

The logo for ONPAR features the word "ONPAR" in a bold, black, sans-serif font. A blue curved line arches over the letters "O" and "N". A small "TM" trademark symbol is positioned to the upper right of the "R".

ONPARTM



SCIENCE ASSESSMENT FOR THE FUTURE

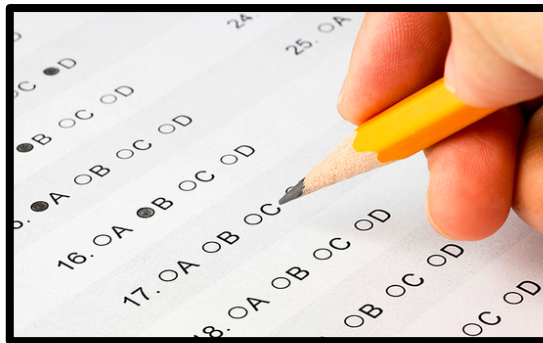
**NASBE Regional Symposium
The Next Generation Science Standards:
Updates, Challenges, and Opportunities**

Pittsburgh, PA
9/20/13

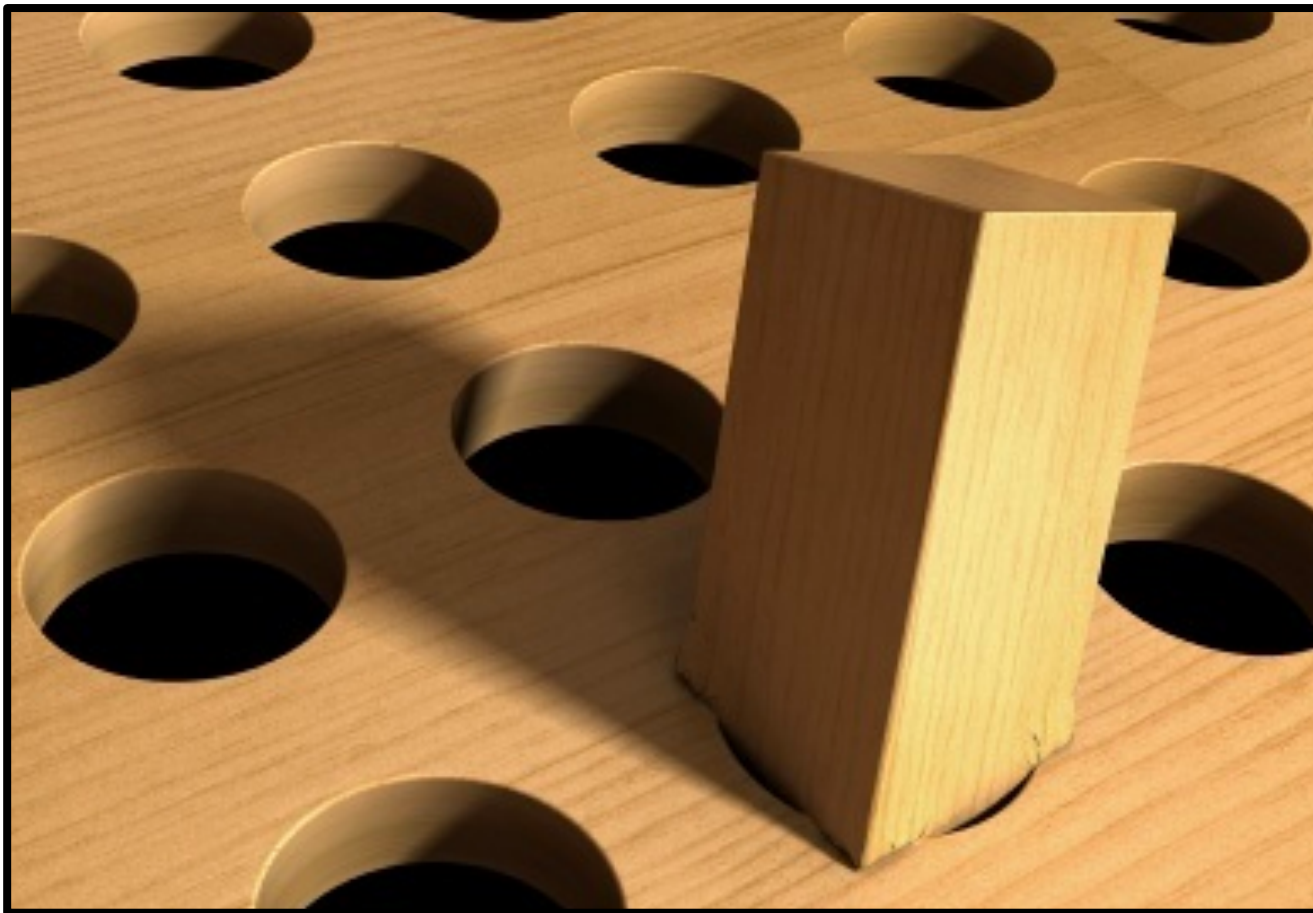
Therese Gleason Carr & Rebecca Kopriva
University of Wisconsin

