

Unit NE2: Building Problem Solving, Reasoning and Understanding Skills

Year 1

Rachel McCarthy

Nerang Cluster

Make It Count

Year One

Action Learning Cycle One

Overview

In Year 1, we identified that the Math Curriculum that was being implemented lacked any problem-based teaching and focused primarily on proficiency in math skills.

Back to Front Math was identified as a tool that could assist us to further enhance our students' problem solving, reasoning and understanding of math concepts. As well as providing the math lessons, Back to Front Math also gave us information so we could focus on improving our questioning techniques, our differentiation during Math and our identification of students' misconceptions prior to beginning new topics.

Objectives

To use Back To Front Math as a learning tool to improve all students' problem solving, reasoning and understanding of Year 1 math concepts.

Moderation Task

The Year 1 moderation task "Emma is bowling with skittles" was delivered to small groups of Year 1 students by the classroom teacher.

The results showed that most students were underperforming in the area of problem solving and that all Indigenous students, bar one, were performing below a sound grade in all assessed areas.

Results

Name	Problem Solving	Reasoning	Understanding
Nita	C	C	D
Louise	D	D	D
Nigel	D	D	D
Jacob	E	E	E

The results of the Indigenous students who undertook that Year 1 Moderation Task.

Moderation Task

The Year 1 Moderation Task "*Emma is bowling with skittles*" follows and is accompanied by each Indigenous student's record sheet with their results.

Name: _____

Grade 1 moderation task: start of year

Emma is bowling with skittles

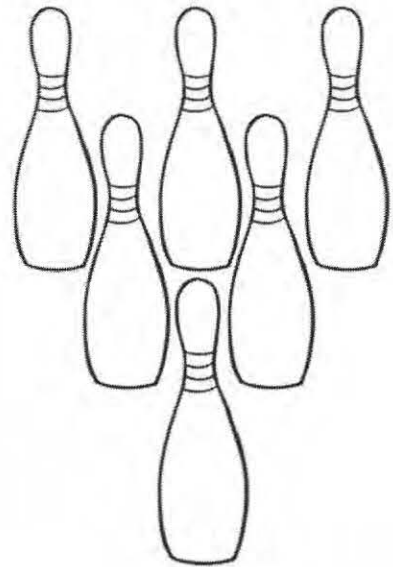
Play a game of skittles with the students first, then ask the questions beneath to individual students and record their answers on the student record sheet. Have students draw pictures to represent the situations. Stop when the student gets really stuck – you don't need to get answers for all 5 questions.

You will need:

- Six skittles and a ball to knock them down with
- Some photocopies of the image to the right of the six skittles for students to draw on if they need to.
- Paper and pencils for students to draw their answers
- Consider having cut-outs of the skittles for students to glue instead of drawing.
- The student record sheet for recording student answers to the questions below.
- A blue, black and red pen.

Questions to ask students:

1. How many skittles are there? Can you count them? (*reduce the number of skittles to 4 if they can't count to 6*) Does it matter that they are not in a straight line? How could you make sure that you counted them all and didn't miss any? What if we start counting from this one (front first, then repeat choosing one in the middle at the back to count first) instead? Will it still be the same number of skittles?
2. What would happen if we knocked one down? How many would there be still standing up? Can you draw that? (*give them some paper, or some stickers of skittles to use to represent the ones that would be left*) Would it have mattered which one we knocked down? Would there be a different amount left standing up if a different one was knocked down?
3. If there were four left standing up, how many did we knock down? Can you draw just the ones that we knocked down?
4. If I knocked one down, and then another 2 down, how many would still be standing up? How do you know? Does it matter which skittles I knocked down?
5. If I knocked some down, and then knocked another one down, and there were 3 left, how many did I knock down the first time?

