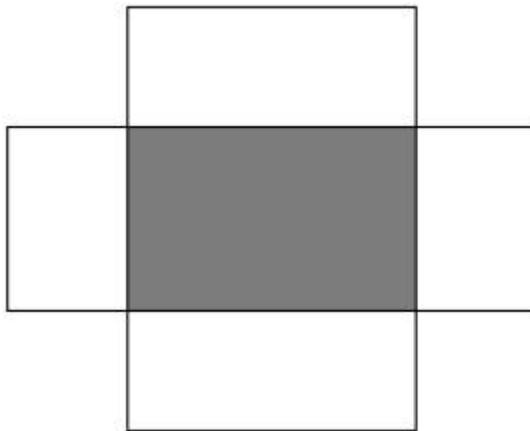
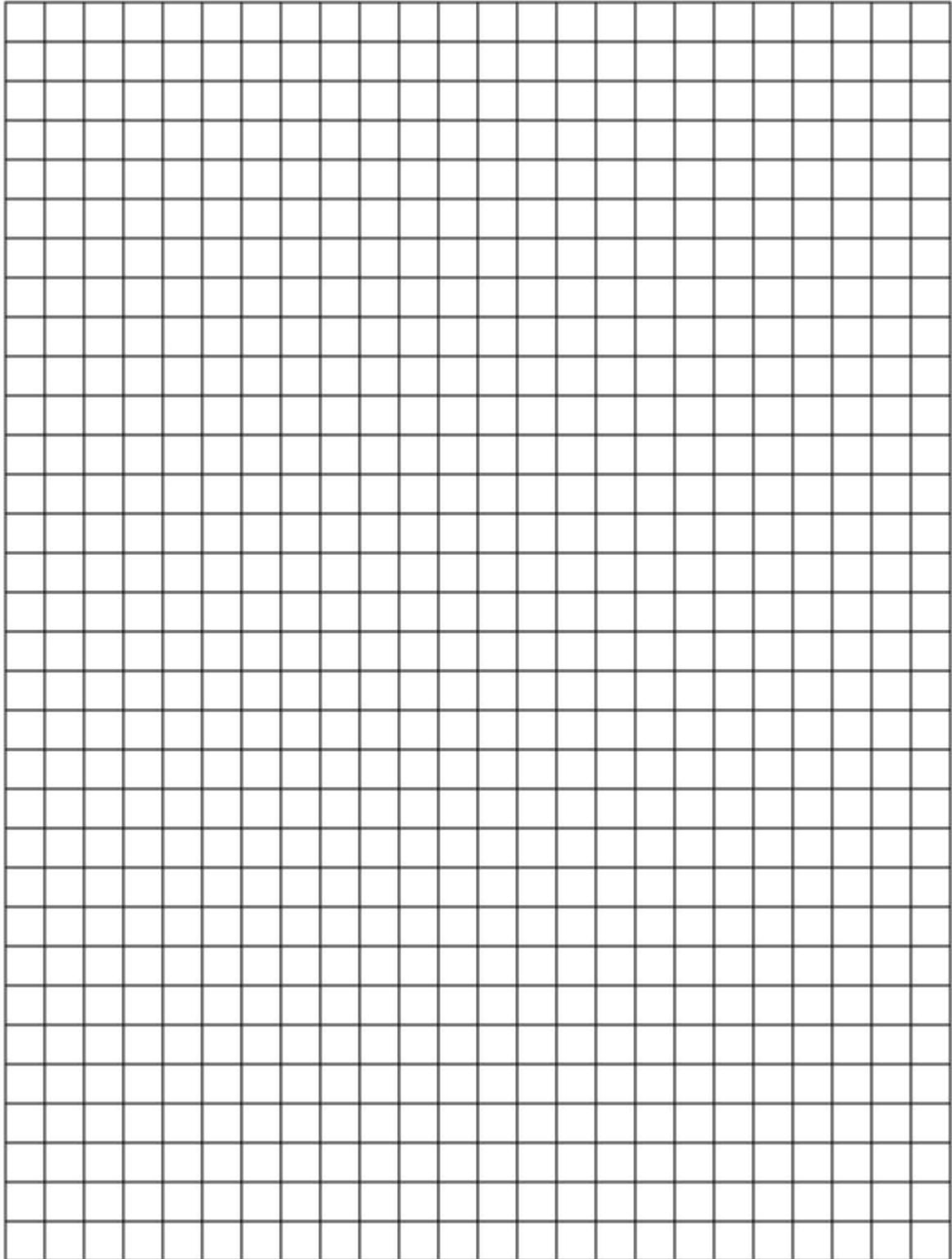


When the open box shown above is cut along the four darkened edges and then flattened, the result is shown below.



