Peanuts and Ducks

Lee bought a bag of 15 peanuts to feed the ducks. When he got to the lake he saw 6 ducks and then 6 more came. He wants to give each duck one peanut.

1. Does he have enough to give each duck a peanut?_____
Show how you found the answer using words, numbers or pictures.

2. How many will be leftover?_____
Explain your answer in words or a number sentence.

Mathematics Assessment Collaborative
Performance Assessment Rubric Grade 2

	Peanuts and Ducks: Grade 2: Practice Test #1	Points	Section Points
	The core elements of the performance required by this task are: • Use operations to solve problems • Understand the relative magnitude of whole numbers • Determine the difference between numbers • Communicate process using words, numbers or pictures. Based on these credit for specific aspects of performance should be assigned as follows		
1	**Yes** Correct explanation such as: Match peanuts to ducks Or 6+6 = 12, 15 is more than 12 Or 12 + 3 = 15 Or 15 – 3 = 12 (Twelve ducks represented by pictures or numbers)	**1** **2** **(1)**	**3**
2	**3** Correct explanation: 15 – 12 = 3 or 15 – 3 = 12 or 12 + 3 = 15	**2ft** **2ft**	**4**
	Total Points		**7**

Looking at Student Work – Peanuts and Ducks

Student A shows a clear picture to represent the situation. Student A uses a number sentence to find the total number of ducks, then uses words to complete the mathematical argument by saying that 12 is less than 15. Student A was also able to use a number sentence to explain how many peanuts were left.

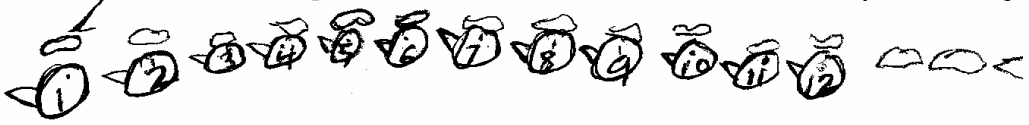
Student A

Peanuts and Ducks

Lee bought a bag of 15 peanuts to feed the ducks. When he got to the lake he saw 6 ducks and then 6 more came. He wants to give each duck one peanut.

1. Does he have enough to give each duck a peanut? yes ✓
Show how you found the answer using words, numbers or pictures.

6 + 6 = 12 12 is less than 15 so he can give each duck one peanut



2. How many will be leftover? 3 ✓
Explain your answer in words or a number sentence.

he has 3 more because 15 - 12 = 3 ✓

Student B is able to abstract from the situation to use a mathematical model instead of drawing peanuts and ducks. The student also shows a clear understanding of number operation and can compute accurately.

Student B

Peanuts and Ducks

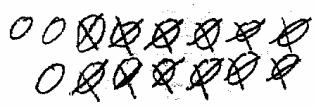
Lee bought a bag of 15 peanuts to feed the ducks. When he got to the lake he saw 6 ducks and then 6 more came. He wants to give each duck one peanut.

1. Does he have enough to give each duck a peanut? yes
Show how you found the answer using words, numbers or pictures.

$\begin{array}{r} 6 \\ +6 \\ \hline 12 \end{array}$ $\begin{array}{r} 12 \\ +3 \\ \hline 15 \end{array}$ $\begin{array}{r} 15 \\ -12 \\ \hline 03 \end{array}$

2

$6+6=12$ $12+3=15$ $15-12=3$



2. How many will be leftover? 3
Explain your answer in words or a number sentence.

2

There is supposed to be 3 peanuts because 15 take away 12 equals 3.

$\begin{array}{r} 15 \\ -12 \\ \hline 3 \end{array}$

Student C demonstrates the ability to think abstractly and use mathematical symbols to make an accurate argument for having enough peanuts.

Student C

Peanuts and Ducks

Lee bought a bag of 15 peanuts to feed the ducks. When he got to the lake he saw 6 ducks and then 6 more came. He wants to give each duck one peanut.