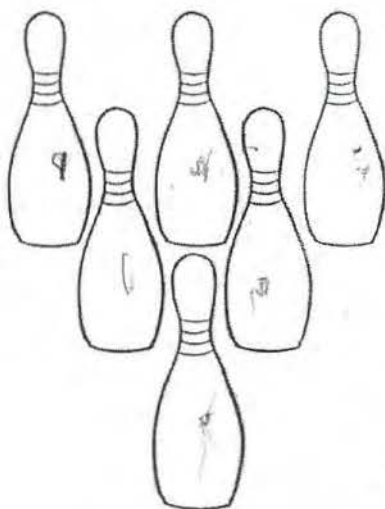


Back to Front Math

Year 1 Moderation Task: Skittles

Name: Nigel 18/04/12

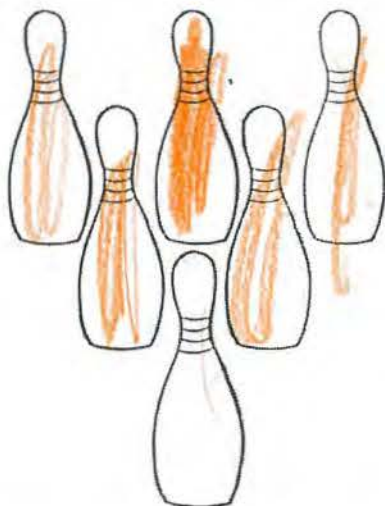
1.



0 ✓

* answered that we could count them even though they weren't in a straight line
* knew that there would be 6 no matter where we started counting

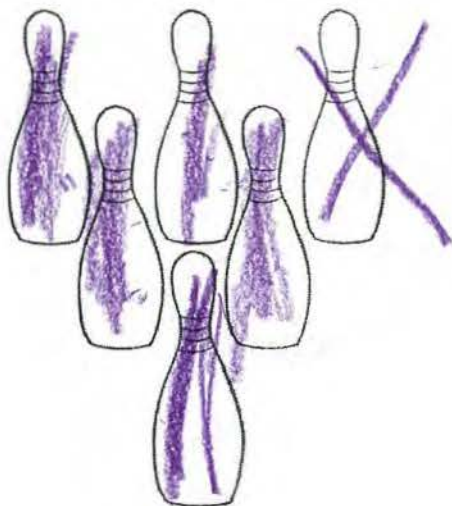
2.



5 ✓

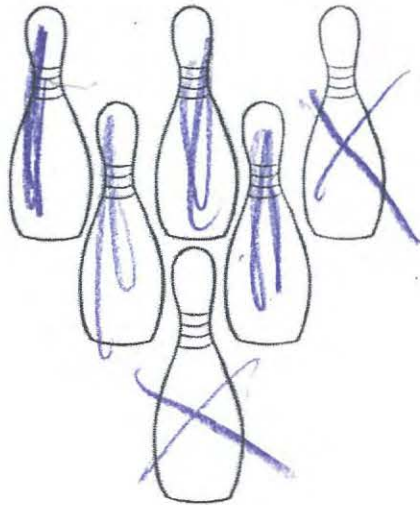
* repeatedly answered 1 even though question was rephrased
* required more than level 2 prompts to arrive at answer

3.



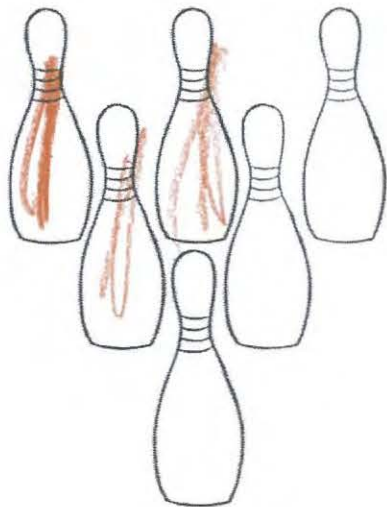
X

4.



4 x

5.



3 x

Teacher Comments

Problem solving - D

Reasoning - D

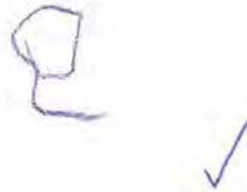
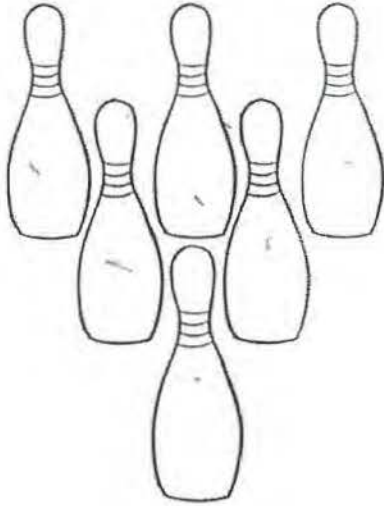
Understanding - D

