AUGUST 2023
EBS 350J
STATISTICS AND PROBABILITY I
2 HOURS

Candidate's Index Number
Signature:

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
SCHOOL OF EDUCATIONAL DEVELOPMENT AND OUTREACH
INSTITUTE OF EDUCATION

COLLEGES OF EDUCATION
FOUR-YEAR BACHELOR OF EDUCATION (B.ED)
THIRD YEAR, END-OF-FIRST SEMESTER EXAMINATION, AUGUST 2023

15TH AUGUST 2023 **STATISTICS AND PROBABILITY I** **2:00 PM – 2:40 PM**

This paper consists of two sections, A and B. Answer ALL the questions in Section A and TWO questions from Section B. Section A will be collected after the first 40 minutes.

SECTION A
(40 MARKS)

Answer ALL questions in this Section.

Items 1 to 20 are stems followed by four options lettered A to D. Read each item carefully and circle the letter of the correct or best option.

1. Which of the following is/are the characteristics of a good measure of dispersion?
   I. It should be based on all the observations within a series.
   II. It should be easy to calculate.
   III. It should not be affected by the fluctuations within the sampling.

   A. I and II only
   B. I and III only
   C. I, II, and III
   D. II and III only

2. The coefficient of variation is a percentage expression for .....
   A. mean deviation
   B. quartile deviation
   C. standard deviation
   D. None of the above

3. If you secure 97 percentiles in an examination, it means that your position is below ..... percent of the total candidates who had written in the examination.
   A. 3
   B. 25
   C. 90
   D. 97

4. When the values in a series are **not** of equal importance, we calculate the .....
   A. arithmetic mean.
   B. geometric mean.
   C. mode.
   D. weighted mean.

5. Which of the following **cannot** be calculated for open-ended distributions?
   A. Mean deviation
   B. Range
   C. Standard deviation
   D. None of the above

6. Which of the following is a disadvantage of observation as a tool for data collection? They can .....
   A. be influenced by participant bias.
   B. be time-consuming and difficult to standardize.
   C. suffer from social desirability bias.
   D. None of the above.

7. Which of the following is an advantage of surveys as a tool for data collection? They can .....
   A. be conducted in natural or controlled settings.
   B. gather information from a large number of people.
   C. provide detailed information on behaviour and interactions.
   D. None of the above.

8. Which of the following is a consideration when selecting a tool for data collection? The .....
   A. availability of funding.
   B. research question and design.
   C. researcher's personal bias.
   D. None of the above.

9. The following scores were obtained by eleven footballers in a goal-shoot competition: 5 3 6 8 7 8 3 11 6 3 2. Determine the modal score of the distribution.
   A. 3
   B. 6
   C. 8
   D. 11

10. A number is selected at random from the set $B = \{1, 2, 3, 4, \ldots\ldots\ldots, 40\}$. Find the probability that it is a prime number.
   A. $\frac{13}{40}$
   B. $\frac{7}{20}$
   C. $\frac{3}{8}$
   D. $\frac{3}{10}$

11. The probability that the event A occurs is $P(A)$. Which of the following is **false?**
   A. $0 \leq P(A) \leq 1$
   B. $P(A) = 0$ implies A is an impossible event
   C. $P(A)=1$ implies A is certain to occur
   D. $P(A) > 1$

Use the table below to answer questions 12 and 13.

Number of children	Number of families
0	8
1	16
2	22
3	14
4	6
5	4
6	2

12. Calculate the mean number of children per family for the sample.
    A. 1.91
    B. 2.19
    C. 2.47
    D. 3.14

13. Using the table above, calculate the standard deviation.
    A. 1.45
    B. 1.46
    C. 2.10
    D. 2.17

14. The probabilities that Mike and Emma solve a problem correctly are $\frac{2}{3}$ and $\frac{1}{5}$ $respectively$. If they both attempt the problem, find the probability that one of them solves it correctly.
    A. $\frac{2}{15}$
    B. $\frac{2}{5}$
    C. $\frac{3}{5}$
    D. $\frac{4}{5}$