Problem:

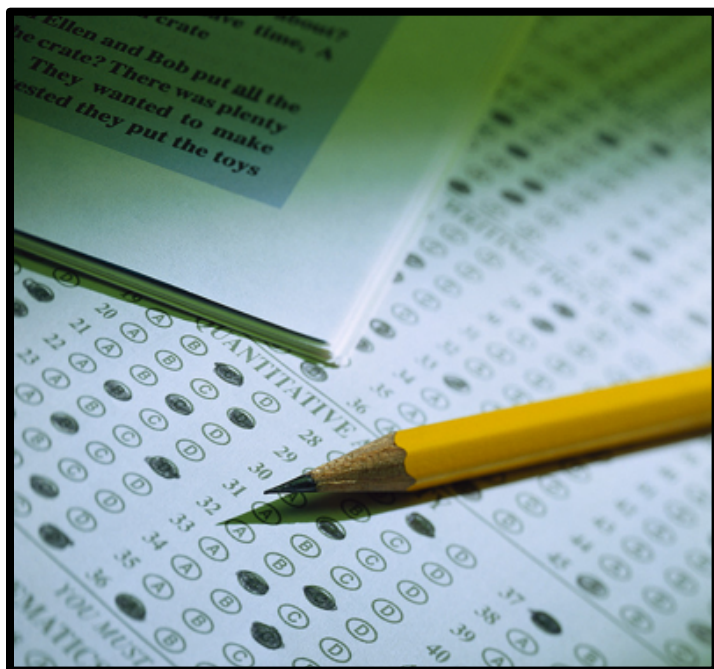
Pop Quiz



Answer:



The Past: Superficial, Static



If the only tool you have is a hammer, you tend to see every problem as a nail.

-Abraham Maslow

Form – i.e., multiple-choice – constrained test content as much as (or more than) intended measurement topics...resulting in **'mile wide, inch deep'** assessments.

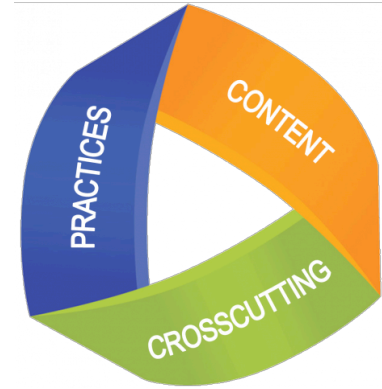
The Future: Deep, Dynamic

From the National Research Council's *Framework*:

Science as "...both a body of knowledge *and* an evidence-based, model and theory building enterprise that continually extends, refines, and revises knowledge."



So too measurements.



New Standards Beg New Assessments

- NGSS are best assessed with truly interactive tasks that measure deeper learning and cognitive processes.
- We (and others) have learned to build rich, efficient, and effective computer-delivered performance tasks – and to score them electronically in real time.
- Research shows that this type of assessment can work well for **all** types of learners.

The Time Has Come...

For differentiated learning with *REAL* Universal Design assessment.

We can convey substantive meaning to and from students using multiple, multi- semiotic representations.

It *works* for everyone and disadvantages no one.

And it's *good* assessment!



Multiple Representations and Cognitive Complexity: A Good Fit

- Interactive, multi-modal performance tasks especially effective for tapping higher order knowledge, skills, and abilities
- Not necessary to use these types of tasks on the entire test
- Good, well edited multiple-choice items work well for some types of questions and content
- It all depends on what you're measuring...

ONPAR Middle School Forces and Motion Promotional Testlet - www.onpar.us



Welcome to the ONPAR Science Testlet!

This interactive middle school science testlet on forces and motion contains 5 multi-part tasks.

Please use of one of the following browsers: **Chrome 19+**, **IE9+**, **Firefox 12+**, or **Safari 5+** and ensure you have JavaScript enabled.

Upon completion, a printable score report will be generated.

[Start the Testlet](#)

Cognitive Psychology Foundations

As you can see, the **ONPAR approach** involves:

- Asking questions in many different ways
- Providing various and varied means for students to provide responses
- Using many different types of media
- Eliciting continuous interaction between student and task elements

How do we handle possible confusion/cognitive ‘overload’?

Multiplicity and richness is balanced by numerous instructional elements and ‘Help’ resources integrated into assessment tasks...