Back to Front Math

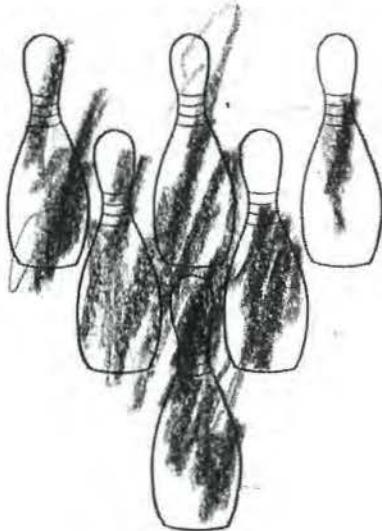
Year 1 Moderation Task: Skittles

Name: Jacob 18/04/12

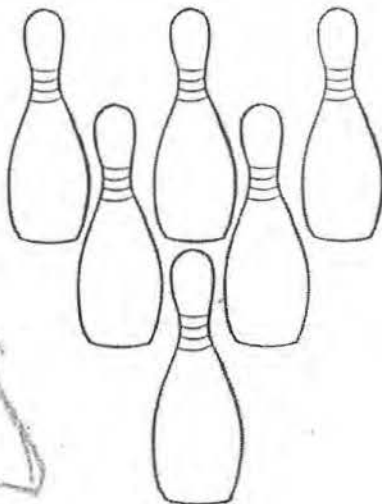
1.



2.

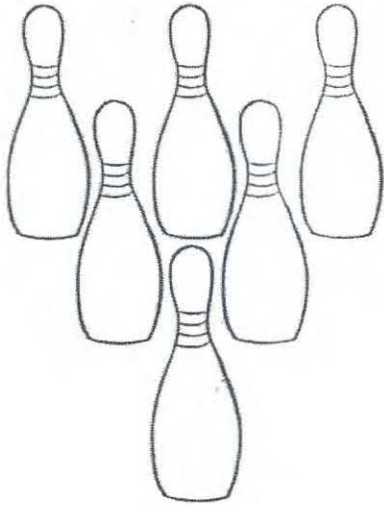


3.



X

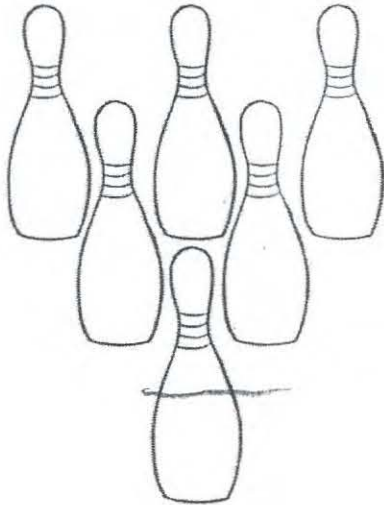
4.



4

x

5.



x

Teacher Comments

Problem solving - E

Reasoning - E

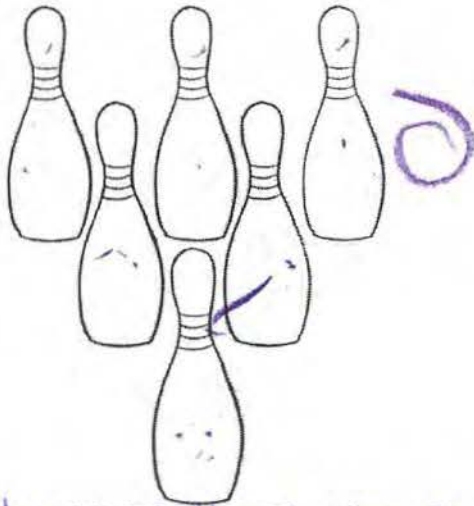
Understanding - E

Back to Front Math

Year 1 Moderation Task: Skittles

Name: Louise 18/04/12

1.



✓
* Needed to recount pins everytime counting started from a new pin.

