2	7
A <sup>c</sup>	1	2	3
	6	4	10

1)  $p(A \cap B^c) =$

- A) 0.5                      B) 0.8                      C) 0.2                      D) 0.4

2)  $p(B \cup A^c) =$

- A) 0.5                      B) 0.8                      C) 0.2                      D) 0.4

3)  $p(A^c \cup B^c) =$

- A) 0.5                      B) 0.8                      C) 0.2                      D) 0.4

A certain section of students took two examinations. The Arabic Language exam. and the English Language exam.. 12% of the students failed the A.L. exam., 21% failed the E.L. exam.; and 5% failed both the Arabic and the English Language exams. Find:

4) The probability that a student in this section, chosen randomly, will fail the Arabic Language exam., and will pass the English Language exam.

- A) 0.07                      B) 0.23                      C) 0.59                      D) 0.95

5) The probability that a student in this section, chosen randomly, will pass the Arabic Language exam., and will fail the English Language exam.

- A) 0.37                      B) 0.28                      C) 0.16                      D) 0.05

6) The probability that a student in this section, chosen randomly, will pass either the Arabic Language exam., or the English Language exam.

- A) 0.07                      B) 0.23                      C) 0.59                      D) 0.95

7) The probability that a student in this section, chosen randomly, will pass only one of the two exams., the Arabic Language exam. only, or the English Language exam. only.

- A) 0.07                      B) 0.23                      C) 0.59                      D) 0.95

8) The probability that a student in this section, chosen randomly, will fail either the Arabic Language exam., or the English Language exam.

- A) 0.37                      B) 0.28                      C) 0.16                      D) 0.05

	$B_1$	$B_2$	$B_3$	$B_4$	
$A_1$	11	3	2	4	20
$A_2$	5	7	3	1	16
$A_3$	7	10	1	2	20
	23	20	6	7	56



- 9)  $p(A_1 | B_2) =$   
 A) 0.35                      B) 0.15                      C) 0.25                      D) 0.5
- 10)  $p(B_1 | A_3) =$   
 A) 0.35                      B) 0.15                      C) 0.25                      D) 0.5
- 11)  $p(A_1 \cup A_2 | B_2) =$   
 A) 0.35                      B) 0.15                      C) 0.25                      D) 0.5
- 12)  $p(B_1 \cup B_4 | A_1) =$   
 A) 0.5                      B) 0.0                      C) 0.55                      D) 0.75
- 13)  $p(B_3 | A_1 \cup A_2) =$   
 A) 0.5                      B) 0.0                      C) 0.55                      D) 0.75
- 14)  $p(A_1 | B_1 \cup B_4) =$   
 A) 0.5                      B) 0.0                      C) 0.55                      D) 0.75
- 15)  $p(B_1 \cap B_2 | A_2) =$   
 A) 0.5                      B) 0.0                      C) 0.55                      D) 0.75

-----

The height (in inches) of female students who participated in the study are  
 61, 66, 68, 68, 63

31. The sample variance is:  
 (A) 13                      (B) 9.70                      (C) 2.16                      (D) Non of these
32. The coefficient of variation is:  
 (A) 4.78                      (B) 8.395                      (C) 7.161                      (D) Non of these
33. The Range is:  
 (A) 7.00                      (B) 5.00                      (C) 7.00                      (D) Non of these

The following table gives the height (in inches) of male, of a sample of 21 people.

Height	freq	Cumulative
$x_i$	$f_i$	CumCnt
61	1	1
62	2	3
63	2	5
64	1	6
65	4	K
66	5	15
67	3	18
68	3	21

Use the table to answer ( 34) - ( )

34.The value of the missing cumulative frequency K is

- (A) 13                      (B) 10                      (C) 2.16                      (D) Non of these

35.The mean height is

- (A) 65.238                      (B) 24.395                      (C) 27.1667                      (D) Non of these

36. The sample variance is

- (A) 37.0384                      (B) 39.5                      (C) 4.290                      (D) Non of these

37.The coefficient of variation

- (A) 5.4091                      (B) 3.18                      (C) 6.1258                      (D) Non of these

-Let A and B be independent events defined on the same sample space such that  $P(A)=0.4$  , $P(B)=0.2$