Rich, Efficient, Effective

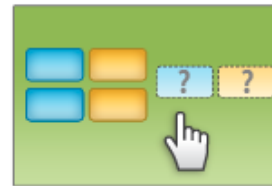
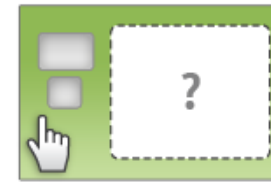
- ◆ Many layered ways of conveying meaning **to** **and from** student are integrated seamlessly within and across tasks
 - ❖ Text (Less → More)
 - ❖ Audio
 - ❖ Simulations
 - ❖ Visuals
 - ❖ Creating, building, modeling, demonstrating solutions

Rich, Efficient, Effective, Cont'd

◆ Tutorial to acclimate students



◆ Animated 'How To' Icons



We want rich tasks but we also know we need to do it efficiently.

ONPAR approach allows us to get in, get out – conveying a lot of meaning quickly (like good ads).

Empirical Basis for Interactive Tasks

Research (ours and others') has shown that dynamic assessment tasks *are* valid and effective.

ONPAR:

- Built on R&D efforts spanning 1996-present
- Backed by over \$15M in competitive federal, other funding
- Rigorous randomized controlled trials and one-on-one student interviews
- 100+ prototypes and 2 promotional testlets
- Beneficial for measuring higher order thinking
- **Works for everyone, disadvantages no one**

(See www.onpar.us for research reports, papers, presentations)



ONPAR AND NGSS

Selected Examples – And Affinities – with NGSS

Gas Exchange – Middle School

What color will the water be in each test tube in light and dark?


more oxygen


more carbon dioxide

oxygen = carbon dioxide

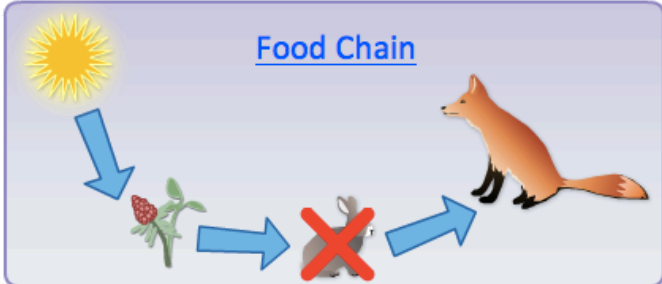
Question: 1 of 1 Scene: 3 of 5 English

Food Web Crises - Elementary

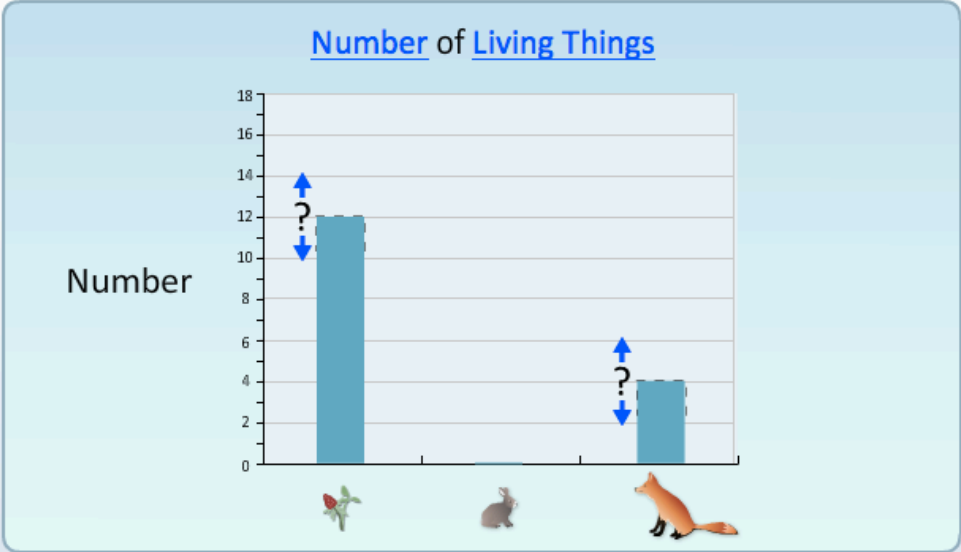
 What will happen to the plants and foxes? Estimate