On the grid on the next page, draw two flattened boxes that will fold up into different open boxes. Each box should have a volume of 8 cubic units. Be sure to label your drawings with numbers that show the length, width, and height for each box. Each square on the grid has a side of length 1 unit.



Scoring Guide

Solution:

Possible dimensions of boxes are

1×1×8

2×2×2

2×4×4

Score & Description

Extended

Two correct open boxes (with correct volumes)

Note: If drawn on grid, an unlabeled box can be scored correctly.

Satisfactory

Only one correct open box (with correct volume)

OR

An open box with the same dimensions shown flattened in two different ways (with correct volume)

OR

Two correct closed boxes (with correct volumes)

Partial

One drawing that folds up into an open box but volume is incorrect

OR

Response folds up into a closed box with correct volume

Minimal

One drawing that shows 5 faces but does not fold up into a box

OR

One drawing that shows correct box dimensions only

OR

A 3-dimensional box with correct dimensions

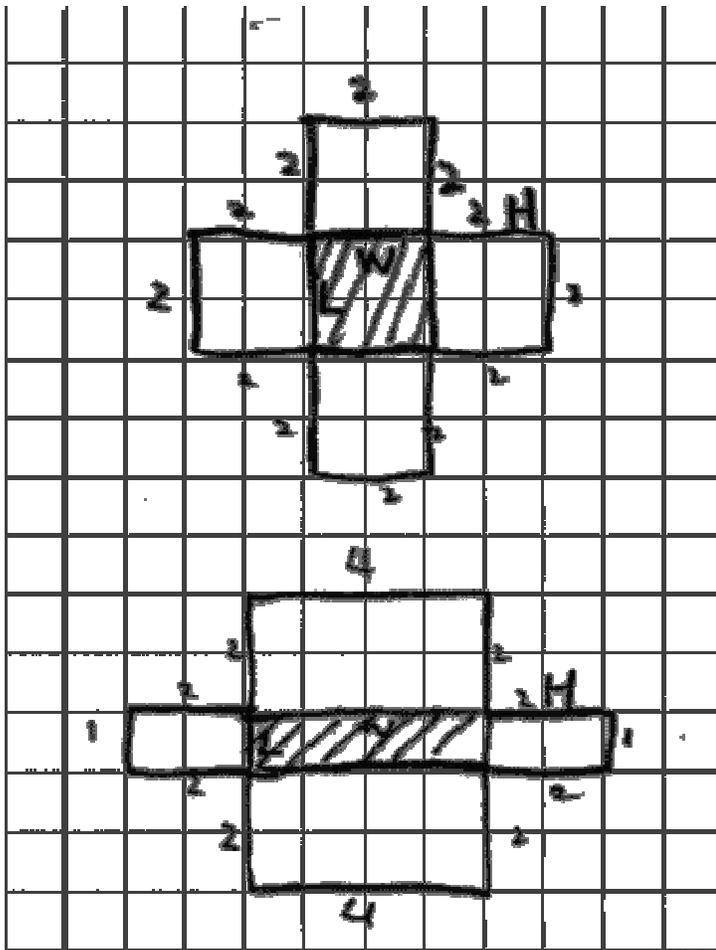
Incorrect

Incorrect response (includes 3-dimensional box without dimensions)

In this question the student was asked to demonstrate two- and three-dimensional visualization skills by drawing two different figures (two-dimensional) that will fold up into a box (three-dimensional) of given volume. This question required students to know and apply the formula for volume in a non-standard situation and to draw a model of the flattened box with correct dimensions.