1. Does he have enough to give each duck a peanut? yes ✓ 1
Show how you found the answer using words, numbers or pictures.

$6 + 6 = 12$

$15 > 12$ ✓ 2

2. How many will be leftover? 3 ✓ peanuts 2
Explain your answer in words or a number sentence.

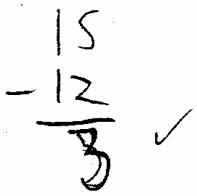
$15 - 12 = 3$ ✓ 2

Approximately 37% of the students were able to complete all the demands of Peanuts and Ducks. However many students had difficulty explaining their thinking or completing the logic required in part one. Student D does a nice job of seeing equal groups and using multiplication to find the total number of ducks. However the student does not show that 12 is less than 15.

Student D

1. Does he have enough to give each duck a peanut? yes ✓
Show how you found the answer using words, numbers or pictures.

2. How many will be leftover? Three ✓
Explain your answer in words or a number sentence.



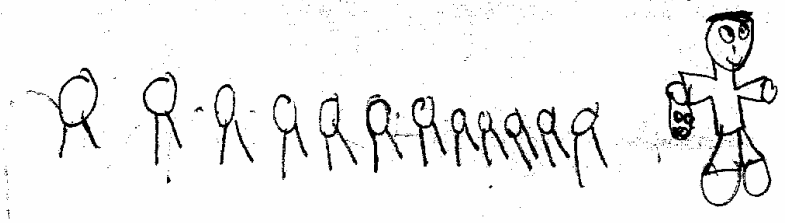
Student E is typical of many students. The drawing shows the number of ducks, but doesn't address the issue of peanuts. If you look at the bag of peanuts in Leonardo's hand, there are 4 nuts left instead of three. In part 2 of the task the student shows good number sentences, but the number sentences don't explain how he knows that there are 3 peanuts left.

Student E

cada pavo.

1. ¿Tiene bastante cacahuetes para dar uno a cada pavo? SÍ ✓

Muestra como encontraste la respuesta usando palabras, números o dibujos.



12 Pavos ✓ (1)

2. ¿Cuántos cacahuetes tendrá después de dar de comer a los pavos? 7 ✓

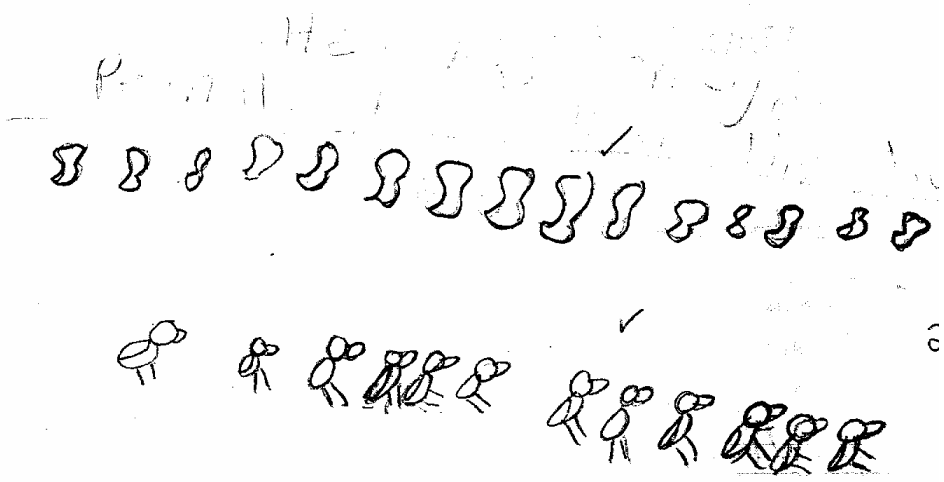
Explica tu solución en palabras o en una frase de números.

6+6=12 12-6=6 x

Student F is able to make sense of the situation by using concrete pictures. This allows the student to find the number of leftovers. Note that there is no use of abstraction or symbolic notation on the paper.

Student F

1. Does he have enough to give each duck a peanut? yes ✓ 1
Show how you found the answer using words, numbers or pictures.