38. Find  $P(A \cap B)$  Use this information to answer question 1 and 4

- A) 0.8                      B) 0.5                      C) .3                      D) .75

39.Find  $P(A \cup B)$

- A) 0.6-0.16                      B) 0.5                      C) .3                      D) .75

Following table shows 1000 patients classified by smoking and thrombosis group.

	smoking Group		
	smoking( $S$ )	Non-smoking $S^c$	sum
Thrombosis ( $T$ )	10	8	18
Non thrombosis ( $T^c$ )	290	692	982
Sum	300	700	1000

40. The probability that a patient selected randomly is a thrombosis and has smoking group  $S$  is  
 (A) 1/100 (B) 8/1000 (C) 29/100 (D) 10/18 (E) None is correct
41. The probability that the patient is a thrombosis is  
 A) 10/300 (B) 10/1000 (C) 18/1000 (D) 10/18 (E) None is correct
42. The probability that the patient is a thrombosis given that is non smoking  
 (A) 8/700 (B) 8/700 (C) 692/7000 (D) 700/1000 (E) None is correct
43. Find  $P(T^c \cup S)$   
 (A) 982+300-290 (B) 40/80 (C) 23/80 (D) 22/80 (E) None is correct
44. Does knowing the patient is smoker have an affect on the probability of being thrombosis (i.e., are the events  $T$  and  $S$  independent)?  
 A)  $T$  ind  $S$  (B)  $T$  dep  $S$  (C) (D) 0 (E) None is correct
45. If a probability of an event  $A$  is 0.2 then the probability of complement  $A$  is  
 A) 0.5 (B) 0.8 (C) 0.3 (D) .9 (E) None is correct
46. The variance is negative if all data are negative.  
 (A) 8/700 (B) 8/700 (C) 692/7000 (D) 700/1000 (E) None is correct
- \*\*The sample variance of the observations  $x_1, x_2, x_3, \dots, x_n$  is 9. Use the information to answer Question 47.
47. The sample variance of  $2x_1 + 4, 2x_2 + 4, 2x_3 + 4, \dots, 2x_n + 4$  is  
 (A) 36 (B) 18 (C) 22 (D) 27

Department of Statistics & O.R.  
 College of Science  
 King Saud University

Final Examination  
Summer Semester 1421/1422 H

STAT - 106

Student's Name		Student's No.	
Section No.		Serial No.	
Teacher's Name			

Question	Marks
1	
2	
3	
4	
5	
6	
Total	

Instructions:

1. Time allowed is 3 hours. Attempt all questions.
2. This examination consists of 6 questions. There are 6 different pages excluding this cover page and the normal table page at the end.
3. Answer on the page of the question. For additional space use backsides and indicate the question and the part numbers.

**Q.1 (A)** Against each statement, put a tick mark (✓) if it is true and a cross (×) if it is false. [Half mark for each]

- (i) If  $P(A|B) > P(B|A)$ , then  $P(A) > P(B)$ . ----- ( )
- (ii) If  $X \sim \text{Binomial}(10, 0.25)$ , then  $P(X < 11) = 1$ . ----- ( )
- (iii) If  $Z \sim \text{Normal}(0, 1)$ , then  $\mu = 1$ . ----- ( )
- (iv) If the range = 0, then the variance = 0. ----- ( )
- (v) If  $X \sim \text{Normal}(10, 4)$ , then the median = 10. ----- ( )
- (vi) If  $(-10, 20)$  is a confidence interval for the mean  $\mu$ , then  $\bar{X} = 15$ . ----- ( )
- (vii) If  $X$  is a discrete random variable, then  $P(X < k) = P(X \leq k)$ . ----- ( )
- (viii) If  $P(X=x)$  is a probability distribution for a discrete random variable  $X$ , then  $\sum_x P(X=x) = 1$ . ----- ( )
- (ix) The unit of c.v. is the same as the unit of the original data. ----- ( )
- (x) The range is a good measure for dispersion. ----- ( )

