

AP Biology Standard Deviation Practice worksheet

1. The formula for the standard deviation, $S(SD)$, is on the right: Identify what each of the following parts of the formula mean by explaining it in words.

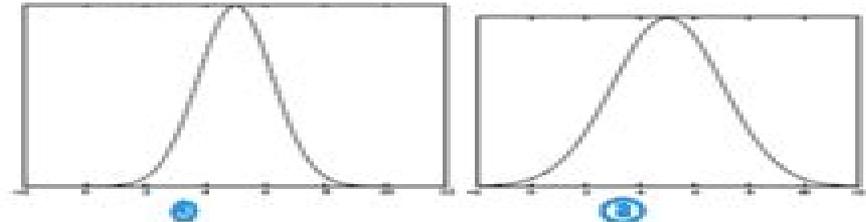
- (a) n = ~~number of data points~~
- (b) x = ~~data value~~
- (c) \sum = ~~summation~~
- (d) A name for the quantity $n - 1$ is ~~degrees of freedom~~

$$S = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

2. Consider the two figures. Each shows a distribution of data with a mean, \bar{x} , of 5. Which has a bigger standard deviation and why?

The **narrower** graph because it has a **narrower distribution**

narrower distribution - larger standard deviation



The formula for the standard error is:

$$SE_{\bar{x}} = \frac{S}{\sqrt{n}} = \sqrt{\frac{\sum (x - \bar{x})^2}{n(n-1)}}$$

3. You have three data sets with the same standard deviation, $S = 3.258$. Data Set 1 has ten observations in it ($n=10$), Data Set 2 has twenty observations in it ($n=20$), and Data Set 3 has fifty observations in it ($n=50$). For each of these calculate the standard error.

$$SE_1 = \frac{S}{\sqrt{n}}$$

$$SE_2 = \frac{3.258}{\sqrt{20}} = 0.727$$

$$SE_3 = \frac{3.258}{\sqrt{50}}$$

$$SE_3 = \frac{3.258}{7.07}$$

Data Set 1: 1.023 Data Set 2: 0.727 Data Set 3: 0.460

4. Explain how the standard error changes when the sample size changes (but the standard deviation stays the same). Then, explain how the formula for the standard error justifies this change.

As the sample size increases, the standard error decreases because the standard deviation is constant and the denominator of the formula increases.

5. You and your lab partner record the following counts of stomata in sunflower leaves.

Sunflower Plant	1	2	3	4	5	6
Stomata (per examination area)	28	33	30	32	25	28

(a) Calculate the standard deviation of the number of stomata for the sunflower leaves.

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}} = \sqrt{\frac{2(28-30)^2 + (33-30)^2 + (30-30)^2 + (32-30)^2 + (25-30)^2 + (28-30)^2}{6-1}} = 2.62$$

(b) Calculate the standard error in the number of stomata for the sunflower leaves.

$$SE = \frac{s}{\sqrt{n}} = \frac{2.62}{\sqrt{6}} = 1.07$$

6. Three classes study when fruit fly populations choose Food A over Food B. Each pair of partners in the classes record the number of times that Food A is chosen in preference to Food B in a total of 25 trials. The data from each pair for the three classes is shown below. Use the data to answer the questions below.

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8
Class 1	12	16	11	11	13	14	12	15
Class 2	10	9	18	8	16	18	13	12
Class 3	4	19	6	20	12	13	23	7

largest range

largest range

are all the same — 1st, median = 12.5

Standard Deviation Problems For Ap Biology

Patrick Vollmar



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