

Mid-Term Exam.

Name: Muhammad Abdullah Khan

Reg # 7720

Subject: Probability and Statistics

Instructor: Anwar Shamim

Department of Civil Engineering

Iqra National University

ID # 7720

Probability and Statistics

QNo: 1 The following are the scores made by the three batsman A, B and C in a series of Innings.

A	12	15	6	73	7	19	199	36	84	65
B	3	13	43	102	175	220	204	139	69	30
C	5	14	36	105	99	20	15	96	13	45

Who is better as a run getter? who is more consistent player? which one player is more variate? Find empirical Relation for player A.

A/x	B/y	C/z	$x^2/A^2$	$y^2/B^2$	$z^2/C^2$
12	3	5	144	9	25
15	13	14	225	169	196
6	43	36	36	2401	1296
73	102	105	5329	10404	11025
7	175	99	49	30625	9801
19	220	20	361	48400	400
199	204	15	39601	41616	225
36	139	96	1296	19321	9216
84	69	13	7056	4761	169
65	30	45	4225	900	2025
516	998	448	58322	158606	34.378

ID # 7720

Probability and Statistics

(a) Better run getter.

Arithmetic mean of Batsman A

$$\bar{x}_A = \frac{\sum x}{n}$$

$$= \frac{516}{10}$$

$$\bar{x}_A = 51.6$$

Arithmetic mean of Batsman B -

$$\bar{x}_B = \frac{\sum x}{n}$$

$$\bar{x}_B = \frac{998}{10}$$

$$\bar{x}_B = 99.8$$

Arithmetic mean of Batsman C.

$$\bar{x}_C = \frac{\sum x}{n} = \frac{448}{10}$$

$$= 44.8$$

The batsman with more arithmetic mean is better run getter'. So, Batsman "B" with arithmetic mean of 99.8 is better run getter.

b) More consistent player.

→ Coefficient of Variation, C.V of batsman

$$A \quad C.V = \frac{s}{\bar{x}} \times 100$$

Probability and Statistics

Standard deviation of A

$$S = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$$

$$S = \sqrt{\frac{58322}{10} - \left(\frac{516}{10}\right)^2}$$

$$S = \sqrt{5832.2 - 2662.56}$$

$$S = \sqrt{3169.64}$$

$$S = 56.29$$

$$\begin{aligned} \text{C.V of A} &= \frac{S}{\bar{x}_A} \times 100 \\ &= \frac{56.29}{51.6} \times 100 \\ &= 109.08\% \end{aligned}$$

$$\Rightarrow \text{C.V of B} = \frac{S_B}{\bar{x}_B} \times 100$$

Standard deviation of B

$$S_B = \sqrt{\frac{\sum Y^2}{n} - \left(\frac{\sum Y}{n}\right)^2}$$

$$S_B = \sqrt{\frac{158606}{10} - \left(\frac{998}{10}\right)^2}$$

$$= \sqrt{15860.6 - 9960.04}$$

ID # 7720

Probability and Statistics

$$S_B = \sqrt{5900.56}$$

$$S_B = \sqrt{76.81}$$

$$\text{C.V of } B = \frac{S_B}{\bar{x}_B} \times 100$$

$$= \frac{76.81}{99.8} \times 100$$

$$= 76.96\%$$

$$\Rightarrow \text{C.V of } C = \frac{S_C}{\bar{x}_C} \times 100$$

Standard deviation of C.

$$S_C = \sqrt{\frac{\sum z^2}{n} - \left(\frac{\sum z}{n}\right)^2}$$

$$S_C = \sqrt{\frac{34378}{10} - \left(\frac{448}{10}\right)^2}$$

$$S_C = \sqrt{3437.8 - 2007.04}$$

$$S_C = \sqrt{1430.76}$$

$$S_C = 37.82$$

$$\text{C.V of } C = \frac{S_C}{\bar{x}_C} \times 100$$

$$= \frac{37.82}{44.8} \times 100$$

$$= 84.41\%$$

ID# 7720

Probability and Statistics

The batsman with least co-efficient of variation is more consistent. Player - So batsman B with  $C.V = 76.96\%$  is more consistent player.

c) More Variate Player:

A large value of co-efficient of variation indicates that it is more variate.  
Hence,  $C.V$  of A =  $109.08\%$ . So batsman A is more variate.

ID # 7720

Probability and statistics

QNo2: The following is the distribution of wages per thousand employees in a certain factory.

Classes	2-4	6-8	10-12	14-16	18-20	22-24	26-28	30-32	34-36
F	3	13	6	10	5	3	5	3	2

Calculate Mean, mode, median? Discuss the symmetrical and skewness characteristic.

Classes	Class-Boundaries	frequency F	MidPoint $x_i$	CF	$f \cdot x_i$
2-4	1-5	3	3	3	9
6-8	5-9	13	7	16	91
10-12	9-13	6	11	22	66
14-16	13-17	10	15	32	150
18-20	17-21	5	19	37	95
22-24	21-25	3	23	40	69
26-28	25-29	5	27	45	135
30-32	29-33	3	31	48	93
34-36	33-37	2	35	50	70
	{	50			778

a) Mean

$$\bar{x} = \frac{\sum fx_i}{f} = \frac{778}{50}$$

$$\bar{x} = 15.56$$

b) Median

$$\rightarrow \frac{n}{2} = \frac{50}{2} = 25^{\text{th}}$$

$$= l + \frac{h}{f} \left( \frac{n}{2} - cf \right)$$

$$= 13 + \frac{4}{10} (25 - 22)$$

$$= 14.2$$

c) Mode

$$\text{Mode} = l + \frac{f_m - f_1}{(f_m - f_1) + (f_m - f_2)} \times h$$

$$l = 13, f_m = 10, f_1 = 6, f_2 = 5, h = 4$$

$$\text{Mode} = 13 + \frac{10 - 6}{(10 - 6) + (10 - 5)} \times 4 = 13 + \frac{4}{(4) + (5)} \times 4$$

$$= 13 + \frac{4}{9} \times 4$$

$$= 14.77$$



Muhammad Abdullah Khan

Page # 8

ID # 7720

Probability and Statistics

---

As the values of median, mean and mode differ from each other so the distribution is asymmetrical.

→ Also mean is greater than median so it is a positively skewed distribution.

## Probability and Statistics

Q:03 Discuss merits and demerits of Median and Geometric mean.

Ans: Median:

### Merits:

- 1/ It is easily calculated and understood.
- 2/ It is located even when the values are not capable of quantitative measurement.
- 3/ It is not affected by extreme values. It can be computed even when a frequency distribution involves "open end" classes like those of income and price.
- 4/ In a highly skewed distribution, median is an appropriate average to use.

### Demerits:

- 1/ It is not rigorously defined.
- 2/ It is not capable of lending itself to further statistical treatment.
- 3/ It necessitates the arrangement of data into an array which can be tedious and time consuming for a large body of data.

## Geometric Mean:-

### Merits:-

- 1/ It is rigidly defined and its value is a precise figure.
- 2/ It is based on all observation.
- 3/ It is capable of further algebraic treatment.
- 4/ It is not much affected by fluctuation of sampling.
- 5/ It is not affected by extreme values.

### Demerits:-

- 1/ It can't be calculated if any one of the observation is negative or zero.
- 2/ Its calculation is rather difficult.
- 3/ It is not easy to understand.
- 4/ It may not coincide with any of the observation.