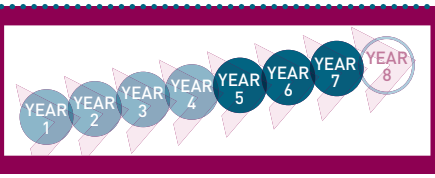


The following examples of student work illustrate achievement at the mathematics standards for years 5, 6, and 7.

Breakdown of Waste

The task used in this illustration was part of a unit on waste, packaging, and recycling, stemming from a school-wide focus on sustainability. The unit was based on the Material World strand (from the science learning area), but this particular task also had links to achievement objectives for number strategies, number knowledge, and measurement from the mathematics and statistics learning area in *The New Zealand Curriculum*.

Breakdown of Waste Timeline

1. *Select some food and packaging items from the table that our class created after last week's research.*

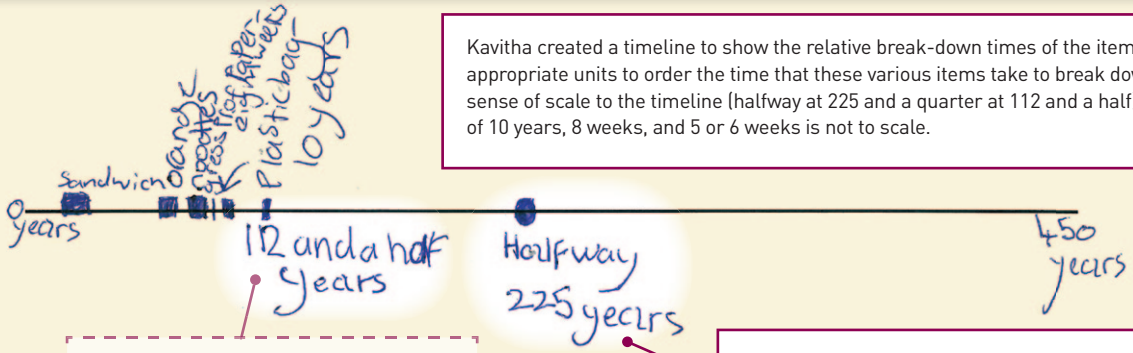
Time that items found in school lunchboxes take to break down	
Food	**Packaging**
Apple core: 2 months	Plastic bag: 10 years
Banana skin: 4 weeks	Paper bag: 8 weeks
Orange skin: 5 weeks	Plastic wrap: 25 years
Sandwich crust: 2 weeks	Greaseproof paper: 8 weeks
Leftover noodles: 6 weeks	Plastic water bottle: 450 years
Bread: 12 days	

2. *Draw a timeline. Place your selected items on the timeline to show how long each item takes to break down.*
3. *Choose one food and one packaging item from your timeline and calculate the difference between the times that they take to break down.*

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

Breakdown of Waste

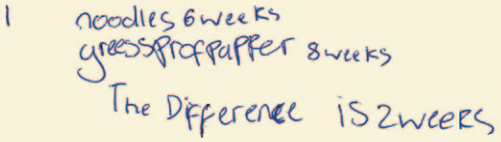
New Zealand Curriculum: Level 3	*Mathematics Standard: By the end of year 5*
In solving problems and modelling situations, students will:	
Number and Algebra • *use a range of additive and simple multiplicative strategies with whole numbers, fractions, … (number strategies)* • *know basic multiplication and division facts (number knowledge)*	*Number and Algebra* • *apply additive and simple multiplicative strategies … to:* – *combine or partition whole numbers* – *find fractions of … quantities*
Geometry and Measurement • *use linear scales and whole numbers of metric units for … time (measurement)*	



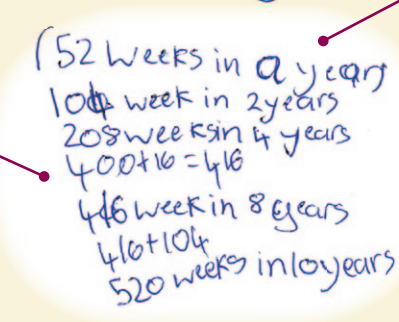
Kavitha created a timeline to show the relative break-down times of the items she chose. She used appropriate units to order the time that these various items take to break down. There is some sense of scale to the timeline (halfway at 225 and a quarter at 112 and a half); however, placement of 10 years, 8 weeks, and 5 or 6 weeks is not to scale.

