

Bridge Test Detectives

Trace how controlled tests guide prototype changes.

3-5-ETS1-3 "Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline three details that stayed the same in every trial. Circle the trial that did not measure bridge strength, and write 1 beside the one planned difference. These marks show how the team kept the test fair and handled a failure point.

Testing Paper Bridges

- ① Maya's team built paper bridges to hold metal washers. They wanted to learn whether the number of folds changed how much weight a bridge could hold. They made two bridge designs from identical index cards. One design had one lengthwise fold. The other had two lengthwise folds. Each bridge rested across the same two books, with the same space between them.
- ② To make the test fair, the team used index cards of the same kind for every trial. They placed each bridge on the books in the same direction and used the same tape at both ends. One person added washers, one at a time, to the center, while another counted. The team tested each design three times. The only planned difference was the number of folds. They counted washers until a bridge touched the table.
- ③ During one trial, a washer rolled off the center before the bridge bent. The team did not count that trial because it did not measure the bridge's strength. They repeated it with the washer centered and the same tape at both ends. The two-fold bridge held more washers in all three fair trials. The team saw that a bridge sagged near its middle. For a next model, they will test a bridge with an extra fold in that area.

2 ANSWER WITH EVIDENCE Use the passage

1 What was the one planned difference between the two bridge designs?

2 Name two conditions the team kept the same to make the test fair.

3 Why did the team repeat the trial when a washer rolled off the center?

4 What change will the team test in its next model, and what problem led them to choose it?

3 YOUR TURN Your own words

Plan a fair test for two toy parachute designs. Write three sentences that name one change, at least two things you will keep the same, a failure point you will handle, and one improvement you could test.

PART 1 • READ AND MARK

Underline three details that stayed the same in every trial. Circle the trial that did not measure bridge strength, and write 1 beside the one planned difference. These marks show how the team kept the test fair and handled a failure point. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	What was the one planned difference between the two bridge designs?	The number of lengthwise folds, one fold or two folds.
2	Name two conditions the team kept the same to make the test fair.	Any two: same kind of index cards, same books and direction, same tape at both ends, washers added to the center one at a time, or three trials for each design.
3	Why did the team repeat the trial when a washer rolled off the center?	A washer rolling off did not measure the bridge's strength.
4	What change will the team test in its next model, and what problem led them to choose it?	They will test an extra fold near the middle because the bridge sagged there.

PART 3 • YOUR TURN (SAMPLE ANSWER)

I will compare a parachute with a small paper canopy to one with a large paper canopy. I will use the same toy, paper, drop height, and three trials for each design. If a string tangles, I will repeat that drop, then improve the model by attaching the strings evenly.

Accept any controlled conditions that would make the parachute comparison fair, along with a clear planned difference. The response should identify a possible failure point and a reasonable prototype improvement.