Food Chain



Number of Living Things



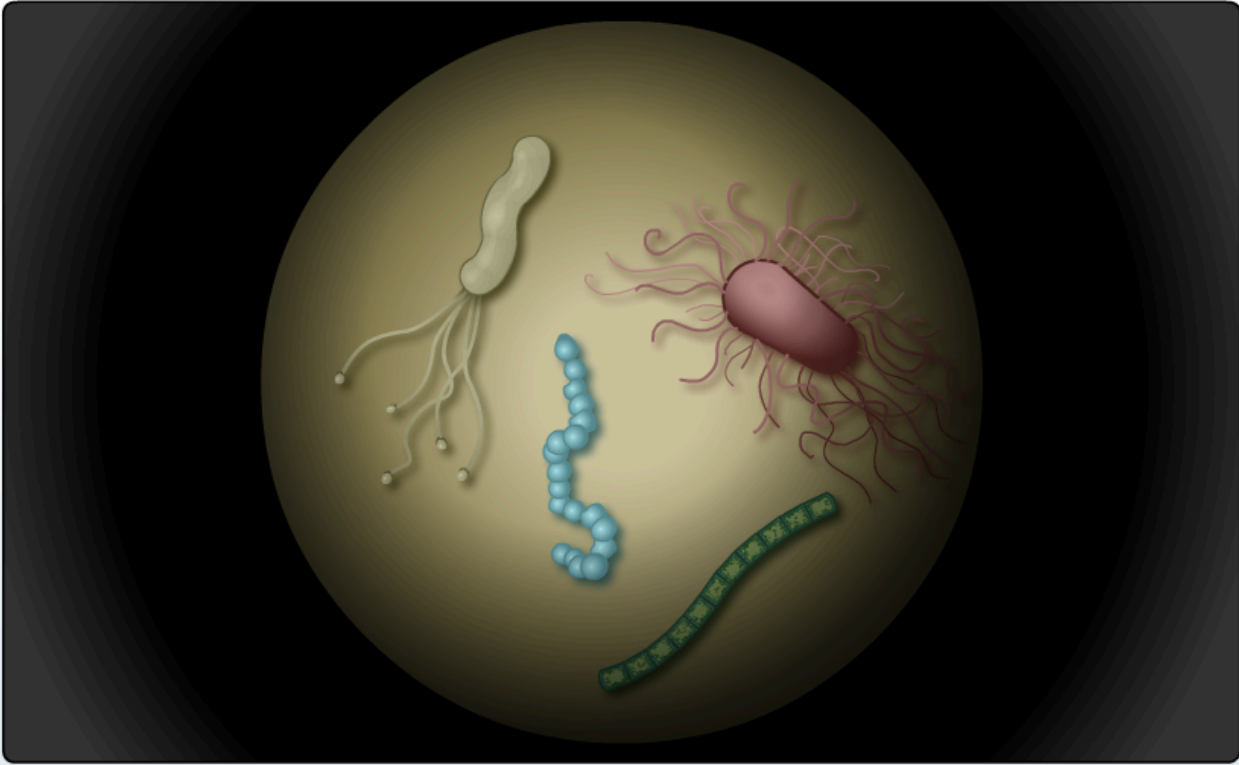
Living Thing	Number
Plant	12
Rabbit	0
Fox	4

Number

Question: 1 of 1

Cladogram – High School

4 new kinds of [bacteria](#)











