**Data taken from 50 Ramen Shops in Kyoto, Japan**

**Prices of Ramen Bowl**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lower Class Limit** | **Upper Class Limit** | **Frequency** | **Mid-Point** |  |
| 500 | 600 | 4 | 550 | 2200 |
| 600 | 700 | 13 | 650 | 8450 |
| 700 | 800 | 18 | 750 | 13500 |
| 800 | 900 | 12 | 850 | 10200 |
| 900 | 1000 | 3 | 950 | 2850 |
|  |  | **50** |  | **37200** |

**Arithmetic Mean:**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| -194 | 37636 | -7301384 | 1416468496 |
| -94 | 8836 | -830584 | 78074896 |
| 6 | 36 | 216 | 1296 |
| 106 | 11236 | 1191016 | 126247696 |
| 206 | 42436 | 8741816 | 1800814096 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| -776 | 150544 | -29205536 | 5665873984 |
| -1222 | 114868 | -10797592 | 1014973648 |
| 108 | 648 | 3888 | 23328 |
| 1272 | 134832 | 14292192 | 1514972352 |
| 618 | 127308 | 26225448 | 5402442288 |
| **0** | **528200** | **518400** | **13598285600** |

**First four moments about mean.**

**Alternative Method**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lower Class Limit** | **Upper Class Limit** | **Frequency** | **Mid-Point** |  |
| 500 | 600 | 4 | 550 | 2200 |
| 600 | 700 | 13 | 650 | 8450 |
| 700 | 800 | 18 | 750 | 13500 |
| 800 | 900 | 12 | 850 | 10200 |
| 900 | 1000 | 3 | 950 | 2850 |
|  |  | **50** |  | **37200** |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 302500 | 166375000 | 91506250000 |
| 422500 | 274625000 | 178506250000 |
| 562500 | 421875000 | 316406250000 |
| 722500 | 614125000 | 522006250000 |
| 902500 | 857375000 | 814506250000 |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 1210000 | 665500000 | 366025000000 |
| 5492500 | 3570125000 | 2320581250000 |
| 10125000 | 7593750000 | 5695312500000 |
| 8670000 | 7369500000 | 6264075000000 |
| 2707500 | 2572125000 | 2443518750000 |
| **28205000** | **21771000000** | **17089512500000** |

**Moments about Zero**

**Moments about Mean**

**Calculations:**

**Beta Ratios**

**Skewness**

If , the distribution is **negatively skewed**.

If , the distribution is **symmetric**.

If , the distribution is **positively skewed**.

**Kurtosis**

If , the distribution is **platykurtic**.

If , the distribution is **mesokurtic**.

If , the distribution is **leptokurtic**.

