

Subject: Probability and Statistics

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DEP:(BS SE)

Q1: Construct a grouped distribution table for the following data and Calculate Mean, Mode Median and Quartiles.

423, 369, 387, 411, 393, 394, 371, 377, 389, 409, 392, 408, 431, 401, 363, 391, 405, 382, 400, 381, 399, 415, 428, 422, 396, 372, 410, 419, 386, 390

class	Tally	Frequency (f)	c.f	class.B	x	fx
360-369	2	2	2	359.5-369.5	364.5	729
370-379	3	3	5	369.5-379.5	374.5	1123.5
380-389	5	5	10	379.5-389.5	384.5	1922.5
390-399	7	7	17	389.5-399.5	394.5	2761.5
400-409	5	5	22	399.5-409.5	404.5	2022.5
410-419	4	4	26	409.5-419.5	414.5	1658
420-429	3	3	29	419.5-429.5	424.5	1273.5
430-439	1	1	30	429.5-439.5	434.5	434.5
Total		30				11914

MEAN:

Fx/f

ANSWER:

$$11914/30 = 397.13$$

MODE:

$$L+fm-f_0/(fm-f_{m-1})+(fm-f_{m+1})$$

$$389.5+8-3/2(8)-3-5(399.5-389.5)$$

$$389.5+5/16-8(11)$$

$$3131/8$$

$$3918$$

MEDIAN:

L=389.5(lower class boundaries of 9390-399)

$$n = 30$$

$$b = 2+3+5=10$$

$$G = 7$$

$$W = 10$$

$$= 389.5 + \frac{(30/2) - 10 * 10}{7}$$

$$= 389.5 + \frac{(15) - 10}{7} * 10$$

$$= 389.5 + 0.7143$$

$$= 390.21$$

QUARTILE:

$$L + h/f(q-c)$$

$$Q = n/u = 30/4 = 7.5$$

$$Q1 = 389.5 + 11/3(7.5 - 7)$$

$$= 389.5/1 + 5.5/3$$

$$Q2 = 11535 - 55/3 + 5.5/3 = 1148/3 = 382.66$$

$$L + h/f(q3-c)$$

$$Q3 = 3n/4 = 3 * 30/4 = 30/4 = 22.4$$

$$Q3 = 40.65 + 11/5(22.5 - 20)$$

$$Q3 = 406.5 + 11/5(2 - 5)$$

$$= 2032.5 + 27.5/5$$

$$= 2060/5$$

$$= 412 \text{ ans}$$

Q2: By multiplying each of the numbers 3,6,2,1,7,5 by 2 and then adding 5, we obtain 11,17,9,7,19,15. What is the relation between the standard deviation and the means of the two sets.

ANSWER:

$$\text{Mean} = \frac{3+6+2+1+7+5}{6} = \frac{24}{6} = 4$$

$$X = 4$$

xi	X1-x	(x1-x)^2	X1^2
3	3-4= -1	1	9
6	6-4= 2	4	36
2	2-4= -2	4	4
1	1-4= -3	9	1
7	7-4= 3	9	49
5	5-4= 1	1	25

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

$$= \sqrt{\frac{28}{6}} = \sqrt{4.66} = 2.16$$

$$\text{Mean} = \frac{11+7+9+7+19+15}{6} = \frac{78}{6} = 13$$

x_i	$X1-x$	$(x1-x)^2$
11	$11-13=-2$	4
7	$17-13=4$	16
9	$9-13=-4$	16
7	$7-13 = 6$	36
19	$19-13=6$	36
15	$15-13=2$	4

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

$$= \sqrt{\frac{112}{6}} = \sqrt{\frac{112}{6}} = \sqrt{18.66} = 4.32$$

$$S = 4.32$$

Q3: For the following grouped distribution table Calculate The Variance and Standard Deviation

Class	64-84	85-104	105-124	125-144	145-164	165-184	185-204
Frequency	15	18	27	10	6	5	13

Class	F	x	fx	X ²	Fx ²
65-84	15	74	1110	5476	82140
85-104	18	94.5	176	8930.25	160744.5
105-124	27	114.5	3091.5	13110.25	353976.5
125-144	10	134.5	1345	18090.25	186902.5
145-164	6	154.5	927	23870.25	143221.5
165-184	5	174.5	872.5	30450.25	152251.25
185-204	13	194.5	2528.5	37830.25	491793.25
	Total=94		Total=11575.5	Total=138357.5	Total=1571029.75

$$F_i = 94$$

$$f_i x_i = 11575.5$$

$$f_i x_i^2 = 1571029.75$$

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

$$= \frac{1571029.75}{94} - \left(\frac{11575.5}{94} \right)^2$$

$$= 1548.73$$

$$S = \sqrt{\frac{\sum f_i x_i^2}{n} - \left(\frac{\sum f_i x_i}{n} \right)^2} = \sqrt{1548.73} = 39.35$$

Q4: If two fair dice are thrown, what is the probability of getting

1. A double six
2. A sum of 8 or more dots

ANSWER:

{
(1,1),(1,2),(1,3),(1,4),(1,5),(1,6),
(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),
(3,1),(3,2),(3,3),(3,4),(3,5),(3,6),
(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),
(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),
(6,1),(6,2),(6,3),(6,4),(6,5),(6,6),
}

So, For getting 6 in both dices, The probability is $1/36$.

And, For getting sum of 8, It can be (2,6),(3,5),(4,4),(5,3),(6,2) and It is $P(B) = 5/36 = 5/12$

Q5. Let C_1, C_2, \dots, C_M be a partition of the sample space SS , and A and B be two events. Suppose we know that

- A and B are conditionally independent given C_i , for all $i \in \{1, 2, \dots, M\}$
- B is independent of all C_i 's.

Prove that A and B are independent.

ANSWER:

Since the c_i 's form a partition of the sample space, we can apply the law of total probability for

$A \cap B$

$$P(A \cap B) = \sum p(A \cap B / C_i) p(C_i)$$

$$\sum p(A / C_i) P(B) P(C_i)$$

$$\sum P(A / C_i) P(B) P(C_i)$$

$$P(B) \sum P(A / C_i) P(C_i)$$

$$= P(B) P(A)$$

