

A2.S.4: Calculate measures of dispersion (range, quartiles, interquartile range, standard deviation, variance) for both samples and populations

1. 010406b, P.I. A2.S.4

Jean's scores on five mathematics tests were 98, 97, 99, 98, and 96. Her scores on five English tests were 78, 84, 95, 72, and 79. Which statement is true about the standard deviations for the scores?

- [A] The standard deviations for both sets of scores are equal.
- [B] The standard deviation for the math scores is greater than the standard deviation for the English scores.
- [C] The standard deviation for the English scores is greater than the standard deviation for the math scores.
- [D] More information is needed to determine the relationship between the standard deviations.

2. 010707b, P.I. A2.S.4

The term “snowstorms of note” applies to all snowfalls over 6 inches. The snowfall amounts for snowstorms of note in Utica, New York, over a four-year period are as follows: 7.1, 9.2, 8.0, 6.1, 14.4, 8.5, 6.1, 6.8, 7.7, 21.5, 6.7, 9.0, 8.4, 7.0, 11.5, 14.1, 9.5, 8.6. What are the mean and population standard deviation for these data, to the *nearest hundredth*?

- [A] mean = 9.46; standard deviation = 3.85
- [B] mean = 9.46; standard deviation = 3.74
- [C] mean = 9.45; standard deviation = 3.85
- [D] mean = 9.45; standard deviation = 3.74

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3. 060917b, P.I. A2.S.4

The accompanying table shows the scores on a classroom test.

x_i	f_i
100	7
90	10
80	4
70	4

What is the population standard deviation for this set of scores?

- [A] 10.2 [B] 25 [C] 88 [D] 10.4

4. 060630b, P.I. A2.S.4

The number of children of each of the first 41 United States presidents is given in the accompanying table. For this population, determine the mean and the standard deviation to the *nearest tenth*. How many of these presidents fall within one standard deviation of the mean?

Number of Children (x_i)	Number of Presidents (f_i)
0	6
1	2
2	8
3	6
4	7
5	3
6	5
7	1
8	1
10	1
15	1

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5. 060729b, P.I. A2.S.4

Conant High School has 17 students on its championship bowling team. Each student bowled one game. The scores are listed in the accompanying table.

Score (x_i)	Frequency (f_i)
140	4
145	3
150	2
160	3
170	2
180	2
194	1

Find, to the *nearest tenth*, the population standard deviation of these scores. How many of the scores fall within one standard deviation of the mean?

6. 080730b, P.I. A2.S.4

Mr. Koziol has 17 students in his high school golf club. Each student played one round of golf. The summarized scores of the students are listed in the accompanying table.

Score	Frequency
70	4
73	3
75	2
80	3
85	1
86	1
90	2
92	1

Find the population standard deviation of this set of students' scores, to the *nearest tenth*. How many of the individual students' golf scores fall within one population standard deviation of the mean?

7. 010927b, P.I. A2.S.4

The average monthly high temperatures, in degrees Fahrenheit, for Binghamton, New York, are given below.

January	28	July	78
February	31	August	76
March	41	September	68
April	53	October	57
May	68	November	44
June	73	December	33

For these temperatures, find, to the *nearest tenth*, the mean, the population standard deviation, and the number of months that fall within one standard deviation of the mean.

8. 080625b, P.I. A2.S.4

Beth's scores on the six Earth science tests she took this semester are 100, 95, 55, 85, 75, and 100. For this population, how many scores are within one standard deviation of the mean?

9. 010529b, P.I. A2.S.4

From 1984 to 1995, the winning scores for a golf tournament were 276, 279, 279, 277, 278, 278, 280, 282, 285, 272, 279, and 278. Using the standard deviation for the sample, S_x , find the percent of these winning scores that fall within one standard deviation of the mean.

10. 060227b, P.I. A2.S.4

An electronics company produces a headphone set that can be adjusted to accommodate different-sized heads. Research into the distance between the top of people's heads and the top of their ears produced the following data, in inches: 4.5, 4.8, 6.2, 5.5, 5.6, 5.4, 5.8, 6.0, 5.8, 6.2, 4.6, 5.0, 5.4, 5.8. The company decides to design their headphones to accommodate three standard deviations from the mean. Find, to the *nearest tenth*, the mean, the standard deviation, and the range of distances that must be accommodated.

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[1] C

[2] B

[3] A

[4] Mean = 3.6, standard deviation = 2.9, and 31, and appropriate work is shown, such as an explanation of how the solutions were found.