The teacher noted that Kavitha needed support to work out half of 225.

Kavitha found half of 450 by partitioning numbers: "What's half of 450? I know half of 400 is 200 and half of 50 is 25, so that's 200 plus 25, which is 225 – and that goes in the middle."

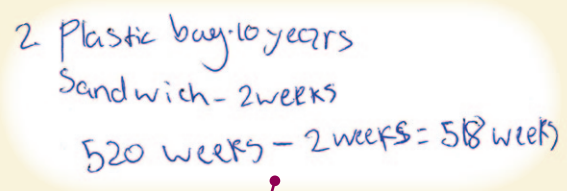


(this was a bit Easy)



To find out the number of weeks in 10 years, Kavitha worked out the number of weeks in 2 years (104), 4 years (208), and 8 years (416). When adding the number of weeks in 8 years and 2 years (416 + 104), she partitioned the 104 into 100 + 4 before adding it to 416: "416 and 100 is 516. Then I added 4. I know 16 and 4 is 20. So that makes 520 weeks in total."

Kavitha worked out how many weeks there are in 10 years by using a repeated doubling strategy, with some partitioning when doubling 208. As she was considering how to work it out, the teacher prompted her: "Would using your times table (multiplication) help and be quicker?" Kavitha responded that she didn't think it would be and proceeded with her doubling and adding method.



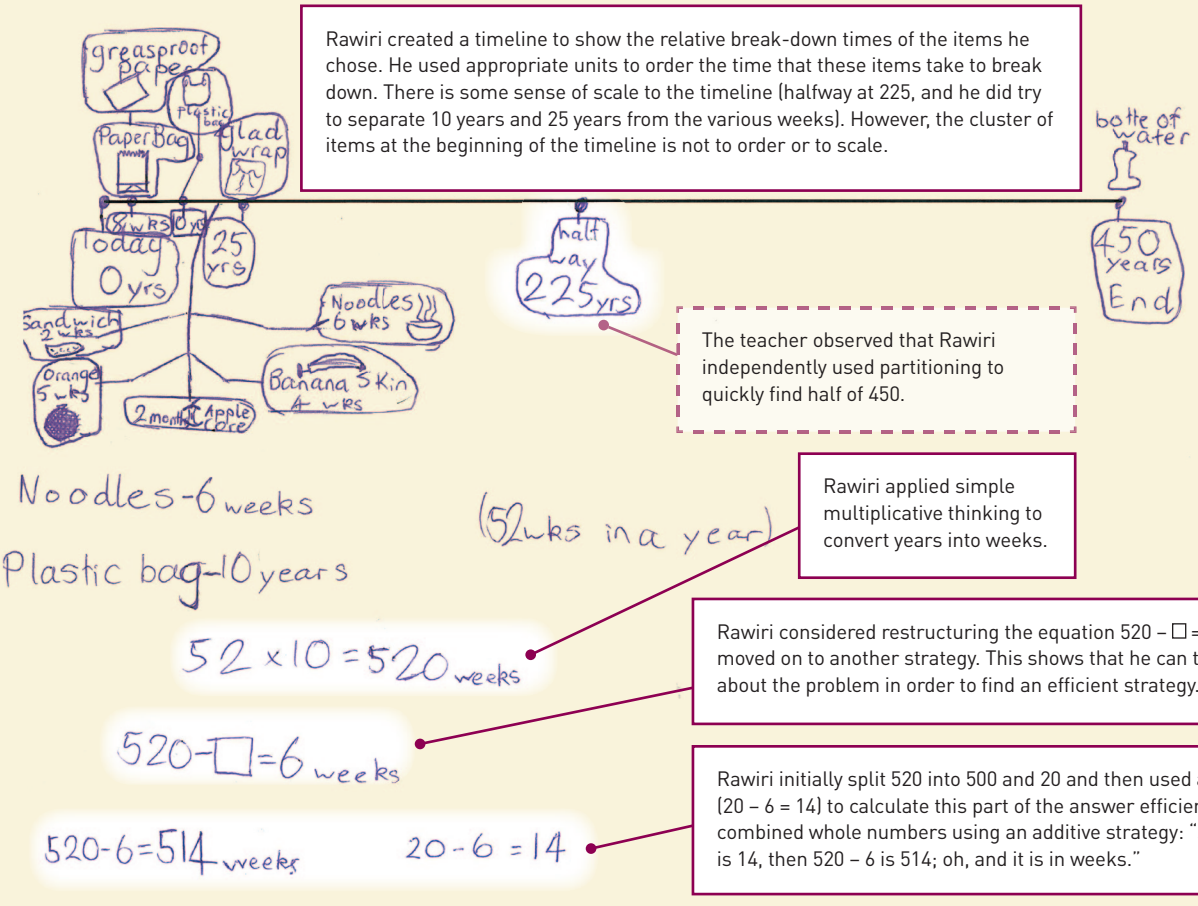
Kavitha explained: "520 weeks minus 2 weeks is how much longer it takes for the plastic bag to break down than the sandwich."

