**Mid Semester Assignment**

**Spring 2020**

**Subject: Probability and Statistics**

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**Q1:** Students were asked how long it took them to walk to school on a particular morning. A cumulative frequency distribution was formed

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Time taken(in minutes)*** | <5 | <10 | <15 | <20 | <25 | <30 | <35 | <40 | <45 |
| ***Frequency*** | 25 | 45 | 81 | 143 | 280 | 349 | 374 | 395 | 400 |

1. Draw a cumulative frequency curve and estimate how many students took less than 18 minutes.

Answer:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time Interval | Frequency | Class Boundary | <Cumulative Frequency | >Cumulative Frequency |
| 0.5 – 5.5 | 25 | -0.5 – 5.5 | 25 | 2092 |
| 5.5 – 10.5 | 45 | 5.5 – 10.5 | 70 | 2097 |
| 10.5 – 15.5 | 81 | 10.5 -15.5 | 151 | 2022 |
| 15.5 – 20.5 | 143 | 15.5 – 20.5 | 294 | 1941 |
| 20.5 – 25.5 | 280 | 20.5 – 25.5 | 574 | 1798 |
| 25.5 – 30.5 | 349 | 25.5 – 30.5 | 923 | 1518 |
| 30.5 – 35.5 | 374 | 30.5 – 35.5 | 1297 | 1169 |
| 35.5 - 40.5 | 395 | 35.5 - 40.5 | 1692 | 795 |
| 40.5 – 45.5 | 400 | 40.5 – 45.5 | 2092 | 400 |

C.B = 0.5

The number of those students who’s reached the school in 18 minutes:

Less then 20 minutes we had 294 students.

In cross multiplication we had in 18 minutes reaching in school are **264.**

1. Take equal class intervals of 0-, 5-, 10-, etc., construct frequency distribution and draw a histogram.

Answer:

|  |  |  |
| --- | --- | --- |
| Class Interval | Frequency | Class Boundary |
| 0 - 5 | 25 | 0.5 – 5.5 |
| 5 - 10 | 45 | 5.5 – 10.5 |
| 10 – 15 | 81 | 10.5 – 15.5 |
| 15 - 20 | 143 | 15.5 – 20.5 |
| 20 - 25 | 280 | 20.5 – 25.5 |
| 25 – 30 | 394 | 25.5 – 30.5 |
| 30 – 35 | 374 | 30.5 – 35.5 |
| 35 - 40 | 395 | 35.5 – 40.5 |
| 40 - 45 | 400 | 40.5 – 45.5 |

**HISTORGAM:**

**Q2:** Construct a grouped distribution table for the following data and Calculate Mean, Mode 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

Answer:

**Distribution Table:**

|  |  |  |  |
| --- | --- | --- | --- |
| Classes | Frequency | Class Boundary | Cumulative Frequency |
| 363 – 373 | 4 | 362.5 – 373.5 | 4 |
| 374 - 384 | 3 | 373.5 – 384.5 | 7 |
| 385 – 395 | 8 | 384.5 – 395.5 | 15 |
| 396 – 406 | 5 | 395.5 – 406.5 | 20 |
| 407 – 417 | 5 | 406.5 – 417.5 | 25 |
| 418 – 428 | 5 | 417.5 – 428.5 | 30 |

**MEAN:**

|  |  |  |  |
| --- | --- | --- | --- |
| Classes | Frequency | x | f.x |
| 363 – 373 | 4 | 368 | 1472 |
| 374 – 384 | 3 | 379 | 1137 |
| 385 – 395 | 8 | 390 | 3120 |
| 396 – 406 | 5 | 401 | 3120 |
| 407 – 417 | 5 | 412 | 2060 |
| 418 – 428 | 5 | 423 | 2115 |
|  |  | ∑f = 30 | ∑f.x = 11909 |

Mean = x = ∑f.x/∑f = 11909/30 = **396.96**

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Largest Xm = 428

Smallest Xo = 363

Range = 428 – 363 = 65

K = 1+3.33 log N

= 1+ 3.33 log (30)

= 1+ 3.33(1.4771)

= 1+ 4.918

K = 5.19

H = R/K = 65/5.918 = 10.98 =11

**MODE:**

M = l1 + f1+fo/2f1-f0-f2(l2 – l1)

M = 384.5 +8-3/2(8)-3-5 (395.5-384.5)

= 384.5 + 5/16-8 (11)

= 384.5 / 1 + 55/8

= 3076 + 55/8 = 3131/8 = **3913**

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**Quartile:**

l + h/f(q-c)

q = n/4 = 30/4 = 7.5

Q1 = 384.5 + 11/3 (7.5 – 7)

Q = 384.5/1 +5.5/3

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

Q3 = l + h/f(q3-C)

Q3 = 3n/4 = 3×30/4 = 90/4 = 22.4

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 = 412

**Q3:** 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 :

Mean = 3+6+2+1+7+5/6 = 24/6 = 4

X=4

Standard deviation

|  |  |  |  |
| --- | --- | --- | --- |
| 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 = **√**∑(xi – x)^2 /n

= **√**28/6 = **√**4.66 = **2.16**

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

Standard deviation

|  |  |  |
| --- | --- | --- |
| Xi | X1 – x | (x1 – x)^2 |
| 11 | 11-13 = -2 | 4 |
| 17 | 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 = **√**∑(xi – x)^2 /n

= **√112/6 = √112/6 = √1866**

**S = 4.32**

**Q4**: 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 |

**ANSWER:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Class | Frequency | xi | Fixi | X1^2 | F1x1^2 |
| 64 – 84 | 15 | 74 | 1110 | 5476 | 82140 |
| 85 – 104 | 18 | 94.5 | 1701 | 8930.25 | 160744.5 |
| 105 – 124 | 27 | 114.5 | 3091.5 | 13110.25 | 353976.75 |
| 125 – 144 | 10 | 134.5 | 1345 | 18090.25 | 180902.5 |
| 145 – 164 | 6 | 154.5 | 947 | 23870.25 | 143221.5 |
| 165 – 184 | 5 | 174.5 | 872.5 | 30450.25 | 152251.25 |
| 185 – 204 | 13 | 194.5 | 2528051 | 37830.25 | 491793.25 |
|  | ∑f = 94 |  | ∑fixi =11575.5 |  | ∑fixi^2= 1565029.75 |

S^2 = ∑fx^2/n- (∑fx/n)^2

S^2 1565029.75/ 60 – (11575.5/60)^2

S^2 = 1565029.75/60 – (133992200/3600)

= 1565029.75/60 – 3720.05/1

= 26083.82 – 3720.05

Variance = S^2 = **22363.77**

**Standard Deviation = S^2 = √22363.77 = 149.54**

**Q5: Comment on the following sentences**

1. The depth of a river at four different points is 2,7,5,6 feet respectively. The average depth is 5 feet. Therefore all the people with heights 5 feet can cross it

Answer:

Yes, but somewhere the depth of the river is 7 feet and here the average height of the people 5 or 6, so maybe the people with 5 or 6 height can’t cross it in 7 feet depth.

1. The average marks of one class of students are 30. Therefore every student is hopeless.

Answer:

Yes, Because the average marks of the students are less for passing, so this way the students with low average were hopeless.

1. The average income of a king and his household servants is £20,000 per month, therefore all the household servants must be fabulously paid.

Answer:

Yes, Because this is the monthly income of a king and fabulously, so the household servants of the king must be fabulously paid.