**Expected value of a Discrete Random Variable**

The expected value , or mean, of a random variable is a measure of centrality for random variables, and is given by

E(X) = \mu  = \sum xf(x)

That is, the sum of each numerical outcomes multiplied by their respective probabilities.

From last example (operating rooms)

|  |  |
| --- | --- |
| **Value of Random Variable**  **(no. of rooms used)** | **Probability** |
| **1** | **0.15** |
| **2** | **0.25** |
| **3** | **0.40** |
| **4** | **0.20** |

E(x) = (1  \times 0.15) + (2 \times 0.25) + (3 \times 0.4) + (4 \times 0.2)

E(x) = 0.15 + 0.50 + 1.2 + 0.8 

E(x) = 2.65

On an average day 2.65 operating rooms are used.

**Variance**

The variance of a discrete random variable is a measure of the variability for the random variable

\mbox{Var}(X) = \sigma^2  = \sum ( x - \mu )^2f(x)

Again, the standard deviation measures variability in the units of the random variable and is defined as the square root of the variance.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | f(x) | x-\mu | (x-\mu)^2 | (x-\mu)^2f(x) |
| ***1*** | ***0.15*** | ***1-2.65 = -1.65*** | ***(-1.65)^2 = 2.7225*** | ***0.408375*** |
| ***2*** | ***0.25*** | ***2-2.65 = -0.65*** | ***(-0.65)^2 = 0.4225*** | ***0.105625*** |
| ***3*** | ***0.40*** | ***3-2.65 = 0.35*** | ***(0.35)^2 = 0.1225*** | ***0.049*** |
| ***4*** | ***0.20*** | ***4-2.65 = 1.35*** | (1.35)^2 = 1.8225 | ***0.3645*** |

\mbox{Var}(X)  is the summation of the last column i.e ***0.9275***