Discussion

This task provides some of the evidence needed to show that Kavitha is achieving at early curriculum level 3 and the year 5 standard in Number. She has demonstrated that she is able to apply additive strategies to combine numbers. This suggests that she is working at the Advanced Additive stage of the Number Framework. This task also shows that she is working within curriculum level 3 in Measurement, but she makes errors in scale in the first quarter of the timeline (possibly stemming from her choice of 0–450 years for her timeline).

Breakdown of Waste

New Zealand Curriculum: Level 3	*Mathematics Standard: By the end of year 6*
In solving problems and modelling situations, students will:	
Number and Algebra • *use a range of additive and simple multiplicative strategies with whole numbers, fractions, … (number strategies)* • *know basic multiplication and division facts (number knowledge)*	*Number and Algebra* • *apply additive and simple multiplicative strategies flexibly to:* – *combine or partition whole numbers, including … using addition and subtraction as inverse operations* – *find fractions of … quantities*
Geometry and Measurement • *use linear scales and whole numbers of metric units for … time (measurement)*	



Rawiri created a timeline to show the relative break-down times of the items he chose. He used appropriate units to order the time that these items take to break down. There is some sense of scale to the timeline (halfway at 225, and he did try to separate 10 years and 25 years from the various weeks). However, the cluster of items at the beginning of the timeline is not to order or to scale.

The teacher observed that Rawiri independently used partitioning to quickly find half of 450.

Rawiri applied simple multiplicative thinking to convert years into weeks.

Rawiri considered restructuring the equation 520 – □ = 6 but moved on to another strategy. This shows that he can think flexibly about the problem in order to find an efficient strategy.

Rawiri initially split 520 into 500 and 20 and then used a basic fact (20 – 6 = 14) to calculate this part of the answer efficiently. He combined whole numbers using an additive strategy: "So if 20 – 6 is 14, then 520 – 6 is 514; oh, and it is in weeks."

The items that Rawiri chose did not allow him to demonstrate flexible use of multiplicative strategies, but when asked how many months were in 32 weeks, he replied, "4 times 8 is 32, so there are 8 months in 32 weeks." This showed a basic understanding of inverse relationships.