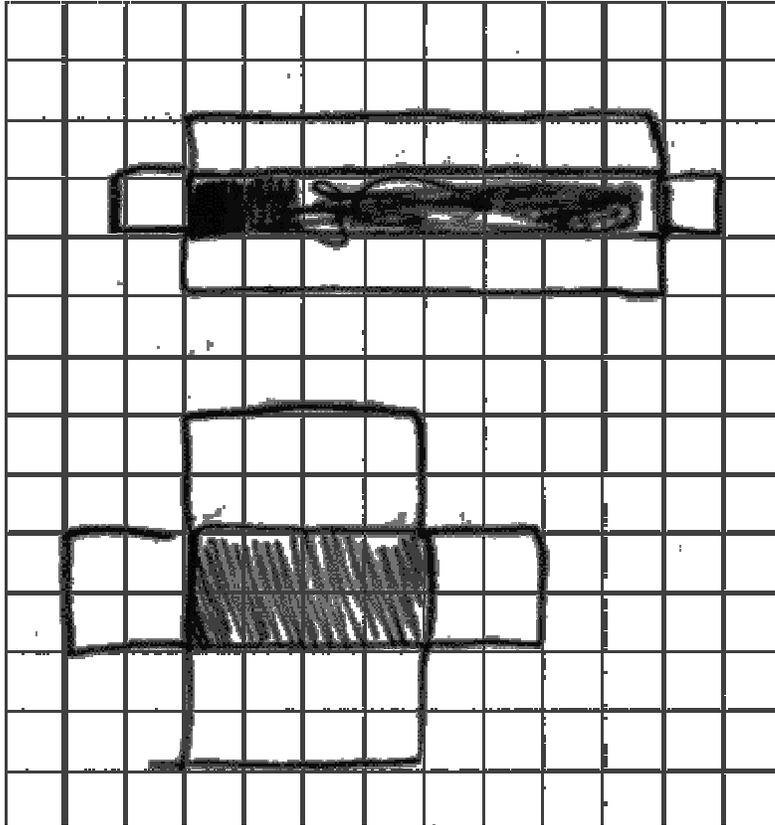
Extended - Student Response

- 1 On the grid on the next page, draw two flattened boxes that will fold up into different open boxes. Each box should have a volume of 8 cubic units. Be sure to label your drawings with numbers that show the length, width, and height for each box. Each square on the grid has a side of length 1 unit.



