1

The standard deviation of a set shows how much variation there is from the mean, how widespread a given set is. So, a low standard deviation indicates that the data points tend to be very close to the mean, whereas high standard deviation indicates that the data are spread out over a large range of values.

So when we add numbers, which are far from the mean we are stretching the set making SD bigger and when we add numbers which are close to the mean we are shrinking the set making SD smaller.

According to the above **adding two numbers which are closest to the mean will shrink the set most**, thus decreasing SD by the greatest amount.

Closest to the mean are 85 and 85 (actually these numbers equal to the mean) thus adding them will definitely shrink the set, thus decreasing SD most.

Answer: D.

2

If the mean of set S does not exceed mean of any subset of set S , which of the following must be true about set S?

I. Set S contains only one element
II. All elements in set S are equal
III. The median of set S equals the mean of set S

A. none of the three qualities is necessary
B. II only
C. III only
D. II and III only
E. I, II, and III

"The mean of set S does not exceed mean of **any** subset of set S" --> set S can be:
A. $S=\{x\}$ - S contains only one element (eg {7});
B. $S=\{x,x,...\}$ - S contains more than one element and all elements are equal (eg{7,7,7,7}).

Why is that? Because if set S contains two (or more) different elements, then we can always consider the subset with smallest number and the mean of this subset (mean of subset=smallest number) will be less than mean of entire set (mean of full set>smallest number).

Example: S={3, 5} --> mean of S=4. Pick subset with smallest number s'={3} --> mean of s'=3 --> 3<4.

Now let's consider the statements:

I. Set S contains only one element - not always true, we can have scenario B too ($S=\{x,x,...\}$);

II. All elements in set S are equal - true for both A and B scenarios, hence always true;

III. The median of set S equals the mean of set S - - true for both A and B scenarios, hence always true.

So statements II and III are always true.

Answer: D.

3

70 75 80 85 90 105 105 130 130 130

The list shown consist of the times, in seconds, that it took each of 10 school children to run a distance of 400 meter. If the SD of ten running times is 22.4 seconds, rounded to nearest tenth of second, how many of the 10 running times are more than one SD below the mean of the 10 running times?
A. one
B. two
C. three
D. four
E. five

"How many of the 10 running times are more than one SD below the mean" means how many data points from given 10 are less than **mean-1SD**.

We are given that SD=22.4, so we should find mean --> mean=100 --> there are only 2 data points below 100-22.4=77.6, namely 70 and 75.

Answer: B.

4

The range of a set is the difference between the largest and smallest elements of a set.

Consider the set S to be {-4, -3, -2, -1, 0, 1, 2, 3, 4} --> $mean=median=0$ and $range=8$.

A. Mean of S = mean of T --> remove 0 from set S, then the mean of T still would be 0;
B. Median of S = Median of T --> again remove 0 from set S, then the median of T still would be 0;
C. Range of S = range of T --> again remove 0 from set S, then the range of T still would be 8;
D. Mean of S > mean of T --> remove 4, then the mean of T would be negative -0.5 so less than 0;
E. Range of S < range of T --> the range of a subset cannot be more than the range of a whole set: how can the difference between the largest and smallest elements of a subset be **more** than the difference between the largest and smallest elements of a whole set.

Answer: E.