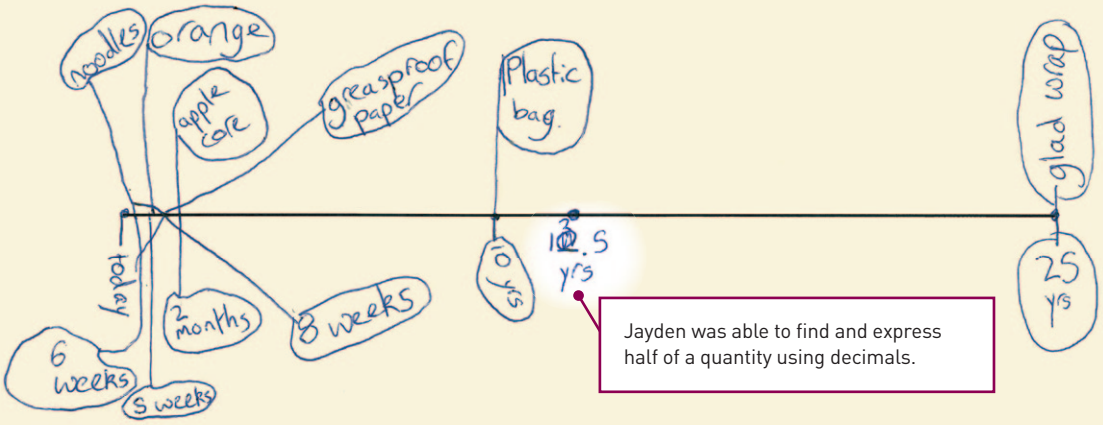
Discussion

This task provides some of the evidence needed to show that Rawiri is achieving at curriculum level 3 and the year 6 standard in Number. He has demonstrated that he is able to apply additive and simple multiplicative strategies flexibly to solve problems. This suggests that he is working at the Advanced Additive stage of the Number Framework. He is also working within curriculum level 3 in Measurement. However, as with Kavitha, he has made errors in scale (possibly stemming from his choice of items spanning from 0–450 years for his timeline).

ILLUSTRATING THE MATHEMATICS STANDARD

Breakdown of Waste

New Zealand Curriculum: Level 4	*Mathematics Standard: By the end of year 7*
In solving problems and modelling situations, students will:	
Number and Algebra • *use a range of multiplicative strategies when operating on whole numbers* • *find fractions, decimals … of amounts expressed as whole numbers … (number strategies and knowledge)*	*Number and Algebra* • *apply additive and multiplicative strategies flexibly to whole numbers, ratios …* • *apply additive strategies to decimals*
Geometry and Measurement • *use appropriate scales … and metric units for … time (measurement)*	



Jayden was able to find and express half of a quantity using decimals.

Jayden created a timeline to show the relative break-down times of the items that he chose. He chose items up to 25 years only, which enabled him to draw his timeline to a realistic scale. He used appropriate decimal units to order the time that various items take to break down. Item placements show consideration of scale, e.g., a cluster of items near "today" and "plastic bag" just left of halfway.

Apple core - 2 months (I'll be 10, and 10 months)
glad wrap - 25 yrs (I'll be 35)

The diffrents betwen 2 months, and 25 yrs is 24 yrs. and 10 months.

Months

25 x 12 = ?
50 x 6 =
100 x 3 = 300

Initially, Jayden considered using an algorithm but decided on a more efficient way to solve 25 x 12. He used repeated doubling and halving to get 50 x 6 and then 100 x 3 = 300.

300 months, - 2 months = 298 months.

When asked to prove that 298 months is the same as 24 years and 10 months, Jayden replied: "I would use 12 x 12 and then double 144, which is 288 months in 24 years. 288 and 10 is 298. So they are the same."

Discussion

This task provides some of the evidence needed to show that Jayden is achieving at early curriculum level 4 and the year 7 standard in Number. He has demonstrated that he is able to apply multiplicative strategies flexibly to whole numbers. This suggests that he is working at the Advanced Multiplicative stage of the Number Framework. He is also working within curriculum level 4 in Measurement: he has demonstrated his ability to use scales for time and make simple conversions between units, using whole numbers and decimals.