Creekside Design Challenge

Test a solution against more than one measure of success

ZOO.10.7 "Enrichment: Use an engineering design process to develop a possible solution to an environmental issue that currently exists in an ecosystem.*"

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the problem and the two design targets, then circle one constraint the team must consider. Number the prototype, test, and revision in the order they appear.

A Basket for Willow Creek

1. After rain, wrappers and bits of foam wash from a school parking lot into a storm drain that empties into Willow Creek. A student team finds litter caught among reeds, where birds may mistake small pieces for food and larger scraps can entangle animals. The team defines the problem as keeping this litter out of the creek without backing up stormwater onto the pavement. They choose a removable basket inside the drain as a possible solution. Their design must also let maintenance workers lift out collected trash without reaching into moving water.

2. Before building, the team sets two model targets: catch at least eight of ten scraps and drain one liter in 30 seconds or less. These targets are not safety limits for a real drain. Their first basket has fine mesh. They pour one liter of water with ten paper scraps and several leaves into a plastic channel. The basket catches nine scraps, but leaves clog it, and draining takes 45 seconds. Catching litter alone does not meet both targets; slow drainage could flood the pavement. Wider mesh might drain faster, but more scraps could escape.

3. To revise the basket, the team adds a raised side spillway so water can pass around the mesh when leaves clog it. This opening could also carry litter toward the creek, so the team cannot assume the revision works. They plan to repeat the same pour, count scraps that pass the basket, and time the drainage. They will also try extra leaves to represent a clogged drain after a storm. If the spillway drains quickly but releases too much litter, they can adjust its height and test again. Only a design meeting both targets is worth considering for a supervised field trial.

2 ANSWER WITH EVIDENCE

Use the passage

1. What two measurable targets does the team use to judge its design?

2. Why does the first basket fail even though it catches nine scraps?

3. How could the side spillway fix one failure while creating another?

4. How will the team test whether its revision works under the same conditions and when the drain is more clogged?

3 YOUR TURN

Your own words

A pond beside a salted parking lot receives winter runoff that may harm amphibians. Propose a solution, state two measurable success criteria and one constraint, then describe a model test and a revision you would make if the test fails.

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PART 1 · READ AND MARK

Underline the problem and the two design targets, then circle one constraint the team must consider. Number the prototype, test, and revision in the order they appear. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What two measurable targets does the team use to judge its design?	**The model must catch at least eight of ten scraps and drain one liter of water in 30 seconds or less.**
2	Why does the first basket fail even though it catches nine scraps?	**Clogging makes the liter take 45 seconds to drain, exceeding the 30-second target and risking backed-up water.**
3	How could the side spillway fix one failure while creating another?	**It could let water drain when leaves clog the mesh, but litter could escape through the spillway.**
4	How will the team test whether its revision works under the same conditions and when the drain is more clogged?	**They will repeat the same pour, count escaping scraps, and time drainage. They will also test with extra leaves.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would add a curb and channel that direct parking-lot runoff into a lined holding tank for proper disposal instead of the pond. In a model, the channel should collect at least nine of ten liters poured onto the lot and leave no more than one liter flowing toward the pond. The channel must not block the sidewalk. I would pour ten liters of water onto a model lot and measure where it goes. If too much reaches the pond, I would widen the channel and test again.

Accept other feasible solutions if the response includes two measurable criteria, a relevant constraint, a model test, and a revision tied to a possible test result. The sample's volume targets are design goals, not established safe levels for amphibians.