**Ungrouped Data**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Shop** | **Price ¥** |  |  |  |
| 1 | 700 | 490000 | 343000000 | 240100000000 |
| 2 | 850 | 722500 | 614125000 | 522006250000 |
| 3 | 600 | 360000 | 216000000 | 129600000000 |
| 4 | 650 | 422500 | 274625000 | 178506250000 |
| 5 | 980 | 960400 | 941192000 | 922368160000 |
| 6 | 750 | 562500 | 421875000 | 316406250000 |
| 7 | 500 | 250000 | 125000000 | 62500000000 |
| 8 | 890 | 792100 | 704969000 | 627422410000 |
| 9 | 880 | 774400 | 681472000 | 599695360000 |
| 10 | 700 | 490000 | 343000000 | 240100000000 |
| 11 | 890 | 792100 | 704969000 | 627422410000 |
| 12 | 720 | 518400 | 373248000 | 268738560000 |
| 13 | 680 | 462400 | 314432000 | 213813760000 |
| 14 | 650 | 422500 | 274625000 | 178506250000 |
| 15 | 790 | 624100 | 493039000 | 389500810000 |
| 16 | 670 | 448900 | 300763000 | 201511210000 |
| 17 | 680 | 462400 | 314432000 | 213813760000 |
| 18 | 900 | 810000 | 729000000 | 656100000000 |
| 19 | 880 | 774400 | 681472000 | 599695360000 |
| 20 | 720 | 518400 | 373248000 | 268738560000 |
| 21 | 850 | 722500 | 614125000 | 522006250000 |
| 22 | 700 | 490000 | 343000000 | 240100000000 |
| **Shop** | **Price ¥** |  |  |  |
| 23 | 780 | 608400 | 474552000 | 370150560000 |
| 24 | 850 | 722500 | 614125000 | 522006250000 |
| 25 | 750 | 562500 | 421875000 | 316406250000 |
| 26 | 780 | 608400 | 474552000 | 370150560000 |
| 27 | 590 | 348100 | 205379000 | 121173610000 |
| 28 | 650 | 422500 | 274625000 | 178506250000 |
| 29 | 580 | 336400 | 195112000 | 113164960000 |
| 30 | 750 | 562500 | 421875000 | 316406250000 |
| 31 | 800 | 640000 | 512000000 | 409600000000 |
| 32 | 550 | 302500 | 166375000 | 91506250000 |
| 33 | 750 | 562500 | 421875000 | 316406250000 |
| 34 | 700 | 490000 | 343000000 | 240100000000 |
| 35 | 600 | 360000 | 216000000 | 129600000000 |
| 36 | 800 | 640000 | 512000000 | 409600000000 |
| 37 | 800 | 640000 | 512000000 | 409600000000 |
| 38 | 880 | 774400 | 681472000 | 599695360000 |
| 39 | 790 | 624100 | 493039000 | 389500810000 |
| 40 | 790 | 624100 | 493039000 | 389500810000 |
| 41 | 780 | 608400 | 474552000 | 370150560000 |
| 42 | 600 | 360000 | 216000000 | 129600000000 |
| 43 | 670 | 448900 | 300763000 | 201511210000 |
| 44 | 680 | 462400 | 314432000 | 213813760000 |
| 45 | 650 | 422500 | 274625000 | 178506250000 |
| **Shop** | **Price ¥** |  |  |  |
| 46 | 890 | 792100 | 704969000 | 627422410000 |
| 47 | 930 | 864900 | 804357000 | 748052010000 |
| 48 | 650 | 422500 | 274625000 | 178506250000 |
| 49 | 777 | 603729 | 469097433 | 364488705441 |
| 50 | 700 | 490000 | 343000000 | 240100000000 |
| **Total** | **37147** | **28174829** | **21790926433** | **17163876935441** |