**Q.1 (B)** Fill in blanks: [Half mark for each]

- (i) If  $(0.1, 0.3)$  is a confidence interval for the proportion  $\pi$ , then a point estimate for  $\pi$  is  $p = \underline{\hspace{2cm}}$ .
- (ii) If  $Z \sim N(0, 1)$ , then  $P(Z \leq Z_{0.95}) = \underline{\hspace{2cm}}$ .
- (iii) If  $A$  and  $B$  are independent,  $P(A) = 0.7$ , and  $P(A \cap B) = 0.5$ , then  $P(A|B) = \underline{\hspace{2cm}}$ .
- (iv) If the variance of  $X_1, X_2$ , and  $X_3$  equals to  $16 \text{ (kg}^2\text{)}$ , then the standard deviation of  $10X_1+5, 10X_2+5$ , and  $10X_3+5$  equals to  $\underline{\hspace{2cm}}$ .
- (v) If  $n=10, \Sigma x=15$ , and  $\Sigma x^2=40$ , then  $S^2 = \underline{\hspace{2cm}}$ .
- (vi) If  $Z \sim \text{Normal}(0, 1)$ , then  $P(Z < 0.00) = \underline{\hspace{2cm}}$ .
- (vii) If  $Z \sim \text{Normal}(0, 1)$  and  $P(Z < k) = 0.975$ , then  $k = \underline{\hspace{2cm}}$ .
- (viii) If  $X \sim \text{Binomial}(n, 0.4)$ , and  $\mu = 8$ , then  $n = \underline{\hspace{2cm}}$ .

(ix) If  $X \sim \text{Poisson}(2)$ , then  $P(X=0) = \underline{\hspace{2cm}}$ .

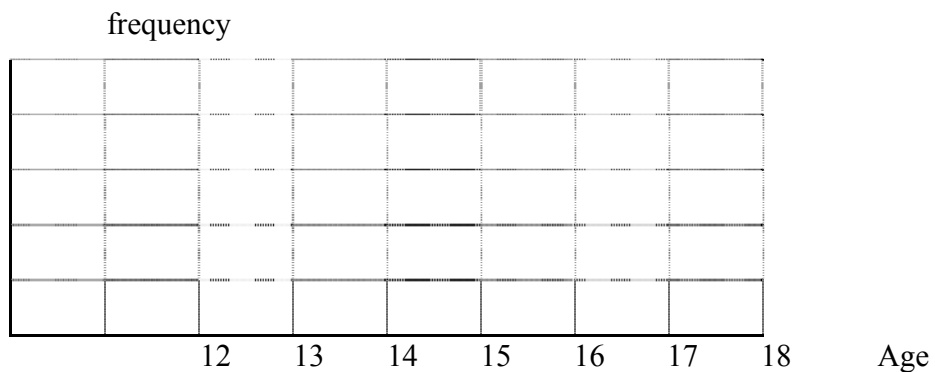
(x) If  $P(X=x) = kx$  for  $x=1, 2, \text{ and } 3$ , then  $k = \underline{\hspace{2cm}}$ .

**Q.2 (A)** The following table represents the frequency distribution of the weights (in kg) of 100 babies:

Weight x	No. of babies f
2	10
3	50
4	30
5	10

1. Find the mean [2 marks]
2. Find the mode [1 mark]
3. Find the median [1 mark]

**Q.2 (B)** The following figure represents the frequency polygon of the ages (in years) of 55 students:



1. Construct the frequency table of the ages of these students. [2 marks]

True C. I.	mid-point	frequency
	13	
	14	
	15	
	16	
	17	

2. Find the mean of ages. [2 marks]

3. Find the variance of the ages. [2 marks]



**Q.3.** The following table represents the probability distribution of a discrete random variable  $X$ .

$X$	$P(X=x)$
-2	0.1
0	0.3
2	0.4
4	0.2

(a) Find the probability that  $X$  is less than 2. [2 marks]

(b) Find  $P(X \leq 2)$ . [2 marks]

(c) Find  $P(X > 4)$ . [2 marks]

(d) Find the mean (expected value) of  $X$ . [2 marks]

(e) Find the cumulative probability distribution of  $X$ .

**Q. 4(A).** It is known that 20% of the patients in a certain hospital are smokers. Suppose that a sample of 5 patients is selected at random from this hospital. Let  $X$  = the number of smokers in the sample selected.