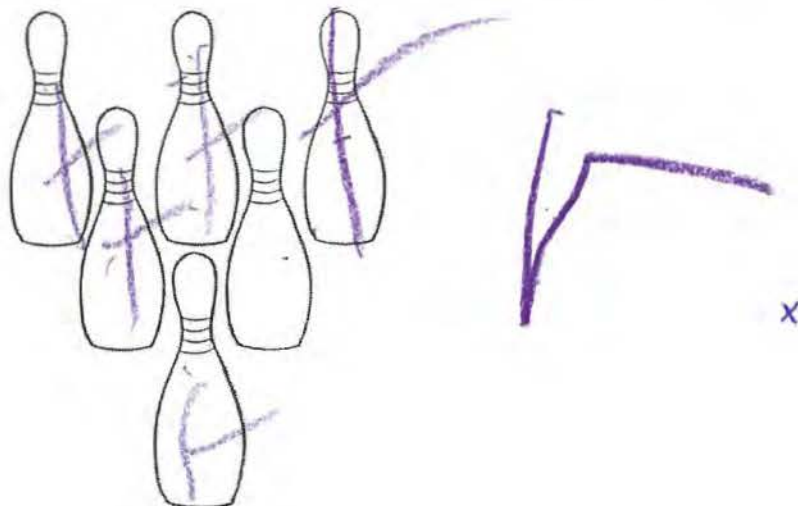
* Used dots to ensure all pins were counted

2.

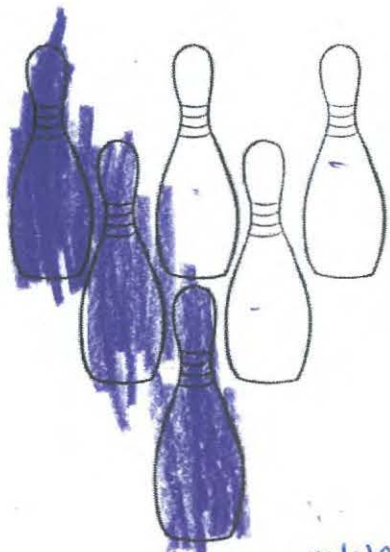


* Drew an extra pin initially - prompted to cross one out instead. Counted remaining pins twice and each time got the answer 8.

3.



4.

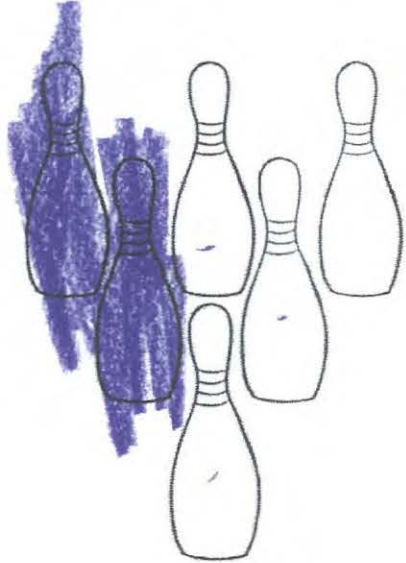


3



* Was not able to explain how she arrived at the answer. Said she had coloured in 4.

5.



4



Teacher Comments

Problem solving - D

Reasoning - D

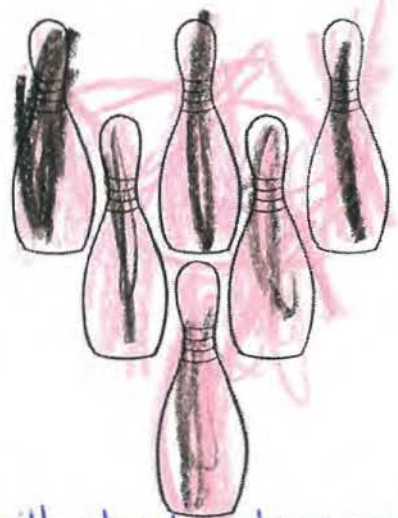
Understanding - D

Back to Front Math

Year 1 Moderation Task: Skittles

Name: Nita 18/04/12

1.



~~10~~

✓

*Came up with idea to colour each pin as counting to ensure each was counted.

2.



