

River Model Detectives

Examine how models help scientists test ideas and where they fall short.

7.2.A "identify advantages and limitations of models such as their size, scale, properties, and materials;"

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each advantage of a model, circle each limitation, and number details about size or scale, materials or properties, or data and assumptions.

Testing a River Valley

- ① Engineers planning for a flood sometimes build a small physical model of a river valley. They shape channels and hills in a tray, then run water through it. Because the model is much smaller than the real valley, the team can test several levee locations quickly and safely. They can watch where water collects and compare changes. A model also makes a large area easier to view at one time. However, the water, soil, and plants in the tray cannot match every condition in the real valley.
- ② Scale is useful, but it creates limits. A one-centimeter channel in a tray does not automatically stand for the same flow behavior as a channel that is many meters wide. Water moves differently when size changes because gravity, friction, and turbulence do not scale in simple ways. Engineers must choose measurements and rules that make the model useful for its purpose. They should not use the tray model alone to predict the exact height of floodwater at every house. Field measurements and computer calculations can add evidence.
- ③ Materials affect what a model can show. Clear plastic walls let a team see water moving, and molded sand can be reshaped between tests. These features are advantages for studying changing channels. Yet molded sand may not pack, erode, or absorb water like real soil. Plastic walls do not represent rock layers beneath a valley. A computer model can include soil data and rainfall records, but its results depend on the data and assumptions entered. Scientists compare model results with observations, then revise the model when evidence shows a mismatch.

2 ANSWER WITH EVIDENCE _____ Use the passage

1 Name two advantages of the tray model for engineers studying a river valley.

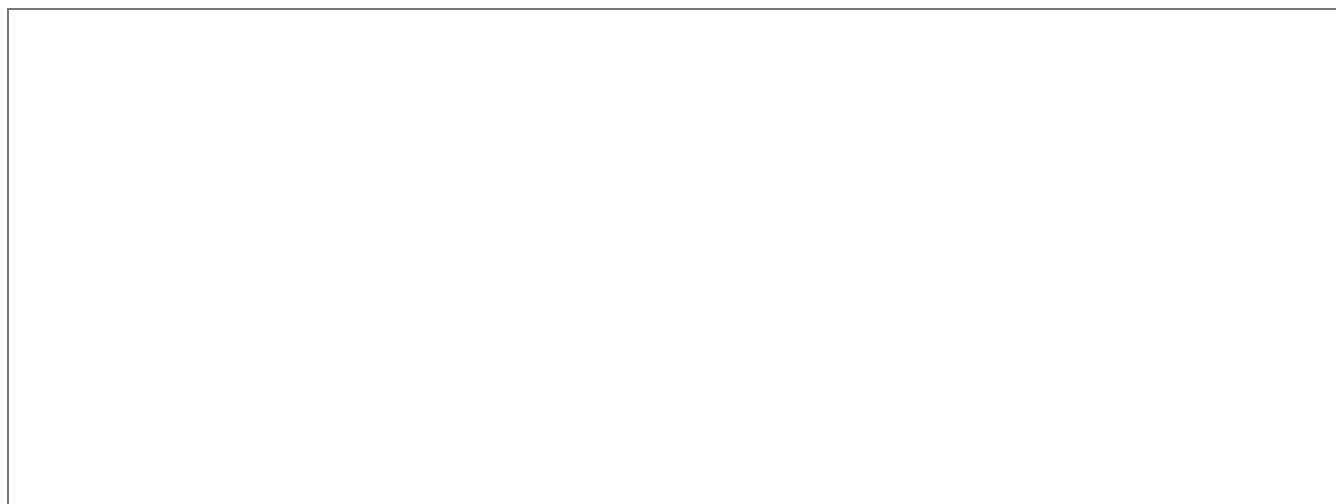
2 Why can engineers not use the tray model alone to predict the exact floodwater height at every house?

3 How do clear plastic walls and molded sand help the model? Give one limitation of molded sand.

4 Why do scientists compare model results with observations?

3 YOUR TURN _____ Your own words

Design a model to investigate where rainwater might collect in a school garden. Sketch your model, label its size or scale and one material, then write two sentences that name one advantage and one limitation.



PART 1 • READ AND MARK

Underline each advantage of a model, circle each limitation, and number details about size or scale, materials or properties, or data and assumptions. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	Name two advantages of the tray model for engineers studying a river valley.	It lets engineers test several levee locations quickly and safely, watch where water collects, compare changes, and view a large area at one time. Any two.
2	Why can engineers not use the tray model alone to predict the exact floodwater height at every house?	The model is much smaller than the real valley, and water behavior does not scale in simple ways because of gravity, friction, and turbulence.
3	How do clear plastic walls and molded sand help the model? Give one limitation of molded sand.	Clear plastic walls let the team see moving water, and molded sand can be reshaped between tests. Molded sand may not pack, erode, or absorb water like real soil.
4	Why do scientists compare model results with observations?	They compare results with observations to find mismatches and revise the model when evidence shows it needs improvement.

PART 3 • YOUR TURN (SAMPLE ANSWER)

A sketch shows a shallow tray that represents the garden at a smaller scale, with sand for soil and a small cup of water for rain. The tray model lets me see where water collects quickly, but the sand may not absorb water like the garden's real soil.

Accept many reasonable model designs if the student identifies a relevant size, scale, material, or property. The advantage and limitation must be connected to the proposed model and scientifically plausible.