- (a) Write down the probability distribution of  $X$ . [2 marks]
- (b) What is the expected number of smokers in the sample selected? [1 mark]
- (c) Find  $P(X \leq 1)$ . [1 mark]
- (d) What is the probability that there will be at least 3 smokers in the sample? [1 mark]

**Q.4(B)** The average number of serious injuries in a certain factory is 3 per year. Let  $X$  = the number of serious injuries in this factory per year, and suppose that  $X$  follows the Poisson distribution.

- (a) Write down the probability distribution of  $X$ . [2 marks]
- (b) Find the probability that there will be at most 1 serious injuries in a year. [1 mark]

(c) Find the probability that there will be exactly 5 serious injuries in tow years. [1 mark]

(b) What is the expected number (average) of serious injuries in 5 years. [1 mark]

**Q.5. (A)** If  $Z \sim N(0,1)$ ,

- (i) find  $P(Z \leq -1.06)$ . [1 mark]
- (ii) find  $k$  such that  $P(Z > k) = 0.102$  [1 mark]
- (iii) find  $Z_{0.9961}$  [1 mark]

**Q.5. (B)** Let  $X$  be the age of a child in a certain school. Suppose that  $X$  has a normal distribution with mean  $\mu = 10$  years and standard deviation  $\sigma = 2$  years.

- (i) Find  $P(9 < X < 11)$ . [2 marks]
- (ii) Find the value of  $x$  such that  $P(X \leq x) = 0.5636$  [3 marks]
- (iii) If a child is selected randomly from this school, what is the probability that his age will be more than 9 years? [2 marks]

**Q.6. (A)** In a study on the weight of patients with a certain disease, the researcher selected a random sample of size 100 patients. The mean weight obtained from this sample was 50 kg with standard deviation of 6 kg.

(a) Find a point estimate for the population weight mean  $\mu$ . [1 mark]

(b) Find 97% confidence interval for  $\mu$ . [4 marks]

**Q.6. (B)** In a study on smoking in a particular university, the researcher selected a random sample of size 120 students. He found that 36 students of the sample are smokers.

(a) Find 97% confidence interval for the population proportion of smokers  $\pi$ . [4 marks]

(b) Interpret the 97% confidence interval obtain in (a). [1 mark]

DEPARTMENT OF STATISTICS AND OPERATION RESEARCH  
COLLEGE OF SCIENCE  
K.S.U

STAT 106  
Final Examination  
First Semester 1423-1424 H

Name	Number
Section number	Teacher's name

Q. No	Marks
1	
2	
3	
4	
5	
6	
Total	

Instructions

- 1-This examination consists of 6 questions. There are 9 pages in all, including the cover page and the normal table.
- 2-The time allowed is 3 hours. Attempt all questions.
- 3-Answer on the page of the question. For additional space, use the back side of the page or the previous page.

4- Write down everything and avoid over writing. Simplify your calculation.

STAT 106 Final Examination 1423 1424 H

Page 1

Q.1 (a): Put the ( $\checkmark$ ) mark against the statement if it is true and ( $\times$ ) if it false (5 marks)

(1) If  $X$  is a continuous random variable, then  $P(X = 5) = 0$  ( )

(2) For any continuous random variable, we must have  
 $P(X \geq 1) = 1 - P(X < 1)$  ( )

(3) The number of children in a family is a qualitative data. ( )

(4) If  $X$  has a binomial distribution with  $n = 3$  and  $\pi = 0.5$ , then  
 $P(1 < X < 3) = 0.375$  ( )

(5) For any two events  $A$  and  $B$  we must have  $P(A \cup B) = P(A) + P(B)$  ( )

(6) If  $A \subset B$ , then  $P(A/B) = P(A)$  ( )

(7) For two events  $A$  and  $B$ ,  $P(A) = 0.3$  and  $P(A \cap B) = 0.2$ , then  
 $P(\bar{A}) = 0.5$  ( )

(8) If  $X \sim N(\mu, \sigma^2)$ , then  $P(X \geq \mu) = 0.5$  ( )