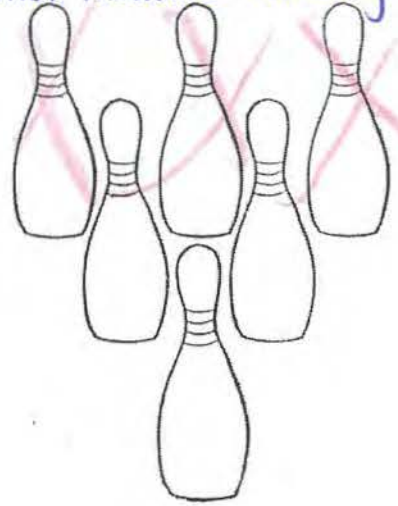
5

✓

*coloured extra one when explaining answer

*Teacher modelled crossing out pins

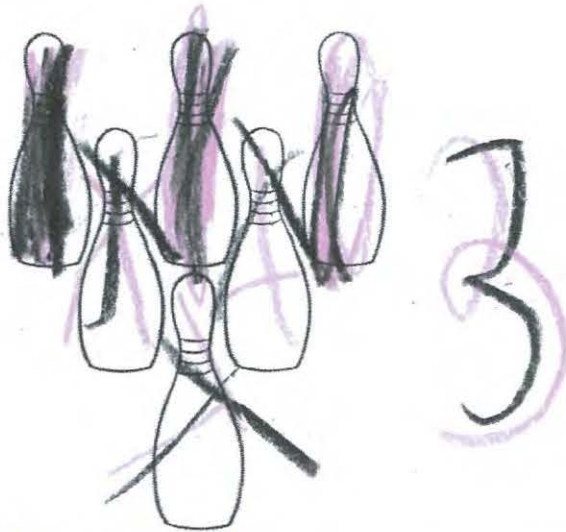
3.



~~3~~

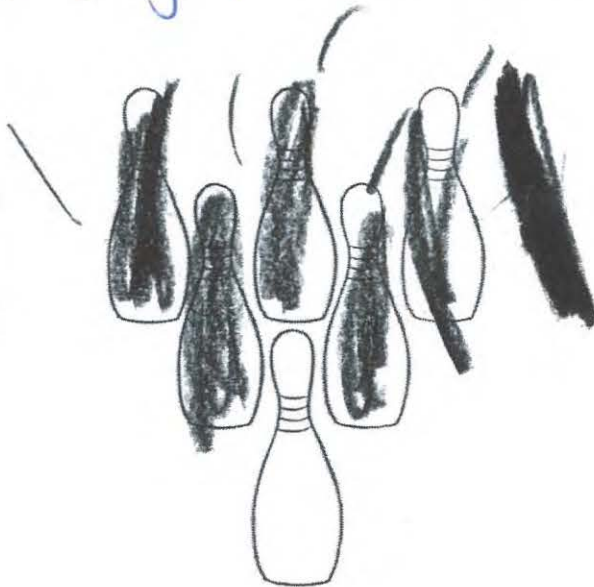
✗

4.



* No prompting required

5.



Teacher Comments

Problem solving - C

Reasoning - C

Understanding - D

Action Learning Cycle One

Action Learning Cycle One was planned around the concept of fractions.

