# Answer on Question #63775 – Math – Statistics and Probability

## Question

Bio Chemical Oxygen Demand(BOD) concentration depends upon velocity of flow. Work out the appropriate mean value from the data of velocity of flow ( m/s) and BOD values given below.

5.0. 9.0. 6.0. 40.0. 2.0. 6.0. 3.0. 10.0. 5.0. 3.0. 7.0 BOD ( mg/l;)

0.8 1.0 1.2 1.4 1.0 1.3 1.0 1.4 1.2 1.0 0.9 Vel( m/S)

What statistic will you compute?

## Solution

| | $x$ | $y$ | $x^2$ | $y^2$ | $xy$ |
|---|---|---|---|---|---|
| | 0.8 | 5 | 0.64 | 25 | 4 |
| | 0.9 | 7 | 0.81 | 49 | 6.3 |
| | 1 | 9 | 1 | 81 | 9 |
| | 1 | 2 | 1 | 4 | 2 |
| | 1 | 3 | 1 | 9 | 3 |
| | 1 | 3 | 1 | 9 | 3 |
| | 1.2 | 6 | 1.44 | 36 | 7.2 |
| | 1.2 | 5 | 1.44 | 25 | 6 |
| | 1.3 | 6 | 1.69 | 36 | 7.8 |
| | 1.4 | 40 | 1.96 | 1600 | 56 |
| | 1.4 | 10 | 1.96 | 100 | 14 |
| **Total** | **12.2** | **96** | **13.94** | **1974** | **118.3** |

Mean velocity of flow is

$$\bar{x} = \frac{\sum x}{n} = \frac{0.8 + 0.9 + 1 + 1 + 1 + 1 + 1.2 + 1.2 + 1.3 + 1.4 + 1.4}{11} = \frac{12.2}{11} = 1.11\frac{m}{s}$$

Mean BOD is

$$\bar{y} = \frac{\sum y}{n} = \frac{5 + 7 + 9 + 2 + 3 + 3 + 6 + 5 + 6 + 40 + 10}{11} = \frac{96}{11} = 8.73\frac{mg}{l}$$

We need to compute the correlation coefficient between velocity of flow and BOD:

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{(n\sum x^2 - (\sum x)^2)((n\sum y^2 - (\sum y)^2)}} = \frac{11 \cdot 118.3 - 12.2 \cdot 96}{\sqrt{(11 \cdot 13.94 - (12.2)^2)((11 \cdot 1974 - (96)^2)}} = 0.60$$

$r = 0.60$ means that there is the positive strong linear relationship between velocity of flow and BOD.