

## Average and standard deviation exercises\*

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1. A list has 10 entries. Each entry is either 1 or 2 or 3. What must the list be if the average is 1? If the average is 3? Can the average be 4?
2. Which of the following two lists has a bigger average? Or are they the same? Try to answer without doing any arithmetic.
  - (a) 10, 7, 8, 3, 5, 9
  - (b) 10, 7, 8, 3, 5, 9, 11
3. Ten people in a room have an average height of 5 feet 6 inches. An 11th person, who is 6 feet 5 inches tall, enters the room. Find the average height of all 11 people.
4. Twenty-one people in a room have an average height of 5 feet 6 inches. A 22nd person, who is 6 feet 5 inches tall, enters the room. Find the average height of all 22 people. Compare with the previous exercise.
5. Twenty-one people in a room have an average height of 5 feet 6 inches. A 22nd person enters the room. How tall would he have to be to raise the average height by 1 inch?
6. For registered students at universities in the U.S., which is larger: average age or median age?
7. The Public Health Service found that for boys age 11 in the Health and Nutrition Examination Survey from 1976-1980, the average height was 146 cm and the standard deviation was 8 cm. Fill in the blanks.
  - (a) One boy was 170 cm tall. He was above average, by \_\_\_\_\_ standard deviations.
  - (b) Another boy was 148 cm tall. He was above average, by \_\_\_\_\_ standard deviations.
  - (c) A third boy was 1.5 standard deviations below average height. He was \_\_\_\_\_ cm tall.

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\*All exercises taken from Freedman, D., Pisani, R., and Purves, R. "Statistics." Fourth Edition. WW Norton & Company, 2007.

- (d) If a boy was within 2.25 standard deviations of average height, the shortest he could have been is \_\_\_\_\_ cm and the tallest is \_\_\_\_\_ cm.
8. Each of the following lists has an average of 50. For which one is the spread of the numbers around the average the biggest? smallest?
- (a) 0, 20, 40, 50, 60, 80, 100  
 (b) 0, 48, 49, 50, 51, 52, 100  
 (c) 0, 1, 2, 50, 98, 99, 100
9. Each of the following lists has an average of 50. For each one, guess whether the standard deviation is around 1, 2, or 10. (This does not require any arithmetic.)
- (a) 49, 51, 49, 51, 49, 51, 49, 51, 49, 51  
 (b) 48, 52, 48, 52, 48, 52, 48, 52, 48, 52  
 (c) 48, 51, 49, 52, 47, 52, 46, 51, 53, 51  
 (d) 54, 49, 46, 49, 51, 53, 50, 50, 49, 49  
 (e) 60, 36, 31, 50, 48, 50, 54, 56, 62, 53
10. One investigator takes a sample of 100 men age 18-24 in a certain town. Another takes a sample of 1000 such men.
- (a) Which investigator will get a bigger average for the heights of themen in his sample? or should the averages be about the same?  
 (b) Which investigator will get a bigger standard deviation for the heights of themen in his sample? or should the standard deviations be about the same?  
 (c) Which investigator is likely to get the tallest of the sample men? or are the chances about the same for both investigators?  
 (d) Which investigator is likely to get the shortest of the sample men? or are the chances about the same for both investigators?
11. Guess which of the following lists has the larger standard deviation. Check your guess by computing the standard deviation for both lists.
- (a) 9, 9, 10, 10, 10, 12  
 (b) 7, 8, 10, 11, 11, 13
12. For each list below, work out the average and the standard deviation. How does the first list compare to the second list?
- (a) 1, 3, 4, 5, 7  
 (b) 6, 8, 9, 10, 12

13. Repeat the above exercise for the following two lists:
  - (a) 1, 3, 4, 5, 7
  - (b) 3, 9, 12, 15, 21
14. Repeat the above exercise for the following two lists:
  - (a) 5, -4, 3, -1, 7
  - (b) -5, 4, -3, 1, -7
15. Can the standard deviation ever be negative?
16. For a list of positive numbers, can the standard deviation ever be larger than the average?