Muhammad Abbas 13063 BSSE-B

Q1:- construct a grouped distribution table for the following data and calculate Mean, Mode Median and Quartiles.

Sol:- The lowest value is 363 and the highest value is 431.

using given data

A class interval of 10.

The interval for the first class is 360 to 369 and include 363 (the lowest value).

The complete distribution table.

Observation	Tally	Freq
360-369	II	2
370-379	III	3
380-389	IIII	5
390-399	IIIIII	7
400-409	IIIII	5
410-419	IIII	4
420-429	III	3
430-339	I	1

Total Freq = 30

Now calculate Mean

Q1

Putting the values

$$\text{Mean} = \frac{\text{Sum of all number}}{\text{total number}}$$

Sum of no = 423+369+387+411+493+394+371+377+389
+409+392+408++431+401+363+391+405+382+
400+381+359+415+428+422+396+372+410
+419+386+390 = 11914

Sum = 11914

Now putting values

$$\text{Mean} = \frac{11914}{30} = 397.1$$

$$\boxed{\text{Mean} = 397.1}$$

Mode:

$$L + \frac{fm - fm_{-1}}{(fm - fm_{-1}) + (f - fm_{+1})} \times W$$

↳ L is Lower class boundary

↳ fm_{-1} is the freq of group before model group

↳ fm_{+1} is the freq of group after model

↳ W is the group width.

M = 389.5 + 8−3/2(8)−3−5(395.5−389.5)

= 389.5 + 5/16−8(11)

= 389.5 / 1+55/8

= 3131/8

= 3918

$$\boxed{\text{Mode} = 3918}$$

Q1 continue

Median:-

L = 389.5 (Lower class boundary of (390-399)

$n = 30$

$B = 2+3+5 = 10$

$G = 7$

$w = 10$

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

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

$$= 389.5 + 0.7143$$

$$\boxed{= 390.21}$$

Quartile:-

$l + h/f\,(q-c)$

$q = n/4 = 30/4 = 7.5$

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

$q = 389.5/1 + 5.5/3$

Q2 $11535.55/3 + 5.5/3 = 1148/3 = 382.66 + l + h/7\,(q3-c)$

Q3 $406.5 + 11/5\,(22.5-20)$

Q3 $406.5 + 11/5\,(2.5)$

Q3 $406.5 + 27.5/5$

$= 2032.5 + 27.5/5$

$= 2060/5 = \boxed{412}$

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

Ans:-

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

$x = 4$

x_i	$x_i - x$	$(x_i - x)^2$	x_i^2
3	3-4=1	1	9
6	6-4=1	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

$$S = \sqrt{\Sigma (x_i - x)^2 / n}$$

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

Mean $= 11+7+9+7+19+15/6 = 78/6 = 13$

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

Q2 continue

$$S = \sqrt{\Sigma (xi - x)^2 / n}$$

$$= \sqrt{112/6} = \sqrt{112/6} = \sqrt{18.66}$$

$$\boxed{S = 4.32}$$

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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

Sol :-

Variance Formula

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

Class limits	f	x	fx	$\bar{x}$	$x-\bar{x}$	$(x-\bar{x})^2$	$f(x-\bar{x})^2$
64-84	15	74	1110	123.14	49.14	2414.7	36220.5
85-104	18	94.5	1701	123.14	105.14	11054.41	198979.38
105-124	27	114.5	30915	123.14	96.14	9242.8	166370.4
125-144	10	134.5	1345	123.14	113.14	12800.6	128006
145-164	6	154.5	927	123.14	117.14	13721.7	82,330.2
165-184	5	174.5	872.5	123.14	118.14	13957.	69785
185-204	13	194.5	2528.5	123.14	110.14	12130.8	157700.4
	94		11575.5				839,391.88

$\bar{x} = 11575.5/94$
$= 123.14$

$$\boxed{S^2 = 839391.88/93 = 9025.71}$$

Variance

$$\boxed{S = \sqrt{9025.71} = 95.003}$$

standard deviation

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:- Probability - Sample space for two dice (outcomes)

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

~~Getting a sum of 8~~

~~Let E_5 = event of getting a sum of 8. The number which is a sum of 8 will be~~

~~$E_5 = [(2,6), (3,5), (4,4), (5,3), (6,2)] = 5$~~

~~Therefore, Probability of getting 'a sum of 8'~~

~~$P(E/5) = \frac{\text{Number of favorable coutcomes}}{\text{Total number of Possible outcome}}$~~

~~$P(E/5) = 5/36$~~

~~$P(E/5) = 0.138$~~

Q4 continue

A double six

There are 36 Possible outcomes

Let A be the event that double six occurs

$A = \{(6,6)\}$ and thus

$\boxed{P(A) = 1/36}$

(2) A Sum of 8 or more dots

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

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

Hence

$\boxed{P(B) = 15/36 = 5/12}$

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 indepentent given C_i, for all $i \in \{1, 2, \dots, M\}$
* B is idenpendent of all C_i's.

Prove that A and B are independant.

Sol:-

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

$$P(A \cap B) = \sum_{i=1}^{M} P(A \cap B | C_i) P(C_i)$$

$$= \sum_{i=1}^{M} P(A/C_i) P(B/C_i) P(C_i) \quad \text{(A and B are conditionally independant)}$$

$$= \sum_{i=1}^{M} P(A/C_i) P(B) P(C_i) \quad \text{(B is independent of all } C_i\text{'s)}$$

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

$$= P(B)\, P(A) \quad \text{law of total probability.}$$