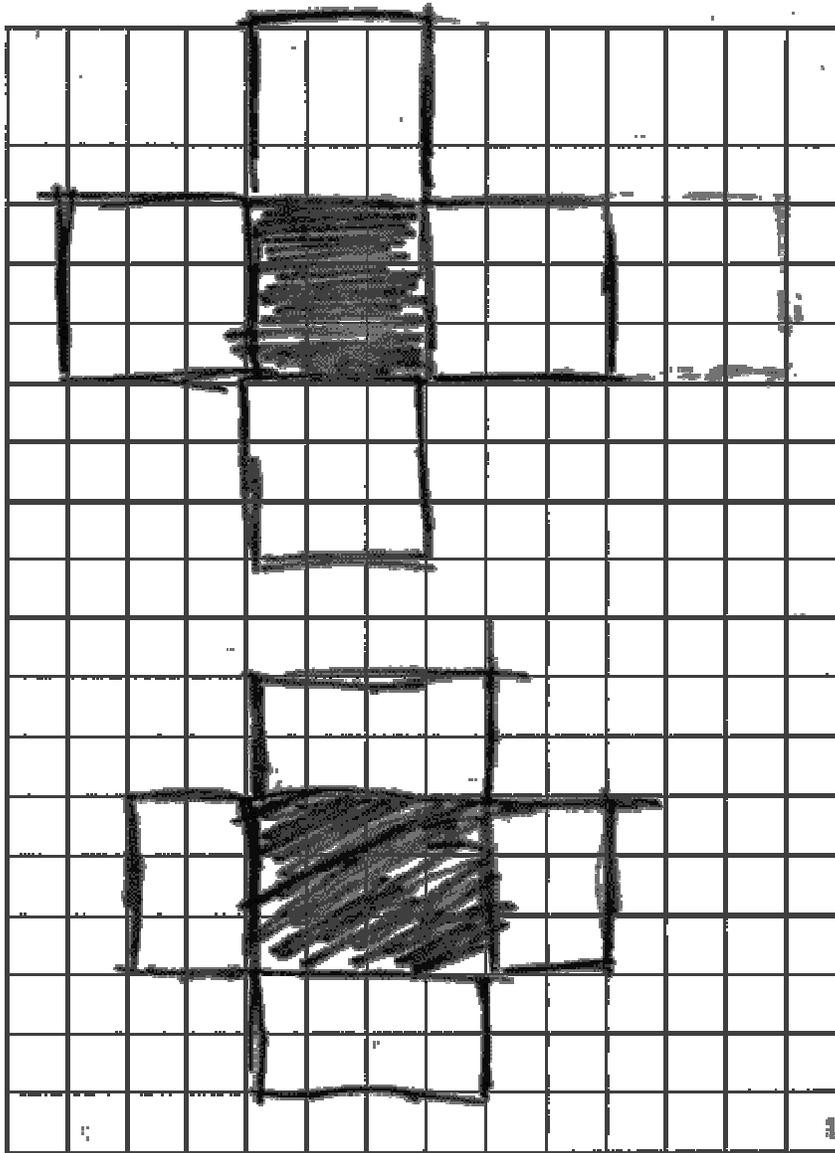
Satisfactory - Student Response

- 1 On the grid on the next page, draw two flattened boxes that will fold up into different open boxes. Each box should have a volume of 8 cubic units. Be sure to label your drawings with numbers that show the length, width, and height for each box. Each square on the grid has a side of length 1 unit.



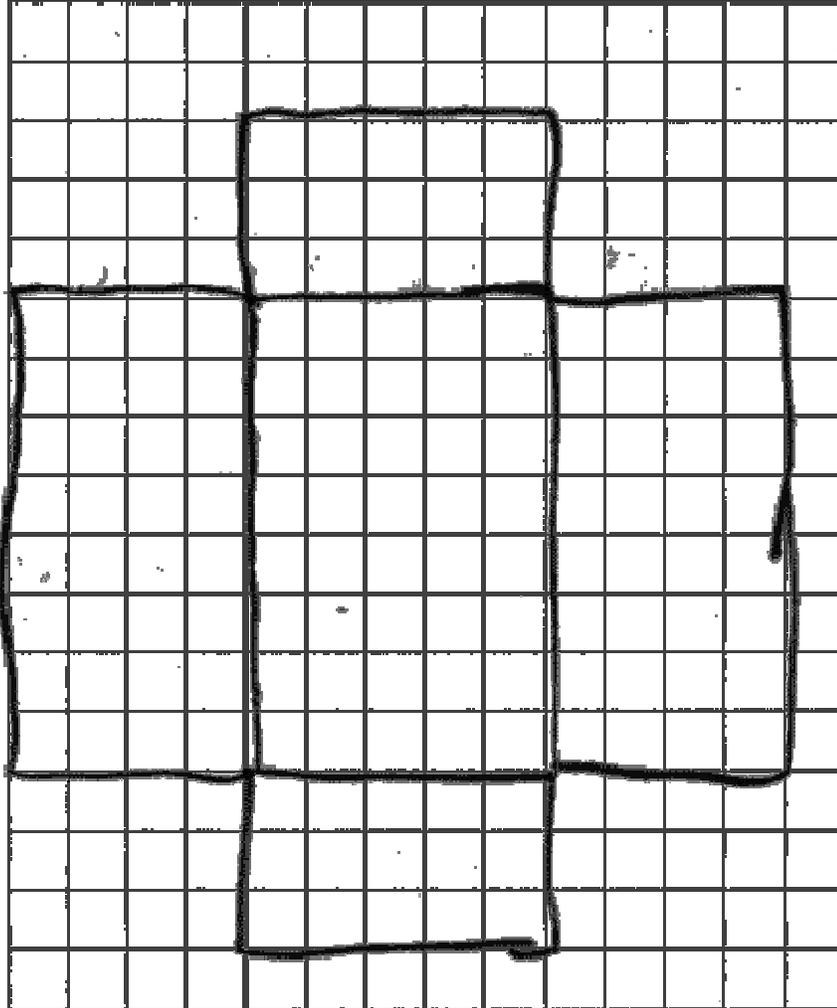
Partial - Student Response

- 1 On the grid on the next page, draw two flattened boxes that will fold up into different open boxes. Each box should have a volume of 8 cubic units. Be sure to label your drawings with numbers that show the length, width, and height for each box. Each square on the grid has a side of length 1 unit.