**Moments about Zero**

**Moments about Mean**

**Calculations:**

**Alternative Method**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Shop** | **Price ¥** |  |  |  |  |
| 1 | 700 | -42.94 | 1843.8436 | -79174.64418 | 3399759.2213 |
| 2 | 850 | 107.06 | 11461.8436 | 1227104.976 | 131373858.7109 |
| 3 | 600 | -142.94 | 20431.8436 | -2920527.724 | 417460232.8949 |
| 4 | 650 | -92.94 | 8637.8436 | -802801.1842 | 74612342.0581 |
| 5 | 980 | 237.06 | 56197.4436 | 13322165.98 | 3158152667.1752 |
| 6 | 750 | 7.06 | 49.8436 | 351.895816 | 2484.3845 |
| 7 | 500 | -242.94 | 59019.8436 | -14338280.8 | 3483341938.5685 |
| 8 | 890 | 147.06 | 21626.6436 | 3180414.208 | 467711713.4014 |
| 9 | 880 | 137.06 | 18785.4436 | 2574732.9 | 352892891.2488 |
| 10 | 700 | -42.94 | 1843.8436 | -79174.64418 | 3399759.2213 |
| 11 | 890 | 147.06 | 21626.6436 | 3180414.208 | 467711713.4014 |
| 12 | 720 | -22.94 | 526.2436 | -12072.02818 | 276932.3265 |
| 13 | 680 | -62.94 | 3961.4436 | -249333.2602 | 15693035.3960 |
| 14 | 650 | -92.94 | 8637.8436 | -802801.1842 | 74612342.0581 |
| 15 | 790 | 47.06 | 2214.6436 | 104221.1278 | 4904646.2750 |
| 16 | 670 | -72.94 | 5320.2436 | -388058.5682 | 28304991.9633 |
| 17 | 680 | -62.94 | 3961.4436 | -249333.2602 | 15693035.3960 |
| 18 | 900 | 157.06 | 24667.8436 | 3874331.516 | 608502507.8741 |
| 19 | 880 | 137.06 | 18785.4436 | 2574732.9 | 352892891.2488 |
| 20 | 720 | -22.94 | 526.2436 | -12072.02818 | 276932.3265 |
| 21 | 850 | 107.06 | 11461.8436 | 1227104.976 | 131373858.7109 |
| 22 | 700 | -42.94 | 1843.8436 | -79174.64418 | 3399759.2213 |
| **Shop** | **Price ¥** |  |  |  |  |
| 23 | 780 | 37.06 | 1373.4436 | 50899.81982 | 1886347.3224 |
| 24 | 850 | 107.06 | 11461.8436 | 1227104.976 | 131373858.7109 |
| 25 | 750 | 7.06 | 49.8436 | 351.895816 | 2484.3845 |
| 26 | 780 | 37.06 | 1373.4436 | 50899.81982 | 1886347.3224 |
| 27 | 590 | -152.94 | 23390.6436 | -3577365.032 | 547122208.0222 |
| 28 | 650 | -92.94 | 8637.8436 | -802801.1842 | 74612342.0581 |
| 29 | 580 | -162.94 | 26549.4436 | -4325966.34 | 704872955.4696 |
| 30 | 750 | 7.06 | 49.8436 | 351.895816 | 2484.3845 |
| 31 | 800 | 57.06 | 3255.8436 | 185778.4358 | 10600517.5477 |
| 32 | 550 | -192.94 | 37225.8436 | -7182354.264 | 1385763431.7317 |
| 33 | 750 | 7.06 | 49.8436 | 351.895816 | 2484.3845 |
| 34 | 700 | -42.94 | 1843.8436 | -79174.64418 | 3399759.2213 |
| 35 | 600 | -142.94 | 20431.8436 | -2920527.724 | 417460232.8949 |
| 36 | 800 | 57.06 | 3255.8436 | 185778.4358 | 10600517.5477 |
| 37 | 800 | 57.06 | 3255.8436 | 185778.4358 | 10600517.5477 |
| 38 | 880 | 137.06 | 18785.4436 | 2574732.9 | 352892891.2488 |
| 39 | 790 | 47.06 | 2214.6436 | 104221.1278 | 4904646.2750 |
| 40 | 790 | 47.06 | 2214.6436 | 104221.1278 | 4904646.2750 |
| 41 | 780 | 37.06 | 1373.4436 | 50899.81982 | 1886347.3224 |
| 42 | 600 | -142.94 | 20431.8436 | -2920527.724 | 417460232.8949 |
| 43 | 670 | -72.94 | 5320.2436 | -388058.5682 | 28304991.9633 |
| 44 | 680 | -62.94 | 3961.4436 | -249333.2602 | 15693035.3960 |
| 45 | 650 | -92.94 | 8637.8436 | -802801.1842 | 74612342.0581 |
| **Shop** | **Price ¥** |  |  |  |  |
| 46 | 890 | 147.06 | 21626.6436 | 3180414.208 | 467711713.4014 |
| 47 | 930 | 187.06 | 34991.4436 | 6545499.44 | 1224401125.2120 |
| 48 | 650 | -92.94 | 8637.8436 | -802801.1842 | 74612342.0581 |
| 49 | 777 | 34.06 | 1160.0836 | 39512.44742 | 1345793.9590 |
| 50 | 700 | -42.94 | 1843.8436 | -79174.64418 | 3399759.2213 |
| **Total** | **37147** | **0** | **576836.82** | **1608681.6384** | **15768306648.9172** |

**First four moments about mean.**

**Beta Ratios**

**Skewness**

If , the distribution is **negatively skewed**.

If , the distribution is **symmetric**.

If , the distribution is **positively skewed**.

**Kurtosis**

If , the distribution is **platykurtic**.

If , the distribution is **mesokurtic**.

If , the distribution is **leptokurtic**.

**Data taken from 50 Ramen Shops in Kyoto, Japan**

**Prices of Ramen Bowl**

Let’s take an arbitrary value from Mid-Point column

As we already know that class interval is

So, we can change the origin and scale of data as follows

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Lower Class Limit** | **Upper Class Limit** | **Frequency** | **Mid-Point** |  |
| 500 | 600 | 4 | 550 | -2 |
| 600 | 700 | 13 | 650 | -1 |
| 700 | 800 | 18 | 750 | 0 |
| 800 | 900 | 12 | 850 | 1 |
| 900 | 1000 | 3 | 950 | 2 |
|  |  | **50** |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| -2 | 4 | -8 | 16 |
| -1 | 1 | -1 | 1 |
| 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 |
| 2 | 4 | 8 | 16 |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| -8 | 16 | -32 | 64 |
| -13 | 13 | -13 | 13 |
| 0 | 0 | 0 | 0 |
| 12 | 12 | 12 | 12 |
| 6 | 12 | 24 | 48 |
| **-3** | **53** | **-9** | **137** |

**Moments about Zero (After Changing Scale of a group data with equal class interval )**

**Moments about Mean**

**Calculations:**