

The following examples of student work illustrate achievement at the mathematics standards for years 3, 4, and 5.

Counting Sheep

The task used in this illustration was one of several used by a teacher as part of a unit on multiplication and division. The teacher gathered samples of students' work as evidence of their ability to apply multiplicative strategies in a variety of contexts.

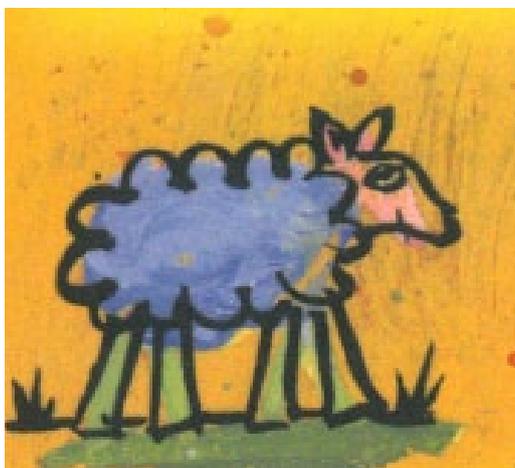
The task relates to achievement objectives for Number from the mathematics and statistics learning area in *The New Zealand Curriculum*.

Counting Sheep

(Adapted from Figure It Out, *Algebra*, Levels 2–3, page 10)

1 sheep has 4 legs:

- How many legs do 4 sheep have altogether?
- If there were 44 legs, how many sheep would there be?



Some features of students' work used to make judgments in relation to the mathematics standards are described below.

AFTER THREE YEARS AT SCHOOL

ILLUSTRATING THE MATHEMATICS STANDARD



Counting Sheep

New Zealand Curriculum: Level 2

In solving problems and modelling situations, students will:

Number and Algebra

- use simple additive strategies with whole numbers ... (number strategies)
- know the basic addition and subtraction facts (number knowledge)
- communicate and interpret simple additive strategies, using words ... and symbols (equations and expressions)

Mathematics Standard: After three years at school

Number and Algebra

- apply basic addition facts ... to:
 - combine or partition whole numbers

Matiu looked at a picture of 1 sheep.



Just add another 4!



add another 4

$$4 + 4 = 8$$

$$4 + 4 + 4 = 12$$

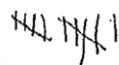
$$4 + 4 + 4 + 4 = 16$$

Matiu stated his strategy (add 4 legs for each extra sheep) and wrote it down. Then he used repeated addition, with each "4" in his equations representing the legs on 1 sheep.

44 legs

40
36
32
28
24
20
16
12
8
4
0

11 sheep



For the second problem, Matiu started with the total number of legs, 44. He used tally marks to keep track of how many times he took away 4 and counted these to get his answer of "11 sheep".

Discussion

This task provides some of the evidence needed to show that Matiu is achieving at early curriculum level 2 and the year 3 standard in Number. He has demonstrated that he is able to apply basic addition facts to combine and partition whole numbers. He used repeated addition and repeated subtraction (early multiplicative and division strategies) to solve the problems. This suggests that he is working at the Early Additive stage of the Number Framework.

Counting Sheep

New Zealand Curriculum: Level 2

In solving problems and modelling situations, students will:

Number and Algebra

- use simple additive strategies with whole numbers ... (number strategies)
- know the basic addition and subtraction facts (number knowledge)
- communicate and interpret simple additive strategies, using words ... and symbols (equations and expressions)

Mathematics Standard: By the end of year 4

Number and Algebra

- apply basic addition facts and subtraction facts [and] simple multiplication facts ... to:
 - combine or partition whole numbers

Noah attempted to state the information given (1 sheep has 4 legs) as a mathematical statement: "1 = 4".

$$1 = 4$$

$$4 \times 4 = 16 \text{ leg}$$

He used a known multiplication fact ($4 \times 4 = 16$) to solve the first problem.

$$16 \times 2 = 32$$

$$\begin{array}{cc} \text{''} & \text{''} \\ 4 \text{ sheep} & 8 \text{ sheep} \end{array}$$

To solve the second problem, Noah started with his answer from the first problem. Then he doubled the 16 to get 32 and added another 16 to get 48. Then he subtracted 1 sheep to get the right number of legs.

The teacher noted that Noah over-generalised the use of the equals sign: he used it to show the relationship between sheep and legs (e.g., "1 = 4", "16 = 4 sheep") rather than to symbolise the balance between sides of an equation. The teacher noted this as a teaching point.

$$32 + 16 = 48$$

$$\begin{array}{cc} \text{''} & \text{''} \\ 8 \text{ sheep} & 12 \text{ sheep} \end{array}$$

$$12 \text{ sheep} - 1 =$$

$$4 \times 4 \text{ leg} = 16 \text{ sheep}$$



But that's 12 sheep, so take off 1 sheep and get 44 legs.

Discussion

This task provides some of the evidence needed to show that Noah is achieving at curriculum level 2 and the year 4 standard in Number. He has demonstrated that he is able to apply basic addition (for example, doubling) and subtraction facts and simple multiplication facts (4×4) to combine and partition whole numbers. This suggests that he is working at the Early Additive stage of the Number Framework.

Counting Sheep

New Zealand Curriculum: Level 3

In solving problems and modelling situations, students will:

Number and Algebra

- use a range of additive and simple multiplicative strategies with whole numbers ... (number strategies)
- know basic multiplication and division facts (number knowledge)
- record and interpret additive and simple multiplicative strategies, using words ... and symbols, with an understanding of equality (equations and expressions)

Mathematics Standard: By the end of year 5

Number and Algebra

- apply additive and simple multiplicative strategies ... to:
 - combine or partition whole numbers
 - find fractions of ... quantities

Jazmin solved the problems with two equations, using known facts for both multiplication and division.

$$4 \times 4 = 16 \text{ legs}$$

$$44 \div 4 = 11 \text{ sheep}$$

The teacher checked Jazmin's use of strategy by asking: "How many sheep would there be if there were 76 legs?"



Well, 4 times 10 is 40, so that's 10 sheep, and there are 36 legs left. And then 4 times 5 is 20, so that's 16 left, and 4 times 4 is 16, so ... it's 10 + 5 + 4. That's 19 ... 19 sheep.

Discussion

This task provides some of the evidence needed to show that Jazmin is achieving at early curriculum level 3 and the year 5 standard in Number. She has demonstrated that she is able to apply her basic fact knowledge and additive and simple multiplicative strategies to combine and partition whole numbers. This suggests that she is working at the Advanced Additive stage of the Number Framework.