Catch the Rain

Test and improve a model for conserving water

ESS.4.4 "Enrichment: Use an engineering design process to research, develop, and test models to aid in the responsible management of natural resources (e.g., recycling, composting, and energy usage).*"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the design requirements, circle the parts the students changed, and number the tests and revision in order. Use your marks to trace how evidence shaped the final model.

A Better Rain Catcher

1. At Riverton High, the garden club used tap water even after storms because its storage tank often stayed nearly empty. Students proposed a small rainwater catcher that could guide roof runoff into a covered barrel. Before building, they checked local rainfall records and learned that roof area, not just storm size, affects how much water a barrel can collect. They also asked the custodian about safety. The catcher had to keep leaves out, prevent mosquitoes from reaching stored water, and cost less than $40. The collected water would be used only on ornamental plants, never for drinking.

2. They built two tabletop models with identical sloped plastic roofs, gutters, and collection cups. One gutter ended in a wide screen; the other ended in a fine mesh screen. For each trial, they poured one liter of water and ten paper leaf pieces onto each roof at the same rate. They repeated the trial three times and averaged the results. The wide screen collected 900 milliliters of water but stopped only four leaf pieces. The fine mesh stopped all ten pieces but collected just 760 milliliters because water splashed off the narrow opening.

3. The team set a target: collect at least 800 milliliters while keeping all ten pieces out of the cup. They added a wider funnel above the fine mesh without changing the roof or the pour. In three new trials, the revised model averaged 850 milliliters and blocked every piece. It met the tabletop target, but the students did not claim it would work during every storm. Real roofs carry dirt, and heavy rain could overflow the funnel. Their next step was to test clogging with safe debris and check local rules before installing any full-size barrel.

2 ANSWER WITH EVIDENCE

Use the passage

1. How did the students' research and conversation with the custodian shape what their catcher needed to do?

2. Why did the students keep the roofs and pouring rate the same when they compared the two screens?

3. Did either original screen meet the team's target? Use both collection and leaf results to support your answer.

4. What evidence supports the team's revision, and what should they test before using a full-size catcher?

3 YOUR TURN

Your own words

Design a tabletop model to reduce water wasted by a school garden hose. Describe one fact you would research, a measurable success target, the model you would build, a fair test against a baseline, and how one possible result would guide a revision.

Catch the Rain

PART 1 · READ AND MARK

Underline the design requirements, circle the parts the students changed, and number the tests and revision in order. Use your marks to trace how evidence shaped the final model. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How did the students' research and conversation with the custodian shape what their catcher needed to do?	**Rainfall records showed that roof area affects collection. The custodian's safety input led to requirements to keep leaves and mosquitoes out and use the water only on ornamental plants.**
2	Why did the students keep the roofs and pouring rate the same when they compared the two screens?	**Keeping those conditions the same made the screen type the main difference between the models, so the results could be compared fairly.**
3	Did either original screen meet the team's target? Use both collection and leaf results to support your answer.	**Neither did. The wide screen collected 900 milliliters but stopped only four leaves. The fine mesh stopped all ten leaves but collected only 760 milliliters.**
4	What evidence supports the team's revision, and what should they test before using a full-size catcher?	**The revised model averaged 850 milliliters and blocked all ten leaf pieces, meeting the tabletop target. They should test whether debris clogs it or heavy rain causes overflow.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would research how much water the garden's seedlings need. My model would attach a trigger nozzle to a hose aimed at a tray of soil. My target is to use at least 25 percent less water than an open hose while wetting the same area. I would test both setups for 30 seconds at the same water pressure, measuring water used and the area wetted. If the nozzle leaves dry patches, I would try a wider spray setting and test again.

Accept equivalent explanations supported by the passage. For the open task, look for a research question, measurable target, model, controlled comparison, and a revision tied to a possible result.