Question: 1 of 1 Scene: 1 of 4

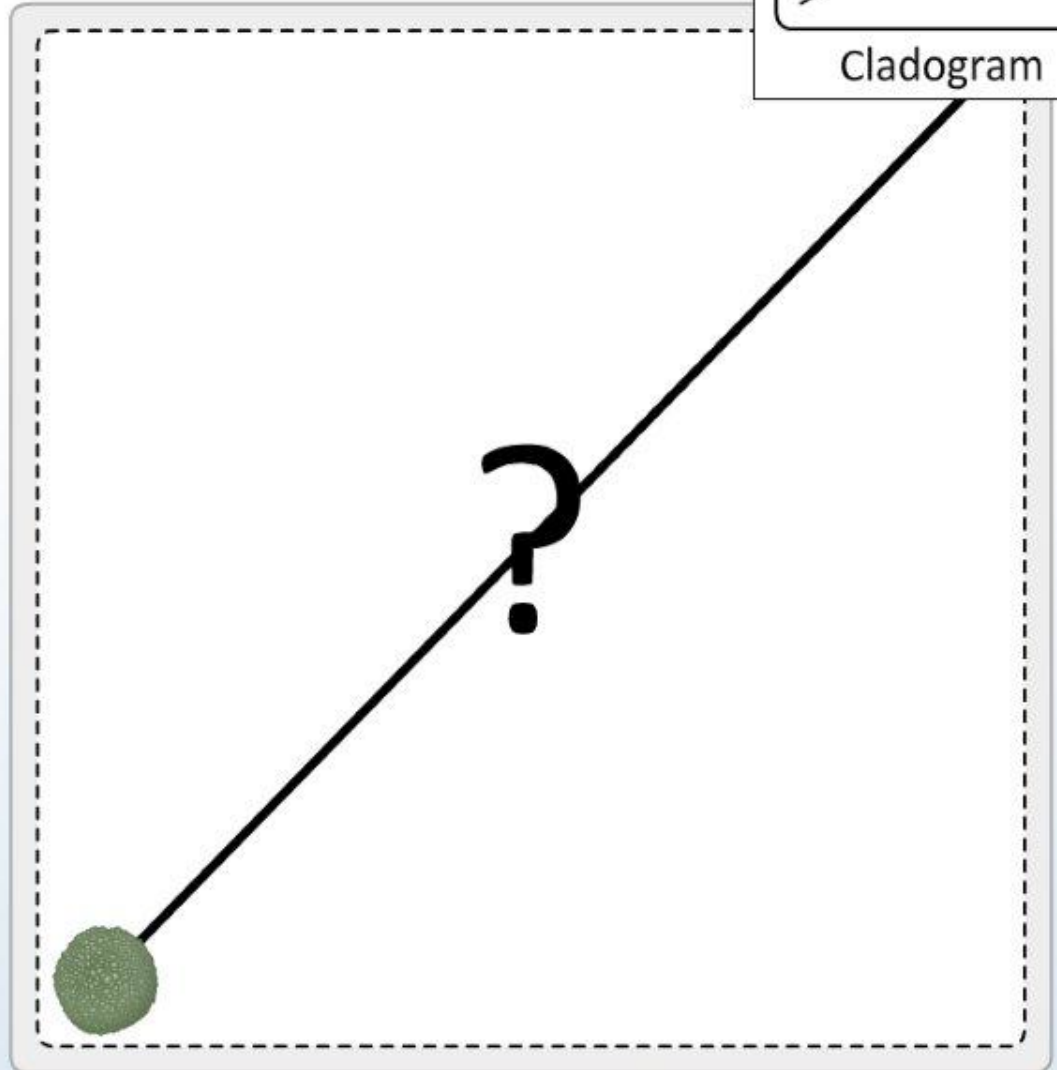
English

GO



Use the amino acid differences to make a cladogram for the bacteria.