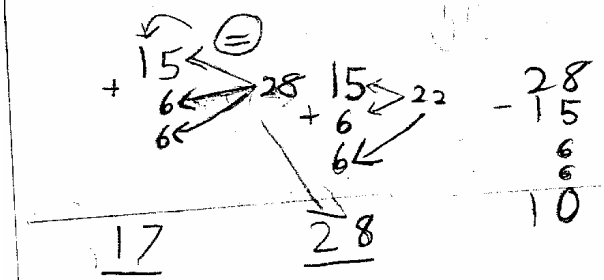
2. How many will be leftover? 3 Peanuts ✓ 2
Explain your answer in words or a number sentence.

He has enage^ Peanuts for all of the ducks 0

Some students did not know how to choose the proper operation. They just put together several number problems to show they could do math, but the work does not relate to the meaning of the story. See the work of student G.

Student G

1. Does he have enough to give each duck a peanut? no X
Show how you found the answer using words, numbers or pictures.



hard part

hard math X

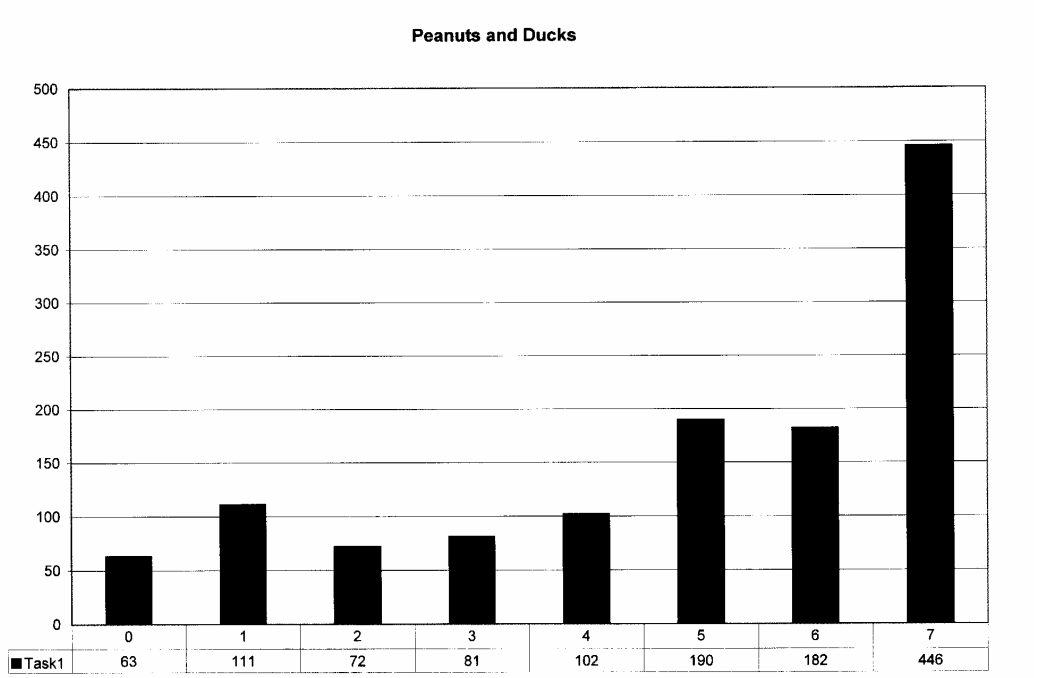
Diffrent number pictures.

C

2. How many will be leftover? 17 X
Explain your answer in words or a number sentence.

Teacher Notes:

Frequency Distribution for each Task – Peanuts and Ducks



The maximum score for this task is 7 points.
The cut score for a level 3 response is 4 points.

Most students (about 90%) could make sense of the total number of ducks. Almost half the students (about 45%) could also justify that there were enough peanuts and find the number of leftovers. About 25% of the students could meet all the demands of the task including explaining how they found the leftovers. About 3% of the students scored no points on the task.

