Where Did It Vary?

Sort changes in measurements and sample results.

S.Q.1.1 "Distinguish among different sources of variability, including measurement, natural, induced, and sampling variability."

NAME _____ DATE _____

MEASUREMENT VARIABILITY

The same thing is measured more than once, but the readings differ because measuring is not perfectly exact.

A pH sensor checks one unchanged solution twice and reports 6.8 and 6.9.

SAMPLING VARIABILITY

Different groups are randomly chosen from the same population. A result calculated for each group, such as an average, differs because the groups contain different members.

Two randomly chosen groups of library books have different average page counts.

1 SORT

8 items

For each numbered situation, circle MEASURE or SAMPLE to show why the results differ.

1.	A ruler gives 42.1 cm and 42.3 cm for the same unaltered board.	MEASURE SAMPLE
2.	Two random groups of 40 teens from one school have different average sleep hours.	MEASURE SAMPLE
3.	Two random sets of 25 homes from one town show different percentages with a pet.	MEASURE SAMPLE
4.	A stopwatch times the same replayed video clip at 9.8 s and 10.1 s.	MEASURE SAMPLE
5.	Repeated readings of one unchanged resistor are 99.9 ohms and 100.1 ohms.	MEASURE SAMPLE
6.	Two random samples of 60 voters from one county give different percentages supporting a new park.	MEASURE SAMPLE
7.	A digital scale reports 72.4 g and 72.6 g for one unchanged key.	MEASURE SAMPLE
8.	Two people measure the same stationary doorway and record heights of 201 cm and 202 cm.	MEASURE SAMPLE

2 PROVE IT

Explain your thinking

Pick one item from each category and explain the clue that helped you sort each one.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Write one new example of each category.

MEASURE _____

SAMPLE _____

CHALLENGE

A scientist measures the average leaf length in each of two random groups of trees. The ruler readings are not perfectly exact. Name both sources of variability and explain what causes each one.

ANSWER KEY

Where Did It Vary?

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	A ruler gives 42.1 cm and 42.3 cm for the same unaltered board.	**MEASURE**	The same board is measured twice.
2	Two random groups of 40 teens from one school have different average sleep hours.	**SAMPLE**	The averages come from different random groups.
3	Two random sets of 25 homes from one town show different percentages with a pet.	**SAMPLE**	The percentages come from different random sets of homes.
4	A stopwatch times the same replayed video clip at 9.8 s and 10.1 s.	**MEASURE**	The clip has one duration, but the recorded times differ.
5	Repeated readings of one unchanged resistor are 99.9 ohms and 100.1 ohms.	**MEASURE**	The same resistor is measured more than once.
6	Two random samples of 60 voters from one county give different percentages supporting a new park.	**SAMPLE**	The percentages come from different random samples.
7	A digital scale reports 72.4 g and 72.6 g for one unchanged key.	**MEASURE**	The same key is weighed twice.
8	Two people measure the same stationary doorway and record heights of 201 cm and 202 cm.	**MEASURE**	Two measurements of the same doorway differ.

PART 2 · PROVE IT

Task: Pick one item from each category and explain the clue that helped you sort each one.
Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **MEASURE**: A thermometer reads the same tank of water twice and shows 18.2°C and 18.4°C.
- **SAMPLE**: Two random groups of 50 trees from one forest have different average heights.

Challenge: Sampling variability comes from choosing different groups of trees, which can produce different average leaf lengths. Measurement variability comes from ruler readings that are not perfectly exact.

For Part 2, accept explanations that identify repeated measurements of one unchanged thing or results from different random groups. Item 4 describes repeated timing of one fixed-duration clip, not samples of different clips.