

Lately, many questions were asked about the standard deviation. So I'm posting here my collection of DS problems on SD, plus some tips about it.

Please note the following:

A. I was assured MANY TIMES, by various GMAT tutors, that GMAT won't ask you to actually calculate SD, but rather to understand the concept of it. Though KNOWING how it's calculated helps in understanding the concept.

B. During the real GMAT it's highly unlikely to get more than one or two question on SD (as on combinatorics), actually you may see none, so do not spend too much of your preparation time on it, it's better to concentrate on issues you'll definitely face on G-day.

Many questions below are easy, some are tough, but anyway they are good to master in solving SD problems. I'll post OA after some discussions. Please provide your way of thinking along with the answer. Thanks.

Here we go:

1. What is the standard deviation of Company R's earnings per month for this year?

- (1) The standard deviation of Company R's earnings per month in the first half of this year was \$2.3 million.
- (2) The standard deviation of Company R's earnings per month in the second half of this year was \$3.9 million.

2. What is the standard deviation of Q, a set of consecutive integers?

- (1) Q has 21 members.
- (2) The median value of set Q is 20.

3. Lifetime of all the batteries produced by certain companies have a distribution which is symmetric about mean m . If the distribution has a standard deviation of d , what percentage of distribution is greater than $m+d$?

- (1) 68 % of the distribution in the interval from $m-d$ to $m+d$, inclusive
- (2) 16% of the distribution is less than $m-d$

4. Question deleted

5. List S and list T each contain 5 positive integers, and for each list the average of the integers in the list is 40. If the integers 30, 40 and 50 are in both lists, is the standard deviation of the integers in list S greater than the standard deviation of the integers in list T?

- (1) The integer 25 is in list S
- (2) The integer 45 is in list T

6. Set T consists of odd integers divisible by 5. Is standard deviation of T positive?

- (1) All members of T are positive
- (2) T consists of only one member

7. Set X consists of 8 integers. Is the standard deviation of set X equal to zero?

- (1) The range of set X is equal to 3
- (2) The mean of set X is equal to 5

8. $\{x, y, z\}$

If the first term in the data set above is 3, what is the third term?

- (1) The range of this data set is 0.
- (2) The standard deviation of this data set is 0.

9. Question deleted

10. A scientist recorded the number of eggs in each of 10 birds' nests. What was the standard deviation of the numbers of eggs in the 10 nests?

- (1) The average (arithmetic mean) number of eggs for the 10 nests was 4.
- (2) Each of the 10 nests contained the same number of eggs.

11. During an experiment, some water was removed from each of the 6 water tanks. If the standard deviation of the volumes of water in the tanks at the beginning of the experiment was 10 gallons, what was the standard deviation of the volumes of water in the tanks at the end of the experiment?

- (1) For each tank, 30% of the volume of water that was in the tank at the beginning of the experiment was removed during the experiment.
- (2) The average (arithmetic mean) volume of water in the tanks at the end of the experiment was 63 gallons.

CALCULATING STANDARD DEVIATION OF A SET $\{x_1, x_2, \dots, x_n\}$:

- 1. Find the mean, m , of the values.
- 2. For each value x_i calculate its deviation $(x_i - m)$ from the mean.
- 3. Calculate the squares of these deviations.
- 4. Find the mean of the squared deviations. This quantity is the variance.
- 5. Take the square root of the variance. The quantity is the SD.

TIPS:

- 1. $|\text{Median} - \text{Mean}| \leq \text{SD}$.

2. Variance is the square of the standard deviation.

3. If Range or SD of a list is 0, then the list will contain all identical elements. And vice versa: if a list contains all identical elements then the range and SD of a list is 0. If the list contains 1 element: Range is zero and SD is zero.

4. SD is always ≥ 0 . SD is 0 only when the list contains all identical elements (or which is same only 1 element).

5. Symmetric about the mean means that the shape of the distribution on the right and left side of the curve are mirror-images of each other.

6. If we add or subtract a constant to each term in a set:

Mean will increase or decrease by the same constant.

SD will not change.

7. If we increase or decrease each term in a set by the same percent:

Mean will increase or decrease by the same percent.

SD will increase or decrease by the same percent.

8. Changing the signs of the element of a set (multiplying by -1) has no effect on SD.

9. The SD of any list is not dependent on the average, but on the deviation of the numbers from the average. So just by knowing that two lists having different averages doesn't say anything about their standard deviation - different averages can have the same SD.