ID :14269

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Note: Please attempt all Questions in sequence. All questions carry equal marks. **(50)**

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

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Class	freq	Mid Point	C.F	C.B	$\bar{x} = \Sigma fx$
360-374	4	367	4	359.5-374.5	1468
375-389	6	382	10	374.5-389.5	2292
390-404	9	397	19	389.5-404.5	3573
405-419	7	412	26	404.5-419.5	2884
420-434	4	427	30	419.5-434.5	1708
					11925

$n = 30$

- Mean $= \dfrac{\Sigma fx}{\Sigma f} \Rightarrow \dfrac{11925}{30}$

mean $= 397.5$

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

To find median calass

$=$ value of $\left(\frac{n}{2}\right)$ obeservation.

$= \dfrac{30}{2} \Rightarrow 15$

From the column of cf, we find that the 15^{th} obsevent lies in class 390-404

$\therefore$ The median class is 389.5-404.5

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(2)

Put in eq/ 1

$$m = L + \left(\frac{\frac{n}{2} - c.f}{f}\right)h$$

where $L = 389.5$

$n = 30$

$c.f = 10$

$f = 9$

$h = 15$

$$m = 389.5 + \left(\frac{15 - 10}{9}\right)15$$

$m = 389.5 + 8.33$

$= 397.83$

- To Find mode

here, ~~max~~ freq/ = 9

so

The mode class is 389.5-404.5

$$mode = L + \left(\frac{f_1 - f_0}{2 \cdot f_1 - f_0 - f_2}\right) \cdot c$$

where

$L = 389.5$

$f_1 = 9$

$f_0 = 6$

$f_2 = 7$

$c = 15$

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$$= 389.5 + \left(\frac{9 - 6}{2 \cdot 9 - 6 - 7}\right) \cdot 15$$

$= 389.5 + 9$

$= 398.5$

- To Find Quartiles

$$Q_3 = \left(\frac{3n}{4}\right) = \left(\frac{3 + 30}{4}\right) = 22.5$$

which lies under 405-419

Q_3 Class : 404.5-419.5

so $Q_3 = L + \left(\frac{\frac{3n}{4} - cf}{f}\right) \cdot h$

where $L = 404.5$

$cf = 19$

$h = 15$

$f = 7$

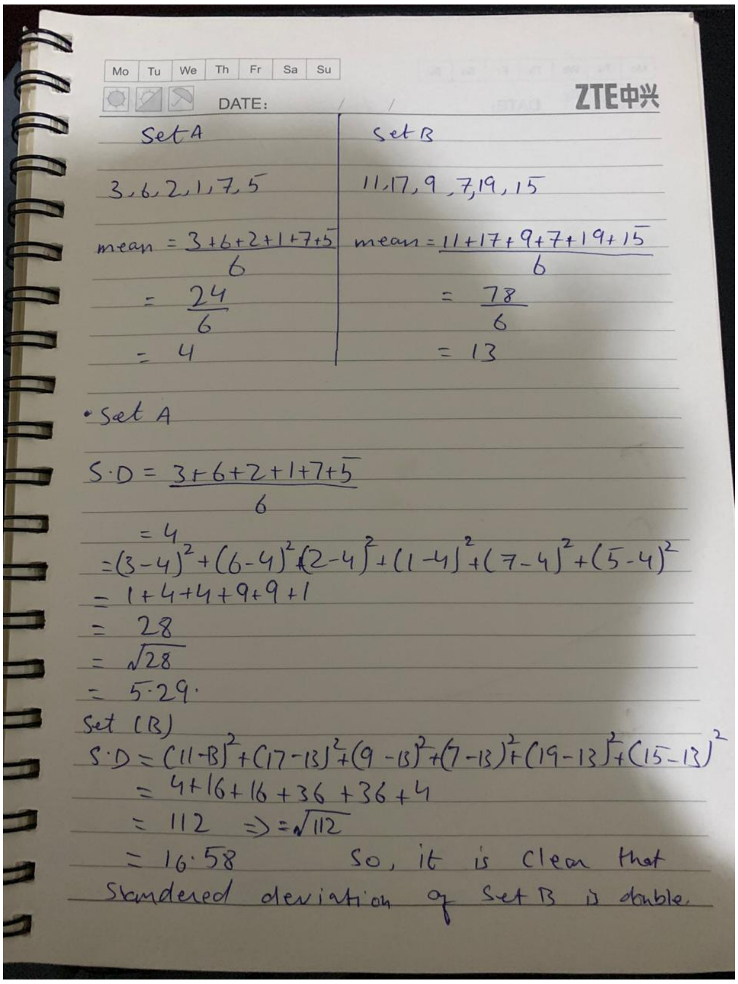
$$Q_3 = 404.5 + \left(\frac{22.5 - 19}{7}\right) \cdot 15$$

$$= 404.5 + \frac{3.5}{7} \cdot 15$$

$= 404.5 + 7.5$

$= 412$.

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.