(9) If  $Y$  has Poisson distribution with variance equal 2, then the mean of  $Y = 2$ . ( )

(10) The variance of data  $a, b, c$  is the same as the variance of data  $a+1, b+1, c+1$ . ( )

STAT 106 Final Examination 1423 1424 H

Page 2

Q.1 (b) Fill in the blanks (5 marks)

(1) If  $Z$  has standard normal distribution and  $P(Z \geq k) = 0.25$ , then  $k = \dots\dots\dots$

(2) If  $X \sim N(\mu, 16)$  and  $n = 4$ , then  $\text{Var}(\bar{X}) = \dots\dots\dots$

(3) For any sample of data, we have  $\sum (X_i - \bar{X}) = \dots\dots\dots$

(4) The mode of 30, 32, 36, 40 and 32 is  $\dots\dots\dots$



(5) If  $P(A) = P(A/B)$ , where  $P(B) \neq 0$ , then  $A$  and  $B$  are .....

STAT 106 Final Examination 1423 1424 H

Page 3

Q.2 (a): The following are weights (in kg) of 5 students from primary school A  
30, 32, 36, 32, 40

Find

(i) the mean, (1 marks)

(ii) sample variance. (2 marks)

Q.2(b): The following table gives blood glucose levels (in mg/dl) of 40 students from school B

Blood glucose levels in mg/dl	frequency
50- 54	8
55- 59	22
60- 64	10

Find

(i) the mean, (2 marks)

(ii) the variance, (2 marks)

(iii) coefficient of variation. (1 marks)

Q2(c): Determine whether the weights of the students from school A are more variable than blood glucose levels of the students from school B. (2 marks)

STAT 106 Final Examination 1423 1424 H

Page 4

Q3: Suppose that in a certain population, 30% have a high blood pressure ( $H$ ), 25% have a high cholesterol level ( $C$ ) and 10% have both high blood pressure as well as high cholesterol level

(a) Find the probability of event that the person

(i) does not have high cholesterol level, (2 marks)

(ii) has high blood pressure but not high cholesterol level, (2 marks)

(iii) does not have high blood pressure and not the high cholesterol level. (2 marks)

(b) Find the probability that a person has high cholesterol level if we know he has high blood pressure. (2 marks)

(c) Are the events  $\bar{H}$  and  $\bar{C}$  independent? (2 marks)

Q.4(a): It is known that 20% of adults are diabetic patients. If we select 4 persons at random, what is the probability that we find

(i) exactly 2 diabetic patients out of 4, (1 marks)

(ii) at most 2 diabetic patients out of 4, (2 marks)

(iii) at least 3 diabetic patients out of 4. (2 marks)

Q.4(b): A telephone exchange receives 4 international calls per hour. Assume that the number of calls received per hour follows a Poisson distribution. Find the probability that there will be

(i) no call in the next one hour time, (1 marks)

(ii) at least one call in the next one hour time, (2 marks)

(iii) two calls in the next 30 minutes time. (2 marks)

Q.5(a): Suppose  $Z$  has a standard normal distribution, find

(i)  $P(Z \geq 1.36)$  (2 marks)

(ii)  $P(1.2 < Z < 2.5)$  (2 marks)

Q.5(b): If  $X$  is  $N(4,100)$ , find

(i)  $P(X > 6)$  (2 marks)

(ii)  $P(4 < X < 20)$  (2 marks)

(iii) the value of  $k$  such that  $P(X \geq k) = 0.1515$ . (2 marks)

- Q.6 (a): In a sample of 400 patients living in Saudi Arabia who got burnt, the mean period of treatment was 3.45 weeks with variance  $2.25(\text{ weeks})^2$ . If  $\mu$  is the true mean period of treatments of all patients who get burnt in Saudi Arabia, find
- (i) a point estimate of  $\mu$  , (2 marks )
  
  - (ii) a 99% confidence interval of  $\mu$  . (3 marks)

- Q.6 (b): In a sample of 368 children from Riyadh , 46 have not received vaccination.
- (i) Find a point estimate of the children in Riyadh who have not received vaccination ( $\pi$ ). (2 marks )
  
  - (ii) Obtain 95% confidence interval for  $\pi$  . (3 marks)