

## Worksheet: Calculating population parameters by hand

This worksheet guides you through calculating population parameters by hand. We have completed the worksheet for an example set of data; in this case the data represents 20 scores from a test where the maximum score was 100.

<b>Step 1.</b> List your values below.		<b>Step 3.</b> Square each value.
X <sub>1</sub>	48	2304
X <sub>2</sub>	67	4489
X <sub>3</sub>	95	9025
X <sub>4</sub>	99	9801
X <sub>5</sub>	66	4356
X <sub>6</sub>	100	10000
X <sub>7</sub>	75	5625
X <sub>8</sub>	34	1156
X <sub>9</sub>	80	6400
X <sub>10</sub>	85	7225
X <sub>11</sub>	60	3600
X <sub>12</sub>	100	10000
X <sub>13</sub>	95	9025
X <sub>14</sub>	60	3600
X <sub>15</sub>	70	4900
X <sub>16</sub>	50	2500
X <sub>17</sub>	86	7396
X <sub>18</sub>	90	8100
X <sub>19</sub>	75	5625
X <sub>20</sub>	84	7056
<b>Step 2. Calculate <math>\sum x</math>:</b> Add up all values from Step 1.  $\sum x = 1519$		<b>Step 4. Calculate <math>\sum x^2</math>:</b> Add up all values from Step 3.  $\sum x^2 = 122183$

**Step 5. Calculate  $(\sum x)^2$** 

Square the outcome of Step 2.

$$(\sum x)^2 = 1519^2 = 2307361$$

**Step 6. Calculate  $\frac{(\sum x)^2}{N}$** 

Take the result of Step 5 and divide it by the number of values you listed at the start.

$$\frac{(\sum x)^2}{N} = \frac{1519^2}{20} = \frac{2307361}{20} = 115368.05$$

**Step 7. Compute  $SS = \sum x^2 - \frac{(\sum x)^2}{N}$** 

Take the result of step 4 ( $\sum x^2$ ) and deduct from it the result of step 6.

$$SS = 122183 - 115368.05 = 6814.95$$

**Step 8. Compute the variance ( $\sigma^2$ )**

Divide the result of Step 7 by the number of values. This is your variance ( $\sigma^2$ ).

$$\sigma^2 = \frac{SS}{N} = \frac{6814.95}{20} = 340.75$$

**Step 9. Calculate the standard deviation ( $\sqrt{\sigma^2}$ )**

Take the square root of the result of Step 9.

$$\sqrt{\sigma^2} = \sqrt{340.75} = 18.46$$