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Problem Statement 1

The marks awarded for an assignment set for a Year 8 class of 20 students were as follows:
6 7 5 7 7 8 7 6 9 7 4 10 6 8 8 9 5 6 4 8

Calculate the mean, median, mode and standard deviation for the problem statements 1 & 2.

Solution

1.1 Calculation of Mean

The mean is given by $\bar{X} = \frac{1}{20}\sum_{i=1}^{20} i$, where I represents the individual marks of the 20 students
N=20

Step 1 $= \frac{6+7+5+7+7+8+7+6+9+7+4+10+6+8+8+9+5+6+4+8}{20}$

=137/20

=6.85

1.2 Calculation of Median

Step 1= Sort the individual marks of the 20 students in descending order
Step 2 = average the middle 2 numbers

Sorted Marks= 4 4 5 5 6 6 6 6 7 7 7 7 7 8 8 8 8 9 9 10
Median = (7+7)/2

=7

1.3 Calculation of Mode

Mode
Mode is the most recurring mark (mark with highest frequency)
Mode = **7**

1.4 Calculation of standard deviation

Standard Deviation

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

$$= \sqrt{\frac{(6-6.85)^2+(6-6.85)^2+(6-6.85)^2+(6-6.85)^2+(7-6.85)^2+(7-6.85)^2+(7-6.85)^2+(7-6.85)^2+(8-6.85)^2+(8-6.85)^2+(8-6.85)^2+(9-6.85)^2+(9-6.85)^2+(10-6.85)^2+(5-6.85)^2+(5-6.85)^2+(4-6.85)^2+(4-6.85)^2+(7-6.85)^2+(8-6.85)^2}{20-1}}$$

$$=\frac{\sqrt{0.7225+0.7225+0.7225+0.7225+0.0225+0.0225+0.0225+0.0225+1.3225+1.3225+1.3225+4.6225+4.6225+9.9225+3.4225+3.4225+8.1225+8.1225+0.0225+1.3225}}{19}$$

$$=\frac{\sqrt{41.305}}{19}$$

=1.63

Problem Statement 2

The number of calls from motorists per day for roadside service was recorded for a particular month: 28, 122, 217, 130, 120, 86, 80, 90, 140, 120, 70, 40, 145, 113, 90, 68, 174, 194, 170, 100, 75, 104, 97, 75, 123, 100, 75, 104, 97, 75, 123, 100, 89, 120, 109

Calculate the mean, median, mode and standard deviation for the problem statements 1 & 2.

2.1 Calculation of Mean

Mean is given by: $\bar{X} = \frac{1}{n}\sum X_i$, where I represents the number of calls per day for roadside service

N=35

Step 1 $=\frac{130+120+86+80+90+140+120+70+40+145+113+90+68+\ldots\ldots\ldots\ldots\ldots\ldots\ldots+109}{35}$

=3763/35

=**107.514**

2.2 Calculation of Median

Median is given by the number in the middle of the ordered data set below

Step 1= Sort the number of calls from motorist per day by the roadside service
Step 2 = average the middle 2 numbers

Sorted numbers = 28 40 68 70 75 75 75 75 80 86 89 90 90 97 97 100 100 100 104 104 109 113 120 120 120 122 123 123 130 140 145 170 174 194 217

Median = **100**

2.3 Calculation of Mode

Mode is the most recurring mark (mark with highest frequency)
Mode = **75**

2.4 Calculation of standard deviation

Standard Deviation

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n - 1}}$$

28 40 68 70 75 75 75 75 80 86 89 90 90 97 97 100 100 100 104 104 109 113 120 120 120 122 123 123 130 140 145 170 174 194 217

$$= \sqrt{\frac{(28-107.514)^2+(40-107.514)^2+(668-107.514)^2+\cdots\ldots\ldots\ldots\ldots\ldots\ldots\ldots+(217-107.514)^2+}{35-1}}$$

=52.62

Problem Statement 3

The number of times I go to the gym in weekdays, are given below along with its associated probability:

x = 0, 1, 2, 3, 4, 5 and f(x) = 0.09, 0.15, 0.40, 0.25, 0.10, 0.01 Calculate the mean no. of workouts in a week. Also evaluate the variance involved in it.

Mean is given by:

$$E[X] = \sum X_i f(X) = 0(0.09) + 1(0.15) + 2(0.40) + 3(0.25) + 4(0.10) + 5(0.01)$$

$$= 0 + 0.15 + 0.80 + 0.75 + 0.40 + 0.05$$

$$= \mathbf{2.15}$$

Problem Statement 4:

Let the continuous random variable D denote the diameter of the hole drilled in an aluminium sheet. The target diameter to be achieved is 12.5mm. Random disturbances in the process often result in inaccuracy. Historical data shows that the distribution of D can be modelled by the PDF $f(d) = 20e^{-20(d-12.5)}, d \geq 12.5$. *If a part with diameter > 12.6 mm needs to be scrapped, what is the proportion of those parts? What is the CDF when the diameter is of 11 mm? What is the conclusion of this experiment?*

Solution 4:

The variable of interest d is not present in the pdf which makes it difficult to answer the question