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Set A	Set B
3,6,2,1,7,5	11,17,9,7,19,15
mean $= \frac{3+6+2+1+7+5}{6}$	mean $= \frac{11+17+9+7+19+15}{6}$
$= \frac{24}{6}$	$= \frac{78}{6}$
$= 4$	$= 13$

• Set A

$S.D = \frac{3+6+2+1+7+5}{6}$

$= 4$

$= (3-4)^2+(6-4)^2+(2-4)^2+(1-4)^2+(7-4)^2+(5-4)^2$

$= 1+4+4+9+9+1$

$= 28$

$= \sqrt{28}$

$= 5.29$

Set (B)

$S.D = (11-13)^2+(17-13)^2+(9-13)^2+(7-13)^2+(19-13)^2+(15-13)^2$

$= 4+16+16+36+36+4$

$= 112 \Rightarrow = \sqrt{112}$

$= 16.58$ So, it is clear that Standered deviation of Set B is double.

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

Classes	frq	c.f	x	$\bar{x} = \Sigma fx$	x^2	fx^2
64 – 84	15	15	74	1110	5476	82140
85 – 104	18	33	94.5	1701	8930.25	160744.5
105 – 124	27	60	114.5	3091.5	13110.25	353976.75
125 – 144	10	70	134.5	1345	18090.25	180902.5
145 – 164	6	76	154.5	927	23870.25	143221.5
165 – 184	5	81	174.5	872.5	30450.25	152251.25
185 – 204	13	94	194.5	2528.5	37830.25	491793.25
	94			11575.5	138357.5	1571029.75

$s^2 = \Sigma fx^2/n - (\Sigma fx/n)^2$

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

$= 16713.082 - 15164.35$

$s^2 = 1548.73$

Standard Deviation $= \sqrt{1548.73}$

$= 39.35$

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

Sol:

The sample space S is represented by the following 36 outcomes

S= {(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)}

1. Let A be the event that double six occurs

A= {(6,6)} and thus

P(A) =1/36

2. Let B denotes that a sum of 8 or more dots occurs

B= {(2,6),(3,5),(3,6),(4,4),(4,5),(4,6),(5,3),(5,4),(5,5),(5,6),(6,2),(6,3),(6,4),(6,5),(6,6)}

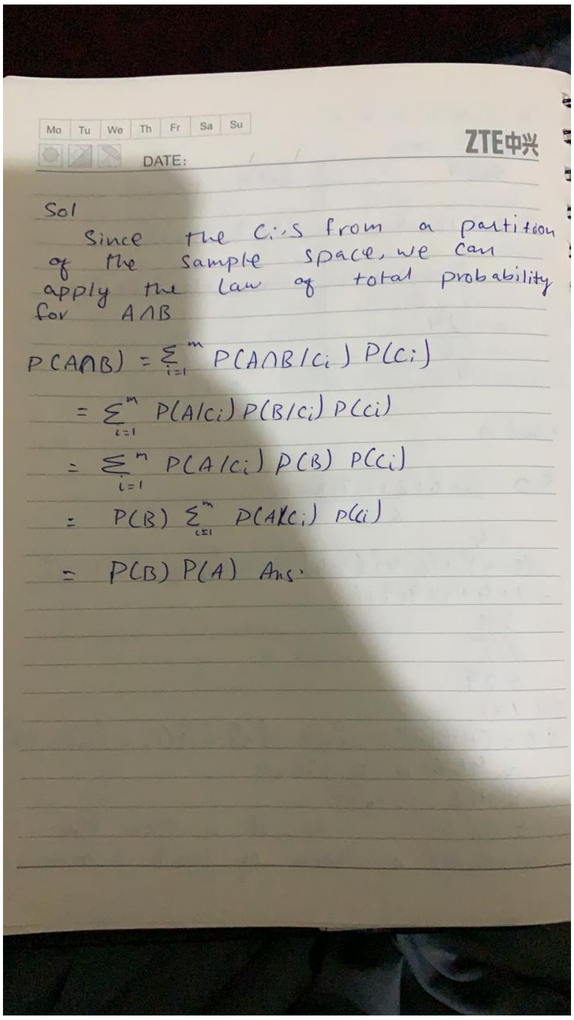
Hence

$P(B) = 15/36 = 5/12$

Q5. Let C1,C2,⋯,CMC1,C2,⋯,CM be a partition of the sample space SS, and AA and BB be two events. Suppose we know that

- A and B are conditionally independent given **C**$_i$, for all i ∈{1,2,⋯,M}
- B is independent of all **C**$_i$**'s.**

Prove that A and B are independent.



Sol

Since the C_i's from a partition of the sample space, we can apply the law of total probability for $A \cap B$

$$P(A\cap B) = \sum_{i=1}^{m} P(A\cap B / C_i)\, P(C_i)$$

$$= \sum_{i=1}^{n} P(A/C_i)\, P(B/C_i)\, P(C_i)$$

$$= \sum_{i=1}^{n} P(A/C_i)\, P(B)\, P(C_i)$$

$$= P(B) \sum_{i=1}^{m} P(A/C_i)\, P(C_i)$$

$$= P(B)\, P(A) \text{ Ans.}$$

Good Luck