15. A fair die is thrown and a fair coin is tossed. What is the probability of obtaining a 2 and a head?
    A. $\frac{1}{2}$
    B. $\frac{2}{3}$
    C. $\frac{1}{6}$
    D. $\frac{1}{12}$

16. Given that $P(X) = 0.3$ and $P(^{Y}/_{X}) = 0.15$. Find $P(X \cap Y)$.
    A. 0.045
    B. 0.15
    C. 0.18
    D. 0.20

17. If a fair coin is tossed four times, what is the probability of getting at least one head?

A. $\frac{13}{16}$

B. $\frac{15}{16}$

C. $\frac{3}{16}$

D. $\frac{1}{4}$

18. If M and N are mutually exclusive events and $P(M) = \frac{2}{5}$ *and* $P(N) = \frac{3}{10}$. Find $(P \cup N)$.

A. $\frac{29}{50}$

B. $\frac{3}{25}$

C. $\frac{1}{10}$

D. $\frac{7}{10}$

19. The mean of ten numbers is 58. If one of the numbers is 40, what is the mean of the other nine?

A. 18

B. 60

C. 162

D. 540

20. The mean of 11 numbers is 7. One of the numbers, 13, is deleted. What is the mean of the remaining 10 numbers?

A. 5.8

B. 6.0

C. 6.4

D. 7.7

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SECTION B
[60 MARKS]

Answer any TWO questions from this Section.

1.

a. The table below shows the masses, to the nearest kg, of 100workers in a factory.

Mass	Frequency
50-59	10
60-69	8
70-79	18
80-89	30
90-99	20
100-109	9
110-119	5

i. Using an assumed mean of 84.5kg, calculate, correct to one decimal place,
   α. the mean of the distribution **[10 marks]**
   β. the standard deviation of the distribution **[10 marks]**

ii. If a worker is selected at random for a blood test, what is the probability that his mass is between 70kg and 99kg? **[5 marks]**

b. The deviations from the mean of a set of numbers are $-2, x, (x+7), (x+2)^2$ *and* $(x+3)^2$, *where x is a constant. Find the value of x.* **[5 marks]**

2.

a. A bag contains 20 small identical objects, 8 of them are black, 7 are red and the rest are white. If three of the objects are selected at random from the bag at once, find the probability that:

i. one is black, one is red and the remaining is white; **[6 marks]**

ii. exactly two are red; **[4 marks]**

iii. none of them is white **[4 marks]**

b. The table shows the classification of students in a school.

	DAY		BOARDING	
	BOYS	GIRLS	BOYS	GIRLS
SS 1	45	40	60	55
SS 2	50	35	65	50
SS 3	70	55	45	30

i. If a student is selected at a random from a school, find the probability that the student is

α. a boy **[4 marks]**

β. a girl **[4 marks]**

ii. If a boarder is selected at random, find the probability that the one is

α. in SS1 **[4 marks]**

β. a girl **[4 marks]**

3.

a. With an illustrative example in each case, explain the following terms:

i. Sample **[3 marks]**

ii. Parameter **[3 marks]**

iii. Ordinal Scale **[3 marks]**

iv. Ratio Scale **[3 marks]**

b. The deviations of six numbers from 12 are: -4, 3, 2, 0, 1 and -3. Calculate, correct to three significant figures the following;

i. mean **[3 marks]**

ii. standard deviation, of the numbers **[3 marks]**

c. The ages, in years, of members of a committee were 28, 30, 24, 30, 32, 39, 22, 25, 26, 34. Calculate, correct to one decimal place, the variance of the ages. **[12 marks]**

4. A blue die and a green die are thrown simultaneously.

a. Write down the sample space for this experiment expressing each element of the sample space as an ordered pair. **[10 marks]**

b. Determine the set representation of each of the events listed below:

i. M = the sum of the scores is divisible by 3; **[2 marks]**

ii. N = the sum of the two scores is odd; **[2 marks]**

iii. O = the scores differ by at least 3; **[2 marks]**

iv. P = an odd score is obtained on the green die. **[2 marks]**

c. Calculate:

i. $n(M \cap N)$ **[6 marks]**

ii. $P(M \cup P)$ **[6 marks]**