

Rain Barrel Choices

Compare designs with criteria and constraints.

3-5-ETS1-2 "Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each criterion or constraint the rain collector must meet. Number the three design ideas 1, 2, and 3 so you can compare them.

Collecting Rainwater

- ① The school garden needs water during dry weeks. A student team wants to collect rain from a small shed roof. Their container must hold at least 20 liters, cost no more than \$30, and let students fill watering cans safely. The team has only a 1-meter space beside the shed. They also need a design that can be built with simple tools.
- ② One idea uses a new 25-liter plastic bin set on the ground. It costs \$18 and fits in the space, but a student must bend low to fill a can. A second idea uses two reused 12-liter buckets joined by a hose. The buckets cost \$10, but together they hold 24 liters and take up more than 1 meter when placed side by side.
- ③ A third idea uses a 22-liter bin on a sturdy wooden stand. The bin and wood cost \$28. The stand lifts the tap so a can fits underneath, but the team must check that the stand will not tip when the bin is full. Before building, students can make a small model, list each design's strengths and problems, and compare every idea with the criteria and constraints.

2 ANSWER WITH EVIDENCE Use the passage

- 1 After checking only the capacity and cost criteria, which design ideas could still work? Use details from the passage.

- 2 Which design does not meet the space constraint? Explain.

- 3 Can the team decide that one design meets every need yet? Explain using evidence from the passage.

- 4 What should students do before building, and how will those actions help them compare the designs?

3 YOUR TURN Your own words

Your class needs a way to carry 12 library books from the classroom to the library, and it must be safe, cost \$15 or less, fit through a doorway, and use at least one reused material. Write three possible solutions, compare how each is likely to meet the criteria and constraints, then choose the strongest solution and explain why.

PART 1 • READ AND MARK

Underline each criterion or constraint the rain collector must meet. Number the three design ideas 1, 2, and 3 so you can compare them. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	After checking only the capacity and cost criteria, which design ideas could still work? Use details from the passage.	All three ideas could work for capacity and cost: 25 liters for \$18, 24 liters for \$10, and 22 liters for \$28.
2	Which design does not meet the space constraint? Explain.	The two-bucket design does not meet it because the buckets take up more than 1 meter when side by side.
3	Can the team decide that one design meets every need yet? Explain using evidence from the passage.	No. The ground bin requires bending, the bucket design is too wide, and the raised-bin stand still needs a tipping test.
4	What should students do before building, and how will those actions help them compare the designs?	They should make a small model and list strengths and problems. Then they can compare each design with the criteria and constraints.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Solution 1 is a reused cardboard box with taped handles for \$2. It holds 12 books and fits through the doorway, but the handles might tear. Solution 2 is a reused milk crate with cloth-covered rope handles for \$4. It holds 12 books, fits through the doorway, and is safer to carry. Solution 3 is a small reused wagon with a cardboard tray for \$12. It holds 12 books, but it could bump into people. I would choose Solution 2 because it uses reused materials, costs less than \$15, fits through the doorway, and is likely safer and sturdier than the others.

Accept reasonable comparisons that use the stated criteria and constraints. For the open task, students should give three distinct ideas, identify likely strengths or problems for each, and support a choice with evidence.