[3] Appropriate work is shown, but one computational or rounding error is made.

or [3] The mean and standard deviation are calculated correctly and appropriate work is shown, but the number of presidents in the specified interval is found incorrectly.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or [2] Appropriate work is shown, but one conceptual error is made, such as using the sample standard deviation.

or [2] The mean and standard deviation are calculated correctly, but the number of presidents is not found.

or [2] The mean and standard deviation are calculated incorrectly, but an appropriate number of presidents is found.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or [1] Mean = 3.6, standard deviation = 2.9, and 31, but no work is shown.

[0] Mean = 3.6 or standard deviation = 2.9 or 31, but no work is shown.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[4] obviously incorrect procedure.

[4] 16.2 and 10, and appropriate work is shown.

[3] Appropriate work is shown, but one computational or rounding error is made.

or [3] Appropriate work is shown, but the sample standard deviation(s) is used, resulting in answers of 16.7 and 10.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or [1] 16.2 and 10, but no work is shown.

[0] 16.2 or 10, but no work is shown.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[5] obviously incorrect procedure.

[4] 7.5 and 9, and appropriate work is shown.

[3] Appropriate work is shown, but one computational or rounding error is made.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or [2] Appropriate work is shown, but one conceptual error is made, such as using 7.7, the sample standard deviation.

or [2] The population standard deviation and mean are found correctly, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or [1] 7.5 and 9, but no work is shown.

[0] 7.5 or 9, but no work is shown.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an

[6] obviously incorrect procedure.

- [4] $\bar{x} = 54.2$, $\sigma = 17.6$, and the number of months is 6, and appropriate work is shown.
- [3] $\bar{x} = 54.2$, $\sigma = 17.6$, but one computational error is made in determining the number of months.
- or [3] $\bar{x} = 54.2$, but σ is incorrect, but work is shown to find an appropriate number of months.
- or [3] $\bar{x} = 54.2$, $\sigma = 17.6$, and the number of months is 6, but no work is shown.
- [2] \bar{x} and σ are incorrect, but work is shown to find an appropriate number of months.
- or [2] $\bar{x} = 54.2$, $\sigma = 17.6$, but the number of months is not determined.
- [1] 6, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response, that was obtained by an obviously incorrect procedure.
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- [2] 5, and appropriate work is shown, such as stating the mean and the standard deviation.
- [1] Appropriate work is shown, but one computational error is made, but an appropriate number of scores is found.
- or [1] Appropriate work is shown, but one conceptual error is made, such as using the sample standard deviation.
- or [1] The mean and standard deviation are found correctly, but the number of scores is missing or is incorrect.
- or [1] 5, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [4] 75, and appropriate work is shown, such as determining the mean (278.5833333) and the standard deviation for the sample (3.146667309).
- [3] Appropriate work is shown, but one computational or rounding error is made.
- or [3] Appropriate work is shown, but the standard deviation for the population (σ) is used.
- or [3] The mean, standard deviation for the sample, and interval are determined correctly, but an error is made in determining the percentage.
- or [3] The mean and standard deviation for the sample are determined correctly, but an appropriate percentage is determined for an incorrect interval.
- [2] Appropriate work is shown, but two or more computational or rounding errors are made.
- or [2] Appropriate work is shown, but one conceptual error is made.
- or [2] The mean and standard deviation for the sample are determined correctly, but no further correct work is shown.
- or [2] Either the mean or the standard deviation for the sample is determined incorrectly, but an appropriate percentage is found.
- [1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
- or [1] The standard deviation for the sample is determined correctly, but no further correct work is shown.
- or [1] 75, but no work is shown.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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[4] $\bar{x} = 5.5$, $\sigma = 0.5$, and the range is 4-7, and appropriate work is shown.

[3] $\bar{x} = 5.5$, $\sigma = 0.5$, but one computational error is made when finding the range, but appropriate work is shown.

or [3] \bar{x} is correct, but σ is incorrect, but the range is appropriate, based on the incorrect σ .

or [3] \bar{x} is incorrect, but σ and the range are appropriate, based on the incorrect \bar{x} .

[2] \bar{x} is incorrect and σ is incorrect, but the range is appropriate, based on the incorrect \bar{x} and σ .

or [2] \bar{x} is correct and σ is correct, but the range is not determined.

[1] $\bar{x} = 5.5$, $\sigma = 0.5$, and the range is 4-7, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[10] incorrect procedure.