		Position		
		11	52	79
Given	Bacteria	W	E	K
				
New		V	P	R
		V	E	R
		W	E	R
		V	E	R
				

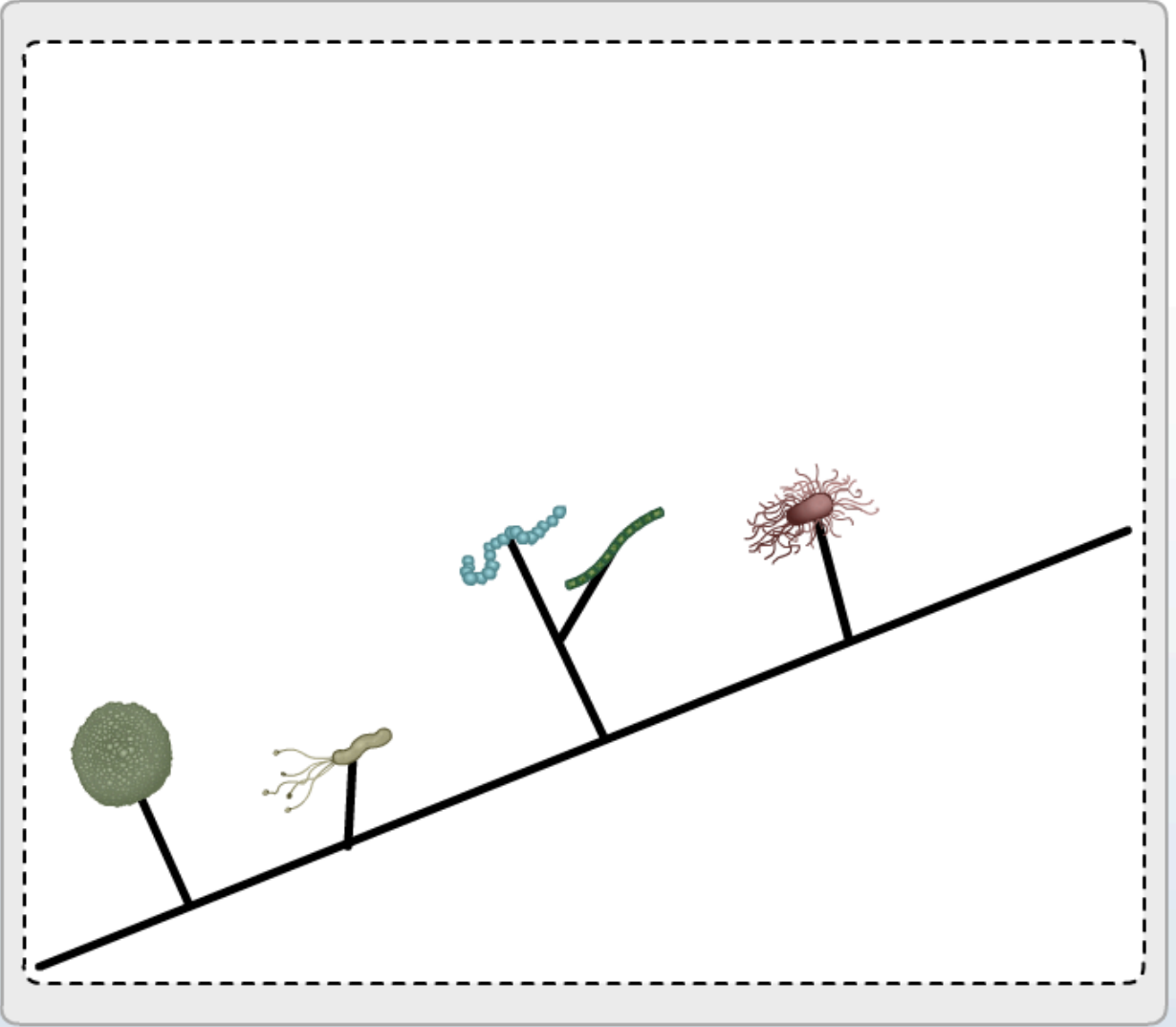




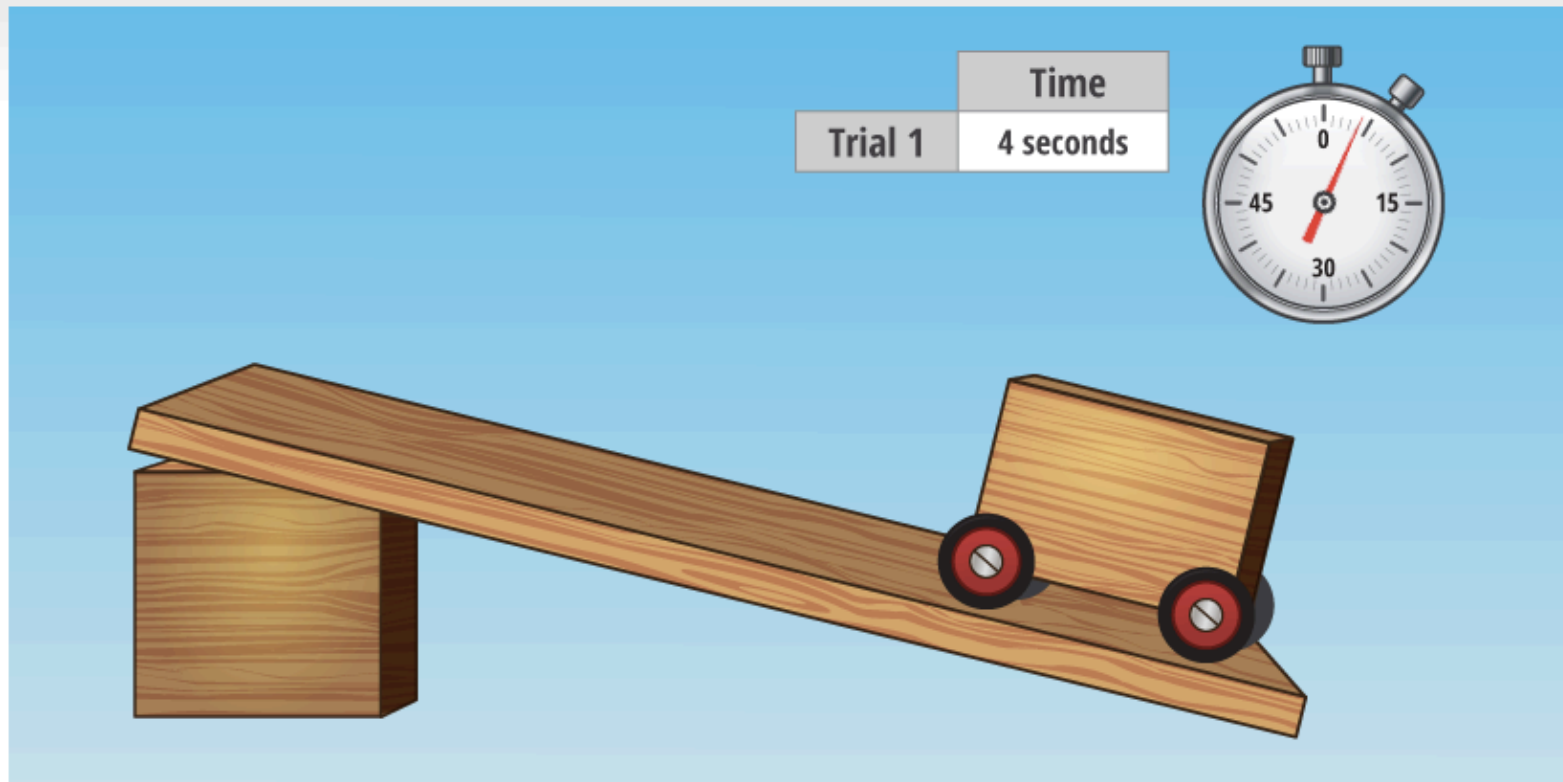
Use the [amino acid differences](#) to [make](#) a [cladogram](#) for the [bacteria](#).



