

## Finding the Population Mean and Population Standard Deviation for a Discrete Probability Distribution

x	P(x)
3	.05
4	.15
5	.40
6	.30
7	.10

It does not matter if the values for each P(x) in the table to the left were found using a sample or were found using a theoretical model or formula. Once we complete a Discrete Probability Distribution Table and state each P(x) for every x we are claiming that this table will be used as **a model for the entire population**. The mean and standard deviation found using the P(x) values in the table will be considered as population values.

### The Mean (or Expected Value) for the Random Variable x.

The Mean of a Discrete Discrete Probability Distribution is denoted by  $\mu_x$ . It can be defined by

$$\mu_x = \sum [x \cdot P(x)]$$

The Standard Deviation of a Discrete Probability Distribution is denoted by  $\sigma_x$ . It can be defined by

$$\sigma_x = \sqrt{\sum [(x - \mu_x)^2 \cdot P(x)]}$$

**We will not use the formulas listed above** to find the Mean and Standard Deviation of a Discrete Probability Distribution. We will rely on our calculator to provide us with the values. It is important to note that the definition above states that we are finding the **Population Mean  $\mu_x$  and Population Standard Deviation ( $\sigma_x$ )** for the Discrete Probability Distributions.

### Round Off Rule:

Round off the answer for the Mean and Standard Deviation to **two decimal places**.

Finding the **Population Mean  $\mu_x$  and Population Standard Deviation ( $\sigma_x$ )**  
for a **Discrete Probability Distribution** using the TI-30XIIS

**Note:** The TI 30X IIS Calculator **will not allow the frequency to be a decimal**. To use this calculator for the problems below **multiply each of the P(x) values in the table by 100** to create whole numbers.

Finding the **Population Mean  $\mu_x$  and Population Standard Deviation ( $\sigma_x$ )**  
for a **Discrete Probability Distribution with the TI-30XIIS**

1. Push the DATA button and input the x values into  $x_1, x_2, x_3$  etc.
2. In the FREQ line for each P(x) use  $100 \cdot (P(x))$  to create a whole number for the Freq. (x) for each x
3. Push the STAT VAR button
4. Find  $\mu_x$  by using  $\bar{x}$
5. The standard deviation for these tables is the population standard deviation  $\sigma_x$

### Example 1

Find the Population Mean  $\mu_x$  and Population Standard Deviation  $\sigma_x$  for the Probability Distribution below.

x	P(x)
0	.10
1	.20
2	.40
3	.22
4	.08

Convert the table on the left  
into the table on the right by  
**multiplying each P(x) by 100**  
and then use this new table to find  
the population mean and  
the population standard deviation

x	100•P(x)
0	10
1	20
2	40
3	22
4	8

The Population Means  $\mu_x$  and the Population Standard Deviations  $\sigma_x$  for the two tables will be the same.  $N = 100$  in the second table.

**Answer:** Population Mean  $\mu_x = 1.98$  Population Standard Deviation  $\sigma_x = 1.07$

Find the Population Mean  $\mu_x$  and Population Standard Deviation  $\sigma_x$  for each Discrete Probability Distributions below.

**Example 2:**

<b>x</b>	<b>P(x)</b>
0	.09
1	.15
2	.23
3	.36
4	.17

**Answers:**

**Mean =  $\mu_x = 2.37$**

**SD =  $\sigma_x = 1.19$**

**Example 3:**

<b>x</b>	<b>P(x)</b>
1	.04
2	.25
3	.37
4	.23
5	.11

**Answers:**

**Mean =  $\mu_x = 3.12$**

**SD =  $\sigma_x = 1.03$**