1. Consider following data set representing final exam scores for several students from STP226 class

   38, 67, 89, 56, 76, 92, 101, 75, 34, 21, 77

   a) Compute standard deviation of these scores treating the data as a sample
   Show work and use proper notation.

   b) Compute standard deviation of these scores treating the data as a population. (use computations from part a and use proper notation.

2. Math part of SAT test scores has mean $\mu = 500$ and SD $\sigma = 100$
ACT test scores have mean $\mu = 18$ and SD $\sigma = 6$.
Eleanor scored 680 on her SAT math test, Frodo received score of 27 on his ACT test.
Assuming that both tests measured the same ability, who has a better score.
(Compute and compare $z$-scores to answer the question)

3. Jesse wanted to compute SD of his weight measurements last week. He computed the following deviations from his mean weight that week:

   -1, 2, 3, -4, 1, 0, ? (one deviation is missing)

   a. What is the missing deviation?

   b. Can you guess what were his weight measurements that week? Do you think there is only one possible answer?
1. a) using definition \( \bar{x} = 66 \)

\[
(x_i - \bar{x}) = \begin{array}{cccccccccc}
-28 & 1 & 23 & -10 & 10 & 26 & 35 & 9 & -32 & -45 & 11 & 0 \\
(x_i - \bar{x})^2 = \begin{array}{cccccccccc}
784 & 1 & 529 & 100 & 100 & 676 & 1225 & 81 & 1024 & 2025 & 121 & 6666 \\
\end{array}
\]

\[
s = \sqrt{6666/10} = 25.82
\]

or using computational formula

\[
x : 38       67       89        56         76        92          101      75         34        21     77 \\
x^2 : 1444    4489   7921    3136     5776     8464     10201   5625    1156     441  5929 \\
\sum x_i = 726 \quad \sum x_i^2 = 54582 \\
s = \sqrt{54582 - \frac{726^2}{11}} = \sqrt{6666/10} = 25.82
\]

b) \( \mu = 66 \quad \sigma = \sqrt{6666/11} = 24.62 \)

2. Eleanor: \[ z = \frac{680 - 500}{100} = 1.8 \quad \text{Frodo:} \quad z = \frac{27 - 18}{6} = 1.5 \]

Eleanor's score is better (1.8>1.5)

3. Sum of deviations from the mean = 0, so last deviation is (-1)

-1, 2, 3, -4, 1, 0, -1

Let call his measurements: \( x_1, x_2, x_3, x_4, x_5, x_6, x_7 \) and mean: \( \bar{x} \)

His measurements can be found as follows:

\[
x_1 - \bar{x} = -1, \quad \text{so} \quad x_1 = \bar{x} - 1 \\
x_2 - \bar{x} = 2, \quad \text{so} \quad x_2 = \bar{x} + 2 \\
x_3 - \bar{x} = 3, \quad \text{so} \quad x_3 = \bar{x} + 3 \\
x_4 - \bar{x} = -4, \quad \text{so} \quad x_4 = \bar{x} - 4 \\
x_5 - \bar{x} = 1, \quad \text{so} \quad x_5 = \bar{x} + 1 \\
x_6 - \bar{x} = 0, \quad \text{so} \quad x_6 = \bar{x} + 0 \\
x_7 - \bar{x} = -1, \quad \text{so} \quad x_7 = \bar{x} - 1
\]

You can have many different answers depending on the value of the mean. Suppose \( \bar{x} = 160 \), then his measurements are:

159, 162, 163, 156, 161, 160 and 159