

Eggsactly how many?

In this task, students are asked to determine the total number of eggs in a stack of trays without being able to count each individual egg.

Problem scenario

I have a friend who buys his eggs directly from a farm. One day, he walked into the barn where the eggs are sold, and this is what he saw [show the picture of the eggs]. What questions do you think popped into his head?

For additional questions, see the **activity sheet** on **page 523**.

Classroom setup

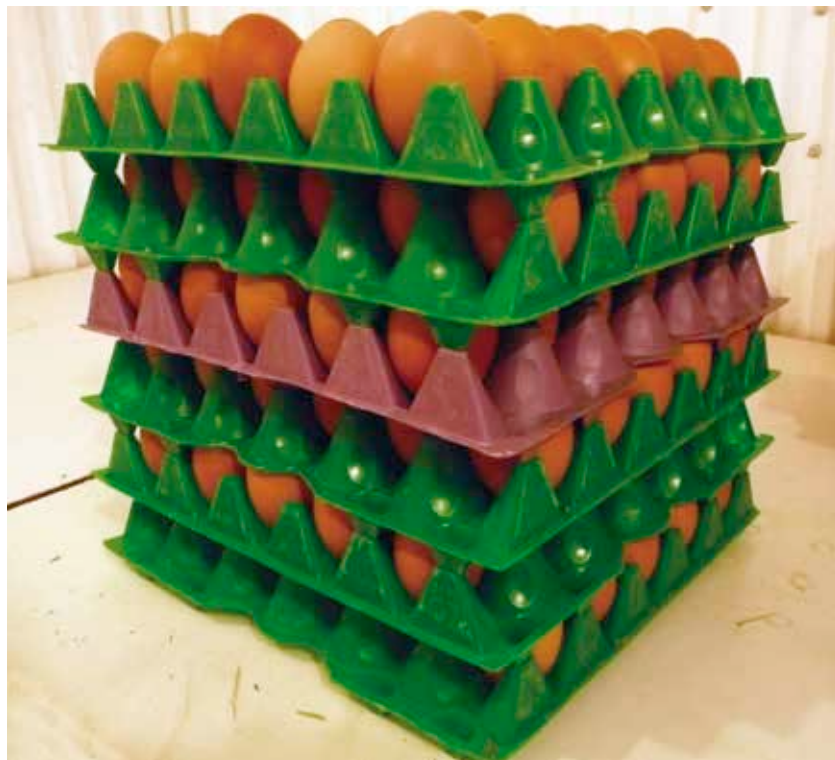
Before presenting the problem to your students, gather these materials:

- Copies of the activity sheet with a clear picture of the eggs and room for a solution
- Pens or markers
- A digital camera or a smartphone or tablet with a camera

Present the problem scenario to the students. Give them a chance to share question ideas after they have seen the picture of the eggs. As soon as one of your students shares the question, “How many eggs are there?” let the class know that this is the problem you will try to solve today.

Organize students in pairs or triads to solve the problem. Distribute copies of the activity sheet or paper for students to record their answers. As students are working, walk around the classroom and observe the strategies they use to answer the questions. You may want to take some pictures with a digital camera, smartphone, or tablet to help gather evidence of student thinking during the solution process. Try not to tell students how to do the math, but use questions, such as the following, to provoke their thinking:

- How many eggs are in the top tray? How could you find out?



- How many trays are there altogether?
- Can you find another way to check your answer?
- Is there a faster way than skip counting by thirty?

When students have answered the questions, select solutions that used different strategies to find the number of eggs on the top tray; share them with the entire class. For example, some students may have incorrectly identified the array of eggs on the top tray as 6×4 , reasoning that they had already counted the corner egg in the row of six, so they could not count it a second time for the column. Other students may argue that the array is 6 eggs \times 5 eggs. After students agree on the number of eggs in the top tray, you could examine different solutions for finding the total number of eggs, such as the repeated addition of 30 six times or combining three 30s as 90 and then doubling, or reasoning that $6 \text{ trays} \times 30 \text{ eggs} = 180$. While you display

Teachers can easily differentiate this problem. Have students find the number of eggs in the top row only, or offer an additional challenge to students who finish quickly.

Where's the math?

This problem provides a context for students to build their conceptual understanding of multiplication using the model of the array. Students must examine, interpret, and analyze the structure of six stacked 6×5 arrays of eggs to determine the total number of eggs.

The angle of the picture of the top 6×5 array of eggs restricts the audience view of the eggs to the outside L-shape of eggs formed by one row and one column of the array. Students are unable to count each individual egg to arrive at a total number of eggs for the top tray. To find the total, they must make sense of the structure of the array to determine the total number of eggs as five columns of six rows or six columns of five rows. An important aspect for students to notice and discuss is that the corner egg is counted both as part of a column and as part of a row. Some students may also notice that each successive tray is turned so that the array alternates between 5×6 and 6×5 , providing an opportunity to discuss the commutative property.

the different solutions, you could ask questions of the class to prompt discussion:

- What do you think this group did to solve the problem?
- What are your questions about this solution?
- These two solutions have different answers for the number of eggs on each tray. Which one is correct? How do you know?
- Do we count the corner egg once or twice? Why?
- Compare how different groups found the total number of eggs.
- What questions do you have about the strategies they used?
- Which strategies would be more efficient? Why?

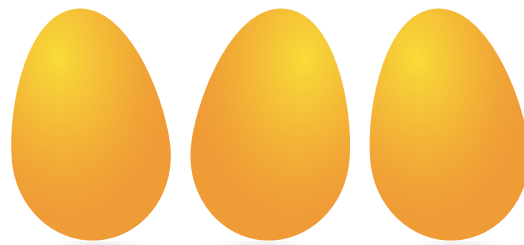
As students share ideas, create a list on the board or on chart paper as a record of their thinking.

Extensions and modifications

Offer students who finish early an additional challenge:

If the farmer charges \$2 per dozen, how much would all of these eggs cost?

If you feel that the task might overwhelm some students, you could ask them to deter-



mine the total number of eggs in the top tray. For other students, you may want to provide a picture or diagram displaying a bird's-eye view of the top row of eggs to help them determine the total number of eggs.

Share your students' work

Try this problem in your classroom. We are interested in how your students responded to the problem, what problem-solving strategies they used, and how they explained or justified their reasoning. Send your thoughts and reflections—including information about how you posed the problem, samples of students' work, and photographs showing your problem solvers in action—by **July 1, 2015**, to Problem Solvers department editor Ed Enns, Waterloo Region District School Board, Learning Services, 51 Ardelt Avenue, Kitchener, ON N2C 2R5; or by email to ed_enns@wrdsb.on.ca. Selected submissions will be published in a subsequent issue of *TCM* and acknowledged by name, grade level, and school name unless you indicate otherwise.

Edited by Ed Enns, who works as an elementary learning services consultant with the Waterloo Region District School Board in Kitchener, Ontario, Canada. In his work with elementary school mathematics teachers, he emphasizes conceptual understanding and explores effective strategies for teaching mathematics through problem solving. Readers may submit problems to be considered for future columns. Receipt of problems will not be acknowledged; however, those selected for publication will be credited to the author. Access www.nctm.org/tcmdepartments to find detailed submission guidelines for all departments.

Name _____

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1. How many eggs are in the top tray? Show your thinking.

2. How many eggs are there in total? Show your thinking.