

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

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In [1]: import statistics as stat
        from math import sqrt

marks = [6,7,5,7,7,8,7,6,9,7,4,10,6,8,8,9,5,6,4,8]

print("\nCalculation using statistics library")
print("Mean = " , stat.mean(marks))
print("Variance = " , stat.variance(marks))
print("Standard_deviation = " , stat.stdev(marks))
print("Median = " , stat.median(marks))
print("Mode = " , stat.mode(marks))

Calculation using statistics library
Mean = 6.85
Variance = 2.6605263157894736
Standard_deviation = 1.6311119875071343
Median = 7.0
Mode = 7
```

$$\text{Mean} = (\sum x_i) / n$$

x_i = Each value in the data set n = Total number of values in the data set

\sum of x_i = $(6+7+5+7+7+8+7+6+9+7+4+10+6+8+8+9+5+6+4+8)/20 = 6.85$ The Mean of the given data is 6.85

1. Median: The Median is the "middle" of a sorted list of numbers

Slno	Data
1	4
2	4
3	5
4	5
5	6
6	6
7	6
8	6
9	7
10	7
11	7
12	7
13	7
14	8
15	8
16	8
17	8
18	9
19	9
20	10

Median of the given data set = Sum of middle values / 2 = $(7 + 7) / 2 = 6.5$

1. Mode: Mode of the data is the most repeated value in the data set. Hence, Mode of the given data set = 7 (most repeated value)

Standard Deviation:

$$SD = \sqrt{\sum (x - \bar{x})^2 / n}$$

Sno	Data
1	4
2	4
3	5
4	5
5	6
6	6
7	6
8	6
9	7
10	7
11	7
12	7
13	7
14	8
15	8
16	8
17	8
18	9
19	9
20	10

Standard Deviation = $50.55 / 20 = \sqrt{2.5275} = 1.5898$

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Problem Statement 2:

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In [4]: # 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 statement
s
import statistics as stat
from math import sqrt
no_of_calls= [28, 122, 217, 130, 120, 86, 80, 90, 140, 120, 70, 40, 145, 113, 90, 6
8, 174, 194, 170, 100, 75, 104, 97, 75, 123, 100, 75, 104, 97, 75, 123, 100, 89, 120
, 109]
print("\nCalculation using statistics library")
print("Mean = ", stat.mean(no_of_calls))
print("Variance = ", stat.variance(no_of_calls))
print("Standard_deviation = ", stat.stdev(no_of_calls))
print("Median =", stat.median(no_of_calls))
print("Mode = ", stat.mode(no_of_calls))
```

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Calculation using statistics library
Mean = 107.51428571428572
Variance = 1547.5512605042018
Standard_deviation = 39.33892805484412
Median = 100
Mode = 75
```

Mean:

$$\text{Mean} = (\sum x_i) / n$$

x_i = Each value in the data set

n = Total number of values in the data set

$$\sum x_i = 3763$$

$$n = 35$$

$$3763 / 35 = 107.51$$

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Median:

$$\{(n + 1) \div 2\}\text{th element}$$

$$n = 35$$

$$n+1 = 35+1 = 36$$

$$\{(n + 1) \div 2\}\text{th element} = 36 / 2 = 18 = 100 \text{ from the below table}$$

Sno	Data
1	4
2	4
3	5
4	5
5	6
6	6
7	6
8	6
9	7
10	7
11	7
12	7
13	7
14	8
15	8
16	8
17	8
18	9
19	9
20	10

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Mode:

Mode of the data is the most repeated value in the data set.

Mode of the given data set = 75 (most repeated value)

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Standard Deviation:

Sno	Data
1	4
2	4
3	5
4	5
5	6
6	6
7	6
8	6
9	7
10	7
11	7
12	7
13	7
14	8
15	8
16	8
17	8
18	9
19	9
20	10

Sno	Data
1	4
2	4
3	5
4	5
5	6
6	6
7	6
8	6
9	7
10	7
11	7
12	7
13	7
14	8
15	8
16	8
17	8
18	9
19	9
20	10

Standard Deviation = $54593 / 35 = \sqrt{1559.8} = 39.4943$

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Problem Statement 3

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In [5]: # The number of times I go to the gym in weekdays, are given below along with its a
        # ssociated probability:
        # x = 0, 1, 2, 3, 4, 5
        # 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.
        '''
        Solution:
        Mean==>  $E[x] = x_1*f(x_1)+x_2*f(x_2)+x_3*f(x_3)+\dots+x_n*f(x_n)$ 
        variance ==>  $E[(x-\text{mean})^2] = (x_1-\text{mean})^2 * f(x_1) + (x_2-\text{mean})^2 * f(x_2) + \dots + (x_n-\text{mean})^2 * f(x_n)$ 
        '''

        import statistics as stat
        from math import sqrt
        x=[0,1,2,3,4,5]
        func_x = [0.09, 0.15, 0.40, 0.25, 0.10, 0.01]
        mean=0
        variance =0
        for n in range(len(x)):
            mean += x[n]*func_x[n]
        print("Mean no. of workouts in a week or Expected Value = ",mean )
        for n in range(len(x)):
            variance += (x[n]-mean)**2 * func_x[n]
        print("Variance = ", variance)

        Mean no. of workouts in a week or Expected Value =  2.15
        Variance =  1.2275

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Expected Mean of the Work outs:

Let us call x as No. of Work outs in a week

P(x) is given as - f(x) = 0.09, 0.15, 0.40, 0.25, 0.10, 0.01

Calculation of Expected mean number of workouts in a week = Weighted average of the workouts and the probability.

i.e., Expected mean of work outs (E) = E(x) :

Sno	Data
1	4
2	4
3	5
4	5
5	6
6	6
7	6
8	6
9	7
10	7
11	7
12	7
13	7
14	8
15	8
16	8
17	8
18	9
19	9
20	10

Sno	Data
1	4
2	4
3	5
4	5
5	6
6	6
7	6
8	6
9	7
10	7
11	7
12	7
13	7
14	8
15	8
16	8
17	8
18	9
19	9
20	10

In []: