

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless such collection displays a valid OMB control number. The valid OMB control number for this information collection is 1850-xxxx. Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. The obligation to respond to this collection is *voluntary*. If you have any comments concerning the accuracy of the time estimate, suggestions for improving this individual collection, or if you have comments or concerns regarding the status of your individual form, application or survey, please contact Janelle Sands at the Institute of Education Sciences (IES) at janelle.sands@ed.gov directly.

Your teacher is participating in a study to help us learn different ways of teaching math to their students. We are asking you and many other students to help us with this project. If you agree to help out, we'll ask you to take a short math test on the computer and then solve a few math problems using pencil and paper. You'll have 15 Minutes to answer these questions.

This is not a test like you usually have in school. You will not be graded on these math problems, and the results won't affect your school grade. All you have to do is try your best to answer the questions. Your teachers, parents and the other students won't know how you do, and your answers won't be shared with anyone besides the people working on the study.

You don't have to answer particular math questions you don't feel comfortable with or any of them if you don't want to. You can also stop answering the questions at any time. It's okay if you don't want to be in the study or if your parents asked you not to participate.

Problem-Solving with Visual Representations measure items to assess student facility in using VRs to solve proportional reasoning problems

Items are drawn from Connecticut Interim Assessment Sample Items, which are Smarter Balanced items, © 2020 The Regents of the University of California.

#9 - 183356

Sara buys a sweater at a store. The original cost of the sweater was \$30.

The sweater is now on sale for 25% off. There is no sales tax.

Draw a diagram or visual representation that you can use to find the amount of money Sara saves from the sale. Use the diagram or visual representation to answer the question below.

Question: What is the amount of money, in dollars, Sara saves from the sale?

English glossary :

sales tax : fees added to price

off : subtracted

sweater : type of thick shirt

sale : event when prices are lowered

saves : spends less money

#20 - 183513

A store sells trail mix in bags of different sizes. This table shows a proportional relationship between the grams of peanuts and raisins in bags of trail mix of different sizes.

Grams of Peanuts	Grams of Raisins
14	4
21	6
35	10

Draw a diagram or visual representation to show the relationship between the grams of peanuts and the grams of raisins in the trail mix. Use the diagram or visual representation to answer the question below.

Question: How many grams of peanuts are there for every 1 gram of raisins in a bag?

#27 - 183704

Sam wants to paint the walls in her room.

Her room has 300 square feet of wall space to paint.

Sam says it takes her 10 minutes to paint 25 square feet.

Draw a diagram or visual representation to show the relationship between the number of minutes and the number of square feet Sam paints. Use the diagram or visual representation to answer the question below.

Question: At this rate, how many hours will it take Sam to paint the walls in her room?

Scoring Rubric for Assessment of Problem-Solving with Visual Representations

Description	Score	Coding notes	Examples (not exhaustive)
No drawing	0	Responses may include some written work but no drawings	
Pictorial drawing	0	Drawing is a picture of an object that does not show any quantities	
Beginning – Representing a quantity	1	<p>Visual representation shows one given quantity from task.</p> <p>OR</p> <p>The visual representation shows more than one quantity but does not attempt to relate the quantities to each other.</p> <p>Notes:</p> <ul style="list-style-type: none"> As long as it is possible that something in the visual representation represents a quantity from the task, code as 1, not 0. (Note: if multiple quantities are shown and related, the code would be 2 or 3). Responses may show a pictorial drawing that does represent a quantity. The visual representation may appear to show two quantities from the task but the visual representation does not illustrate a <u>relationship</u> that leads to a solution. Consider erased quantities. 	<p>For Item 9, an area model showing 25% (but with no connection to the cost).</p> <p>For Item 20, an area model or number line showing only the number of grams of peanuts or raisins.</p> <p>For Item 27, an area model showing the 300 square feet and the 25 square feet as a fraction of that and a separate area model showing 10 minutes with no indication of a connection to the first area model.</p>
Intermediate – Evidence of a solution pathway	2	<p>Visual representation shows evidence of a solution path. Evidence is when the student attempts to relate (or does relate) two or more given quantities in a visual representation in a way that supports solving the task.</p> <p>Notes:</p> <ul style="list-style-type: none"> Give the benefit of the doubt if quantities are related in a manner that may support 	<p>For item 9, a double number line showing percentages on one number line and price on the other, or an area model divided into parts with the whole labeled as the cost and the parts labeled as percentages of that cost.</p> <p>For item 20, a double number line with grams of peanuts on</p>

		<p>solving a task but it is not clear whether the visual representation could lead to a correct solution.</p> <ul style="list-style-type: none"> • Indicators of relationships between quantities include the presence of arrows or brackets or when representations of quantities are next to each other (orthogonally adjacent) and so on. • If student uses a fraction multiplication array using the fractions given (i.e., trying to multiply the given fractions), score a 1. 	<p>one line and grams of raisins on the other, or a graph with grams of peanuts and raisins on the two axes.</p> <p>For Item 27, a double number line showing minutes on one line and square feet painted on the other, or an area model where the whole represents the square feet to be painted and sections of the model represent minutes related to square feet.</p>
Advanced – Evidence of a solution pathway and correct response	3	<p>Visual representation shows evidence of a solution path (see notes under score 2, Intermediate)</p> <p>AND</p> <p>A correct response is given.</p>	See row for 2, above.

Note: Adapted from Nikula et al., 2022