Peanuts and Ducks

Points	Understandings	Misunderstandings
0	Almost all attempted the problem.	The students were not able to make sense of how to use the numbers to solve the problem
1	Generally, these stude nts knew that there were enough peanuts to feed the ducks	Students used incorrect addition and subtraction. Other students gave addition and/or subtraction problems that were unrelated to the questions in this problem.
2	Knew there were enough peanuts to feed the ducks. Usually represented the ducks but not the peanuts.	Most students who scored a 2 got part one correct but didn't complete part two. Many of the students had incorrect drawings of the problem situation.
3/4	Could find the number of ducks and explain that they had enough peanuts.	These papers did not have explanations for part one or part 2.
5	Could tell how many were left over. Could justify that there were enough peanuts.	Either didn't give an explanation or the explanation didn't support problem question. The explanation did not include a written explanation nor a number sentence.
6	Knew that there would be peanuts left over.	Didn't explain their answer in number 1 completely. Either they left out reference to the ducks or to the peanuts.
7	Did extremely well on this problem. 37% of the students scored a "7". 88% of the students used modeling rather that drawing little peanuts and little ducks.	

Based on teacher observation, this is what third grade students seemed to know and be able to do:

- Add the number of ducks (6+6 more) and subtract that from the number of peanuts
- Draw pictures to solve problems

Areas of difficulty for second graders, these students struggled with:

- Completing the logic for having enough peanuts by stating that 15 is greater than 12
- Showing how they knew that there were three peanuts left
- Knowing whether to add or subtract
- Organization of their process for solving

Questions for Reflection on Peanuts and Ducks

- How often do students in your classroom share their strategies? What types of questions do you ask them that help them make the transition from drawing everything to being able to do some kind of modeling?
- Why do you think modeling is important?
- What types of number sentences did your students make to find the number of ducks? Were any of them able to use multiplication to find the equal groups?
- How many of your students were able to write a number sentence for the subtraction in part 2?
- What opportunities have students had solving problems requiring more than one step? What are some good resources for these types of problems?

Being able to make a comparison is a big issue across the collaborative. How many of your students could explain how they knew their would enough peanuts? Did they use:

Matching/ using pictures or models	Missing parts: 12+ ? = 15	Comparison Subtraction: 15 – 12 = ?	Symbolic: 15 > 12	Didn't address this issue

Teacher Notes:

Instructional Implications:

While many students were successful on this problem, teachers feel that students need more experiences that will move them from the concrete representation of the situation to the symbolic representation. The biggest problem area seems to be the ability to explain the answer in a logical and systematic manner. Students need more opportunity to work with multi-step problems and a variety of subtraction situations. Students also need to work with problems that require logical thinking and justification. Two good resources for these types of activities would be **Cognitively Guided Instruction** and **Read It, Draw It, Solve It.** The latter has a selection of many one step and multi-step problems while the former is a resource into the structure of problems and the thinking and justification for problems such as these.

Teacher Notes:

Performance Assessment Task

Peanuts and Ducks
Grade 2

The task challenges a student to demonstrate understanding of concepts involved in addition and subtraction. A student must be fluent with addition and subtraction within 100 and understand the relationship between addition and subtraction. A student must be able to express and justify mathematical understanding with multiple representations: pictures, words, and/or numbers.

Common Core State Standards Math - Content Standards

Number and Operations in Base Ten

Use place value understanding and properties of operations to add and subtract.

2.NBT.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction

2.NBT.7 Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three- digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.

Common Core State Standards Math – Standards of Mathematical Practice

MP.2 Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

MP.6 Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

Assessment Results

This task was developed by the Mathematics Assessment Resource Service and administered as part of a national, normed math assessment. For comparison purposes, teachers may be interested in the results of the national assessment, including the total points possible for the task, the number of core points, and the percent of students that scored at standard on the task. Related materials, including the scoring rubric, student work, and discussions of student understandings and misconceptions on the task, are included in the task packet.

Grade Level	Year	Total Points	Core Points	% At Standard
2	2003	7	4	82%