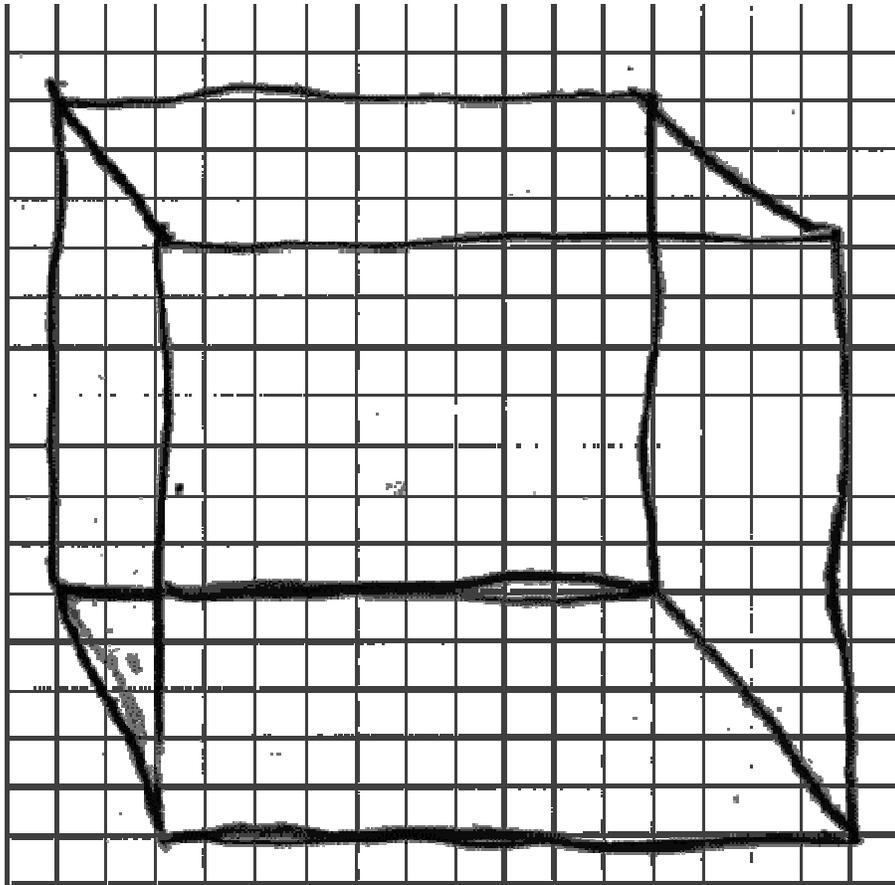
Minimal - Student Response

- 1 On the grid on the next page, draw two flattened boxes that will fold up into different open boxes. Each box should have a volume of 8 cubic units. Be sure to label your drawings with numbers that show the length, width, and height for each box. Each square on the grid has a side of length 1 unit.

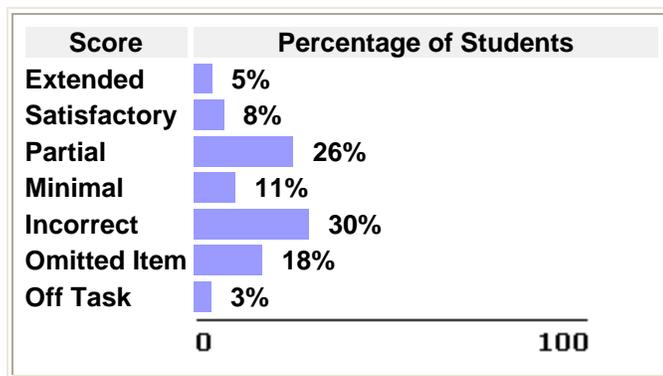


Incorrect - Student Response

- 1 On the grid on the next page, draw two flattened boxes that will fold up into different open boxes. Each box should have a volume of 8 cubic units. Be sure to label your drawings with numbers that show the length, width, and height for each box. Each square on the grid has a side of length 1 unit.



2003 National Performance Results



Note:

- These results are for public and nonpublic school students.
- Percentages may not add to 100 due to rounding.

Mathematical Content Area: *Geometry and spatial sense*
Mathematical Ability: *Problem solving*

Mathematical Content Area

Geometry and spatial sense

This question measures geometry and spatial sense. This content area extends beyond low-level identification of geometric shapes into transformations and combinations of those shapes. It focuses on informal constructions and demonstrations along with their justifications. The geometry and spatial sense area includes the demonstration of reasoning within both formal and informal settings. Proportional thinking to similar figures and indirect measurement is an important connection in this area.

Mathematical Ability

Problem solving

This question measures students' problem solving ability. Students demonstrate problem solving in mathematics when they recognize and formulate problems; determine the consistency of data; use strategies, data, models; generate, extend, and modify procedures; use reasoning in new settings; and judge the reasonableness and correctness of solutions. Problem solving situations require students to connect all of their mathematical knowledge of concepts, procedures, reasoning, and communication skills to solve problems.

	Description	Grade	Type	Difficulty
1	Draw two flattened boxes that have a given volume	8th	Extended Constructed Response	Hard