Mean and standard deviation: 10 practice questions

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Name: _____ Date: _____

Attempt all questions and show your working. Suggested time: 15 to 20 minutes. Unless a question says otherwise, use the population standard deviation (σ, often shown as σ_x on a calculator), and round standard deviations that are not exact to two decimal places.

Section A: Consolidating (Questions 1-4)

Question 1

Ava recorded the number of emails she received on five days: 12, 7, 15, 9, 17.

(a) Find the mean.

(b) Find the range.

Question 2

The data set 2, 4, 4, 4, 5, 5, 7, 9 has a mean of barx = 5.

(a) Copy and complete the table.

x	2	4	4	4	5	5	7	9
x - barx	-3	☐	☐	☐	☐	☐	☐	☐
$(x - barx)^2$	9	☐	☐	☐	☐	☐	☐	☐

(b) Find the sum of the squared deviations.

(c) Find the standard deviation using σ = √((sum of squared deviations)/(n)).

Question 3

Two sets of data both have a mean of 50.

Set A: 48, 50, 50, 52, 50

Set B: 30, 70, 40, 60, 50

Without calculating, which set has the larger standard deviation? Explain.

Question 4

The number of pets in 20 households is shown.

Number of pets	0	1	2	3	4
Frequency	4	7	5	3	1

Find the mean number of pets per household.

Section B: Standard (Questions 5-10)

Question 5

A netball team scored these numbers of goals in six games: 45, 46, 48, 49, 52, 60.

(a) Find the mean.

(b) Find the standard deviation.

(c) In how many games was the score within one standard deviation of the mean? (Count a score exactly one standard deviation away as within.)

Question 6

Two Year 10 classes sat the same test. Both classes had a mean of 68%. Class A had a standard deviation of 4% and Class B had a standard deviation of 12%.

(a) Which class had the more consistent results? Explain.

(b) Describe what the standard deviation of 12% tells you about the results of Class B.

(c) Which class is more likely to include a student who scored above 90%? Explain.

Question 7

The daily maximum temperatures in a town over a fortnight had a mean of 20°C and a standard deviation of 3°C.

(a) The thermometer was found to read 2°C too low, so 2 degrees is added to every reading. Find the new mean and standard deviation.

(b) Instead, the original readings are converted to degrees Fahrenheit using $F = 1.8C + 32$. Find the mean and standard deviation in degrees Fahrenheit.

(c) Explain why adding the same number to every value does not change the standard deviation.

Question 8

Six students recorded their travel times to school in minutes: 10, 11, 14, 16, 17, 22.

(a) Find the mean and standard deviation of the six times.

(b) A seventh student, who lives on a farm, takes 64 minutes. Find the mean and standard deviation of all seven times.

(c) Describe the effect of this one value on the mean and on the standard deviation.

Question 9

For data with a symmetric, bell-shaped distribution, about 68% of values lie within one standard deviation of the mean, about 95% lie within two standard deviations, and about 99.7% lie within three standard deviations.

The heights of Year 10 students at a large school have this shape, with a mean of 168 cm and a standard deviation of 7 cm.

(a) Between which two heights do about 68% of the students lie?

(b) Between which two heights do about 95% of the students lie?

(c) In a group of 400 of these students, about how many would you expect to be taller than 175 cm?

Question 10

Sixteen students sat a quiz marked out of 10.

Score	6	7	8	9	10
Frequency	1	4	6	4	1

(a) Find the mean score.

(b) Find the standard deviation.

(c) What percentage of the students scored within one standard deviation of the mean? (Count a score exactly one standard deviation away as within.)

Mean and standard deviation: answers

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These answers use the population standard deviation (σ, dividing by n), as the test asks. If your child's calculator gave the sample standard deviation (s, dividing by n - 1), also accept: Q5(b) 5.48; Q8 (a) 4.38, (b) 18.95; Q10(b) 1.03; Q11(b) 2.92; Q12 (a) 3.16, (b) 2.83; Q14(b) Town P 4.47, Town Q 2.24; Q17(d) 22.27; Q18 (a) 13.35, (b) 4.19; Q20(c) 7.00. The other parts' answers don't change. Q2 and Q19 use the population formula given in the question.

Question 1

Answer: (a) 12 (b) 10

Question 2

Answer: (a) x - barx: -1, -1, -1, 0, 0, 2, 4; (x - barx)²: 1, 1, 1, 0, 0, 4, 16 (b) 32 (c) σ = √(32/8) = 2

Question 3

Answer: Set B, because its values are much further from the mean of 50 (Set A's values are all within 2 of the mean).

Question 4

Answer: 1.5 pets (30/20)

Question 5

Answer: (a) 50 (b) 5 (c) 5 games (scores from 45 to 55: all except 60)

Question 6

Answer: (a) Class A, because its standard deviation is smaller, so the results are closer to the mean. (b) Class B's results are much more spread out; a typical result is about 12% away from the mean of 68%. (c) Class B, because its results are more spread out (90% is less than 2 standard deviations above its mean, but more than 5 standard deviations above Class A's mean).

Question 7

Answer: (a) mean 22°C, standard deviation 3°C (b) mean 68°F, standard deviation 5.4°F (c) Every value and the mean move by the same amount, so the distance of each value from the mean (the deviations) does not change.

Question 8

Answer: (a) mean 15 minutes, standard deviation 4 minutes (b) mean 22 minutes, standard deviation 17.54 minutes (c) The mean increases by 7 minutes, but the standard

deviation increases far more (from 4 to about 17.5, more than 4 times as large); one outlier has a big effect on the standard deviation.

Question 9

Answer: (a) 161 cm to 175 cm (b) 154 cm to 182 cm (c) about 64 (16% of 400, since (100% - 68%)/(2) = 16%)

Question 10

Answer: (a) 8 (b) 1 ($\sigma = \sqrt{(16/16)}$) (c) 87.5% (14 of the 16 students scored 7, 8 or 9)