

Bill's Dollars

Purpose:

The purpose of this activity is to engage students in using their number knowledge and skills to solve a problem requiring partitioning.

Achievement Objectives:

NA3-1: Use a range of additive and simple multiplicative strategies with whole numbers, fractions, decimals, and percentages.

NA3-2: Know basic multiplication and division facts.

NA3-6: Record and interpret additive and simple multiplicative strategies, using words, diagrams, and symbols, with an understanding of equality.

Description of mathematics:

In readiness for this problem, the students should have familiarity with each of the following components of mathematics. The problem may be solved with different combinations of these components.

- additive strategies
- basic addition facts
- knowledge of the structure of the calendar
- partitioning whole numbers
- multiplication of whole numbers

This activity may be carried out with guidance, or by allowing the student to follow their own method of solution. The approach should be chosen in sympathy with students' skills and depth of understanding.

Activity:

Bill puts exactly \$27 into his piggy bank every month.

It takes one year and seven months to fill. How much money will Bill have in his full piggy bank?



The arithmetic approach

The student is able to use partitioning to solve a challenging multiplication problem.

Prompts from the teacher could be:

1. How many months are there in one year?
2. How many months does it take for Bill to fill his piggy bank?
3. How can you find the total amount he has saved?
4. Can you do anything to the \$27 or to the number of months to break this big calculation into smaller steps?
5. How much has Bill got altogether in his piggy bank?

The image shows a student's handwritten work and a teacher's prompts. The student's work is divided into two sections. The top section shows a multiplication problem 5×27 being broken down into smaller parts: 5×20 , 5×7 , 5×20 , and 4×27 . A large 'X' is drawn over this section. The bottom section shows the student's final calculation: $380 + 70 + 35 + 28 = 513$. The teacher's prompts are in speech bubbles, asking the student to explain their work.

5×27
 5×27
 5×27
 4×27

T: What have you calculated here?
S: Well I went up in 5s for how many months until I got to a year, 12 and 7 more, so 19. And it's times 27.

T: And what about here?
S: Well I added up all the 20s first so that's 5×20 , 5×20 , 5×20 and 4×20 . It's 380. Then I worked out the 7s.
T: So the 70.
S: Oh that's two lots of 5×7 , it's the same as 10×7 . Then I added it all up to get 513.

$380 + 70 + 35 + 28$
 $450 + 35 + 28$
 $485 + 28 = 513$

The conceptual approach

The student is able to use tidy numbers to solve a challenging multiplication problem.

Prompts from the teacher could be:

1. How can you find the total amount he has saved?
2. Can you do anything to the \$27 or to the number of months to break this big calculation into smaller steps?
3. How much has Bill got altogether in his piggy bank?

Handwritten student work showing a multiplication problem and a strategy using tidy numbers:

$$\begin{array}{r} 27 \\ \times 19 \\ \hline \end{array}$$

7 + 12

2 months 54
20 months 540
19 months 513.

T: Tell me about your calculations.

S: Well I need 19 months of savings but that's hard to think up so I did 20. And that's just 2 months and 10 times that. So 2 27s are 54 and then I got 540 and I took a month off.