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STATISTICS AND PROBABILITY

1. Data

   The numerical representation of facts is called data

2. Observation:

   Each entry in the data is called observation.

3. Variable :

   The quantities which are being considered in a survey are called variables.

   It is denoted by x_i , $i = 1,2,3, \ldots n$

4. Frequencies:

   The number of times, a variable occurs in a given data is called the frequency of that variable.

   It is denoted by f_i , $i = 1,2,3, \ldots n$

5. Mean (ungrouped data) $\bar{X} = \frac{\sum_{i=1}^{n} x_i}{n}$

6. Mean (grouped data)

   a) Direct Method $\bar{X} = \frac{\sum_{i=1}^{n} x_i\, f_i}{\sum_{i=1}^{n} f_i}$

   b) Assumed Mean Method $\bar{X} = A + \frac{\sum_{i=1}^{n} f_i d_i}{\sum_{i=1}^{n} f_i}$; $d_i = x_i - A$

   c) Step Deviation Method $\bar{X} = A + c \times \frac{\sum_{i=1}^{n} f_i d_i}{\sum_{i=1}^{n} f_i}$; $d_i = \frac{x_i - A}{c}$

7. Dispersion:

   Dispersion is a measure which gives an idea about the scatteredness of the values.

8. Different Measures of Dispersion:

   a) Range

   b) Mean deviation

   a) Quartile deviation

9. Range $R = L - S$

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10.Coefficient of range $= \frac{L-S}{L+S}$

11.If the frequency initial class is zero, then the next class will be considered for the calculation of range.

12.Variance $\sigma^2 = \frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n}$

13.Standard Deviation for ungrouped data

a) Direct method $\sigma = \sqrt{\frac{\sum(x_i)^2}{n} - \left(\frac{\sum x_i}{n}\right)^2}$

b) Mean Method $\sigma = \sqrt{\frac{\sum(d_i)^2}{n}}$; $d_i = x_i - \bar{x}$

c) Assumed Mean Method $\sigma = \sqrt{\frac{\sum(d_i)^2}{n} - \left(\frac{\sum d_i}{n}\right)^2}$

d) Step Deviation Method $\sigma = c \times \sqrt{\frac{\sum(d_i)^2}{n} - \left(\frac{\sum d_i}{n}\right)^2}$

14. Mean of the first n natural natural numbers $\bar{x} = \frac{n+1}{2}$

15.Variance $\sigma^2 = \frac{n^2-1}{12}$

16.Standard Deviation for grouped data

a) Mean Method $\sigma = \sqrt{\frac{\sum f_i(d_i)^2}{N}}$; $N = \sum f_i$

b) Assumed Mean Method $\sigma = \sqrt{\frac{\sum f_i(d_i)^2}{N} - \left(\frac{\sum f_i d_i}{N}\right)^2}$

c) Shortcut Method (or) Step Deviation Method

$$\sigma = c \times \sqrt{\frac{\sum f_i(d_i)^2}{N} - \left(\frac{\sum f_i d_i}{N}\right)^2}$$

17.Co0efficient of variation $C.V. = \frac{\sigma}{\bar{x}} \times 100\%$

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18. Random Experiment

A random experiment is an experiment in which (i) The set of all possible outcomes are known (ii) Exact outcome is not known

Example : 1. Tossing a coin
2. Rolling a die
3. Selecting a card from a pack of 52 cards

19. Sample Space:

The set of all possible outcomes in a random experiment is called a sample space. It is denoted by S

20. Sample point:

Each element of a sample space is called sample point.

21. Tree diagram:

Tree diagram allow us to see visually all possible outcomes of a random experiment. Each branch in a tree diagram represent a possible outcome.

22. Event :

In a random experiment each possible outcome is called an event.

23. Trial :

Performing an experiment once is called a trail.

24. Equally likely events :

Two are more events are said to be equally likely if each one of them has an equal chance of occurring.

25. Certain event :

In an experiment, the event which surely occur is called certain event.

26. Impossible event :

In an experiment if an event has no scope to occur then it is called an impossible event.

27. Mutually exclusive events:

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Two or more events are said to be mutually exclusive if they don't have common sample points.

i.e., events A, B are said to be mutually exclusive if $A \cap B = \emptyset$

28. Exhaustive events:

The collection of events whose union is the whole sample space are called exhaustive events.

29. Complementary events:

The complement of an event A is the event representing collection of sample points not in A.

It is denoted by $A'(or)A^c(or)\overline{A}$

The event A and its complement A' are mutually exclusive and exhaustive.

30. $P(E) = \frac{n(E)}{n(S)}$

31. The probability of sure event is 1

32. The probability of impossible event is 0

33. The probability value always lies from $0\ to\ 1$ i.e. $0 \leq P(E) \leq 1$

34. $P(E) + P(\overline{E}) = 1$

35. $P(\overline{E}) = 1 - P)E)$

36. Ina card

Spade 13 Clavor 13 Heart 13 Diamond 13

Joker 4 King 4 Queen 4

37. $A \cap A' = \emptyset A \cup A' = S$

38. If A, B are mutually exclusive events, then $P(A \cup B) = P(A) + P(B)$

39. $P(A \cap \overline{B}) = P(only\ A) = P(A) - P(A \cap B)$

40. $P(\overline{A} \cap B) = P(only\ B) = P(B) - P(A \cap B)$

41. If A and B are any two event $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

42. If A, B and C are any three events

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(B \cap C) - P(A \cap C) + P(A \cap B \cap C)$$

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