		Position		
	Bacteria	11	52	79
Known		W	E	K
		V	P	R
New		V	E	R
		W	E	R
		V	E	R
		V	E	R



Ramp Experiment – Middle School





ENGLISH

TRANSLATE

Set up an experiment to test how cart weight affects time down the ramp.





ENGLISH

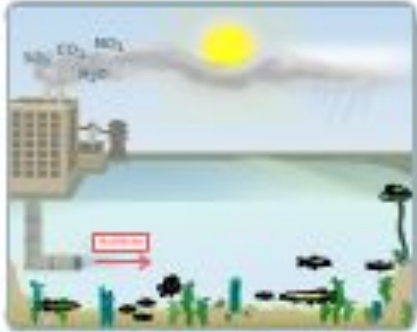
TRANSLATE

Set up an experiment to test how cart weight affects time down the ramp.



Power Plant – Middle School

How does the power plant affect the lake ecosystem?



The diagram illustrates the flow of information for a cause-and-effect puzzle. On the left, a panel contains various items that can be dragged into the puzzle:

- algae, acid water, a frog, a fish, and green plants (represented by icons).
- O₂ air, O₂ water, CO₂ air, CO₂ water, air, and water (represented by text labels).
- Buttons for 'No Change', 'Increase', and 'Decrease' (represented by arrows).

The main puzzle area shows a power plant icon on the left. Arrows labeled 'causes' point from the power plant to several empty boxes, each containing two question marks. These boxes are interconnected by arrows labeled 'causes', forming a network of relationships. One box contains a frog icon and a question mark, and another contains a question mark. At the bottom right, there is a 'Question: 1 of 1' indicator.

Apples and Oranges – Elem Math

The interface features a top navigation bar with a speaker icon, language options for 'ENGLISH' and 'TRANSLATE', and a numeric keypad with a question mark. The main content area displays two 'sale' items: '1 bag of apples = \$3.60' and '1 bag of oranges = \$5.00', each with a corresponding fruit bag illustration. A calculator is positioned on the left, and a 'Show Your Work' area with a return key is in the center. The bottom of the screen contains a 'Task 3' label, a set of navigation icons (back, delete, play, check, forward), and a 'Screen 3/3' indicator.

ENGLISH
TRANSLATE

Show that the price of 1 apple is less than the price of 1 orange.

1 bag of apples = \$3.60

1 bag of oranges = \$5.00

Instructions

Show Your Work

Task 3

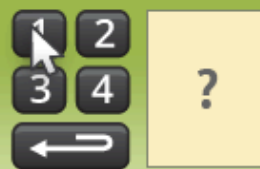
Screen 3/3



ENGLISH

TRANSLATE

Show that the price of 1 apple is less than the price of 1 orange.



