Dr. Homi Bhabha State University

Elphinstone College, Mumbai - 32

SYIT Semester-3

COST Unit-1

Question Bank and Formula Sheet

Anupam Nigam

Arithmetic Mean

Individual	Discrete	Continuous
$\bar{x} = \frac{\sum x}{N}$	$\bar{x} = \frac{\sum fx}{N}$	$\bar{x} = \frac{\sum fm}{N}$
$\bar{x} = A + \frac{\sum d}{N}$ where $d = x - A$	where $N = \sum f$	

Median

Individual	Discrete	Continuous
Odd: $\frac{n+1}{2}$th item	$\frac{N+1}{2}$th item	$L + \frac{\frac{N}{2} - c.f.}{f} \times i$
Even: $\frac{\frac{n}{2}\text{th} + (\frac{n}{2}+1)\text{th}}{2}$		

Mode

Individual	Discrete	Continuous
Most frequent value		$L + \frac{f_1 - f_0}{(f_1 - f_0) + (f_1 - f_2)} \times h$

Geometric Mean (G.M.)

Individual	Discrete	Continuous
$\sqrt[n]{x_1 \times x_2 \times \cdots \times x_n}$	Antilog $\left[\frac{\sum f \log x}{N}\right]$	Antilog $\left[\frac{\sum f \log m}{N}\right]$

Harmonic Mean (H.M.)

Individual	Discrete	Continuous
$\frac{n}{\frac{1}{x_1} + \frac{1}{x_2} + \cdots + \frac{1}{x_n}}$	$\frac{N}{\sum \frac{f}{x}}$	$\frac{N}{\sum \frac{f}{m}}$

Root Mean Square (RMS)

Individual	Discrete	Continuous
$\sqrt{\frac{x_1^2+x_2^2+\cdots+x_n^2}{n}}$	$\sqrt{\frac{\sum_{i=1}^{n} f_i x_i^2}{\sum_{i=1}^{n} f_i}}$	$\sqrt{\frac{\sum_{i=1}^{n} f_i x_i^2}{\sum_{i=1}^{n} f_i}}$

Quartiles

Individual/Discrete	Continuous
$Q_1 =$ value at position $\frac{n}{4}$ $Q_2 =$ Median $Q_3 =$ value at position $\frac{3(n)}{4}$	$Q_k = L + \frac{\frac{k(N)}{4} - CF}{f} \times h$ where $k = 1, 2, 3$

Percentiles

Individual/Discrete	Continuous
$P_i =$ value at position $\frac{i(n)}{100}$	$P_i = L + \frac{\frac{i(N)}{100} - CF}{f} \times h$

Deciles

Individual/Discrete	Continuous
$D_i =$ value at position $\frac{i(n)}{10}$	$D_i = L + \frac{\frac{i(N)}{10} - CF}{f} \times h$

Where:

- L is the lower boundary of the class containing the measure
- N is the total frequency
- CF is the cumulative frequency of the class preceding the class containing the measure
- f is the frequency of the class containing the measure
- h is the class interval
- i is the index of the percentile (1 to 99) or decile (1 to 9)

Standard Deviation

Individual	Discrete	Continuous
$\sigma = \sqrt{\frac{\sum x^2}{N}}$	$\sigma = \sqrt{\frac{\sum fx^2}{N}}$ where $x = (X - \bar{X})$	$\sigma = \sqrt{\frac{\sum fd^2}{N} - \left(\frac{\sum fd}{N}\right)^2} * i$ where $d = \frac{(m-A)}{i}$, i = class interval

Variance

Square of SD
$\sigma^2 = (\frac{\sum fd^2}{N} - \left(\frac{\sum fd}{N}\right)^2) * i^2$

Quartile Deviation

Individual	Discrete	Continuous
	Q.D. $= \frac{Q_3 - Q_1}{2}$	
Q_1 = size of $(\frac{n}{4})$th item	$Q_1 = L_1 + \frac{\frac{N}{4} - cf}{f} \times h$	$Q_1 = L_1 + \frac{\frac{N}{4} - cf}{f} \times h$
Q_3 = size of $(\frac{3(n)}{4})$th item	$Q_3 = L_3 + \frac{\frac{3N}{4} - cf}{f} \times h$	$Q_3 = L_3 + \frac{\frac{3N}{4} - cf}{f} \times h$
where $N = \sum f$ (for Discrete and Continuous)		