Instructions



Show Your Work



$$3 \text{ 🍏 } = 3.6$$

$$3.6 / 3 = 1.2$$

$$4 \text{ 🍊 } = 5$$

$$5 / 4 = 1.25$$

$$1.2 < 1.25$$

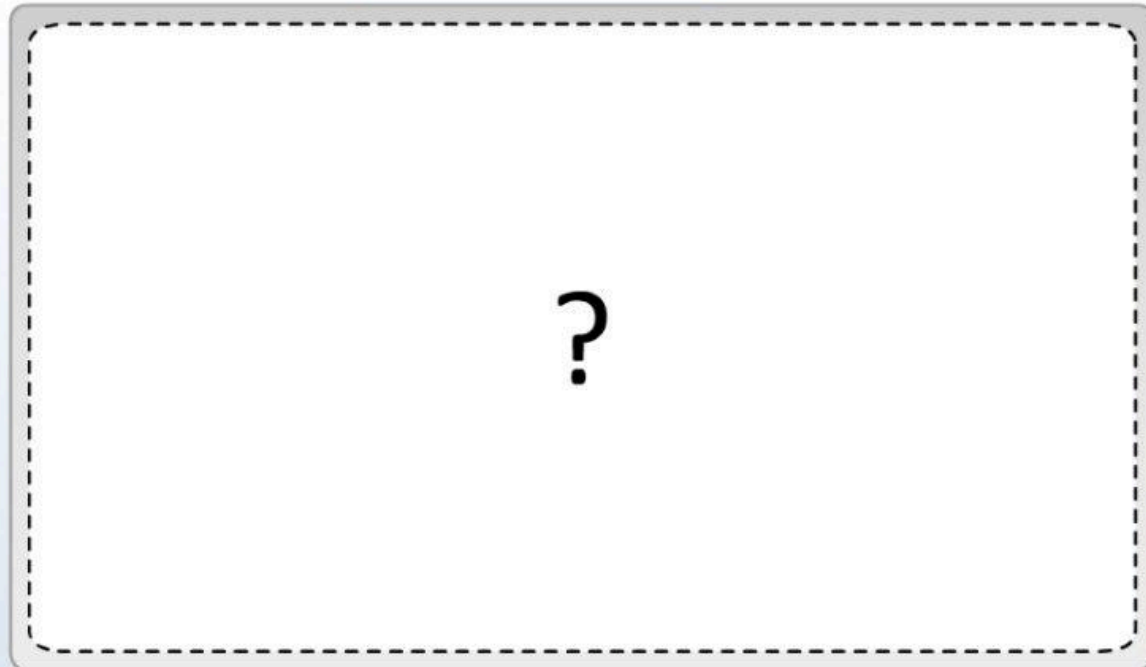
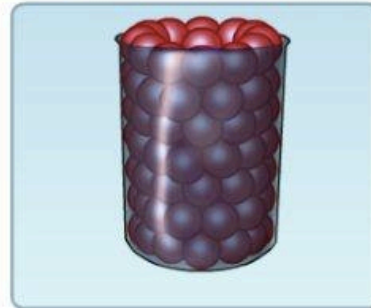
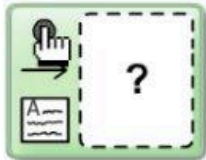
$$\text{🍏} < \text{🍊}$$



Marbles Volume – MS Mathematics

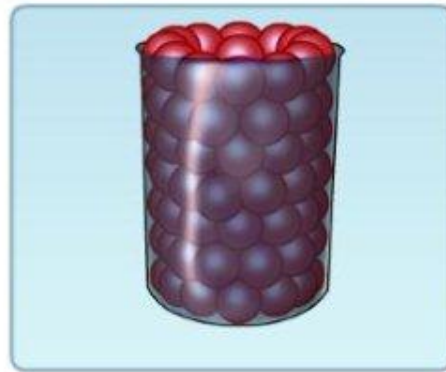
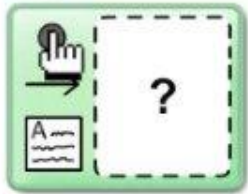


Show how to estimate the number of marbles in the jar.





Show how to estimate the number of marbles in the jar.



12 marbles per layer

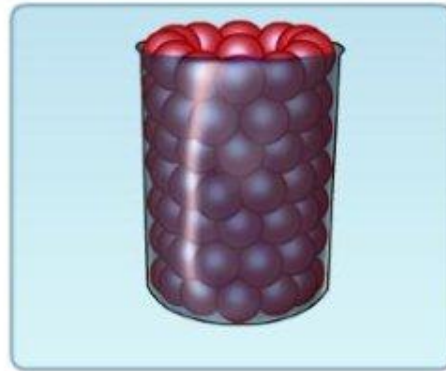
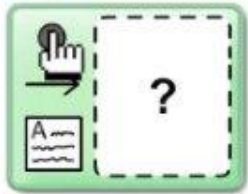
6 layers

$12 * 6 = 72$





Show how to estimate the number of marbles in the jar.



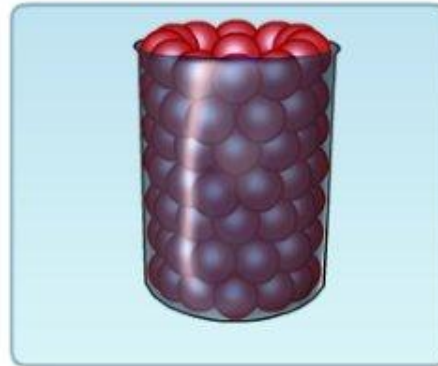
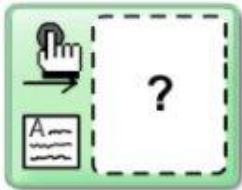
12 marbles on the bottom row

there are about 7 rows in the jar

$12 \times 7 = 84$ marbles



 Show how to estimate the number of marbles in the jar.



Count the number of marbles on the top of the jar, then multiply by the amount of

rows of marbles in the jar



For More Information

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Thank you!