Coefficient of Variation

C.V.$=\frac{\sigma}{\bar{X}} * 100$

"Time to flex those mental muscles! Tackle these mathematical mysteries :"

1. Find the arithmetic mean of the following distribution:

X	10	30	50	70	89
f	7	8	10	15	10

2. Find the arithmetic mean of the following distribution:

X	3	9	12	14	15	17
f	1	3	4	1	4	2

3. Find the arithmetic mean of the following data.

Class Interval	15-25	25-35	35-45	45-55	55-65	65-75	75-85
Frequency	6	11	7	4	4	2	1

4. Find the arithmetic mean of the following data.

Class Interval	10-20	20-30	30-40	40-50	50-60
Frequency	30	27	14	17	2

5. Calculate the weighted mean for following data and compare it with arithmetic mean

Subject	Weight	Student		
		X	Y	Z
Matrices	2	72	42	52
Laplace	3	75	52	62
Integrals	5	58	88	68

"Look at you go! You're making these questions look easy!"

6. Obtain the median for the following frequency distribution:

X	1	2	3	4	5	6	7	8	9
f	8	10	11	16	20	25	15	9	6

[Ans: Median = 5]

7. Obtain the median from the following data.

X	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60
f	35	45	70	105	90	74	51	30

8. Find the mode for the following distribution.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of students	5	8	7	12	28	20	10	10

[Ans: Mode = 46.67]

9. Calculate Geometric Mean from following data.

125	1462	38	7	0.22	0.08	12.75	0.5

[Ans: 6.952]

10. Find the geometric mean, harmonic mean and root mean square of the numbers 3, 5, 6, 6, 7, 10 and 12.

[Ans: G. M. = 6.43, H. M. = 5.87, RMS = 7.55]

"Halfway there and still going strong! You've got this!"

11. Find the arithmetic mean, geometric mean, harmonic mean of numbers 2, 4 and 8. Check the relation between them.

12. Calculate Quartile 3, Deciles -7 and Percentiles 20 from following data.

Class	2 - 4	4 - 6	6 - 8	8 - 10
Frequency	3	4	2	1

13. Calculate Quartile deviation (Q. D.), Mean Deviation (M. D.) from mean for the following data.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70
No. of Students	6	5	8	15	7	6	3

[Ans: Q.D. = 11.23, Mean = 33.4, M.D from mean = 13.184]

14. Calculate Mean Deviation (M. D.) from mean for the following data

Size	2	4	6	8	10	12	14	16
f	2	2	4	5	3	2	1	1

[Ans: Mean = 8, M.D from mean = 2.8]

15. Calculate Mean Deviation and its coefficient from mean for the following data.

Size	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70 -80
Freq	5	8	12	15	20	14	12	6

[Ans: Median = 43, M.D = 15.37, Coe. Of M. D. = 0.357]

"You're unlocking your mathematical superpowers with every question!"

16. Find the standard deviation of the following data.

    (a) 12, 6, 7,3,15, 10, 18, 5

    (b) 9, 3, 8, 8, 9, 8, 9,18

    [Ans: i. St. dev. σ= 4.87, ii. St. dev. σ= 3.87]

17. Find the standard deviation of the following data.

Age	20-25	25-30	30-35	35-40	40-45	45-50
No. of persons	170	110	80	45	40	35

Take assumed average = 32.5

[Ans: Standard deviation σ= 7.936]

18. Calculate the standard deviation from the following data by short method.

240.12, 240.13, 240.15, 240.12, 240.17, 240.15, 240.17, 240.16, 240.22, 240.21

19. Calculate standard deviation from the following data by short method.

Salary	45	50	55	60	65	70	75	80
No. of persons	3	5	8	7	9	7	4	7

[Ans: Standard deviation = 10.35]

20. Calculate arithmetic mean, standard deviation and coefficient of variation.

Class	20-25	25-30	30-35	35-40	40-45
Frequency	1	22	64	10	3

[Ans: $\bar{X} = 32.1$, S. D. (σ) =3.441, C. V. = 10.72]

21. Calculate arithmetic mean, standard deviation and coefficient of variation.

Class	23-27	28-32	33-37	38-42	43-47	48-52	53-57	58-62	63-67	68-72
Freq	2	6	7	12	18	13	9	7	4	2

Mathematics is not about numbers, equations, computations, or algorithms: it is about understanding.

— William Paul Thurston