Pre-Test

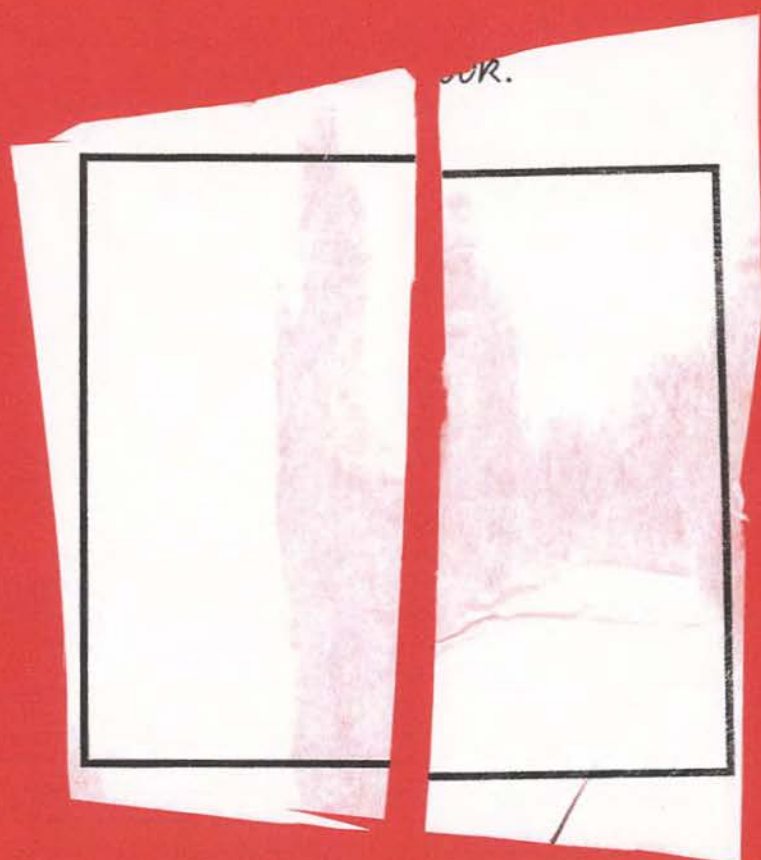
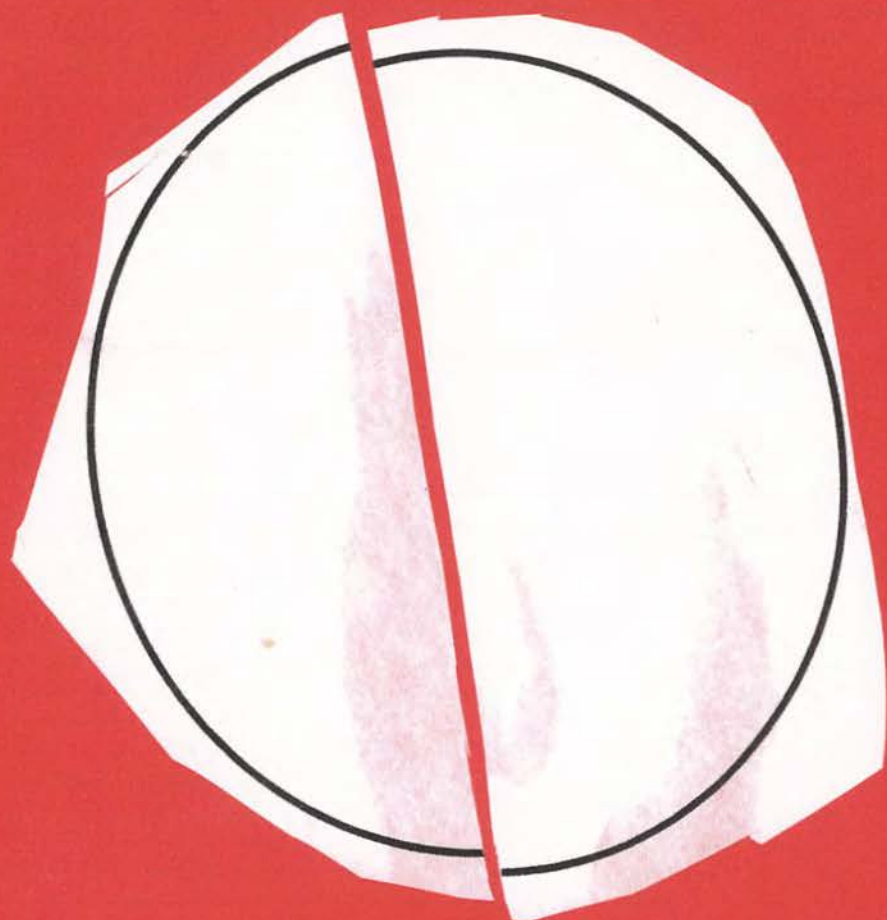
Students were presented with a novel problem. It required them to take basic shapes and cut each in half. All students were given an opportunity to first solve the problem without prompting. They worked independently and were able to approach the problem using any technique or resource they chose.

The teacher observed the students as they worked and took note of which students were able to solve the problem with minimal or no input, who required further prompting and what misconceptions were evident amongst students.

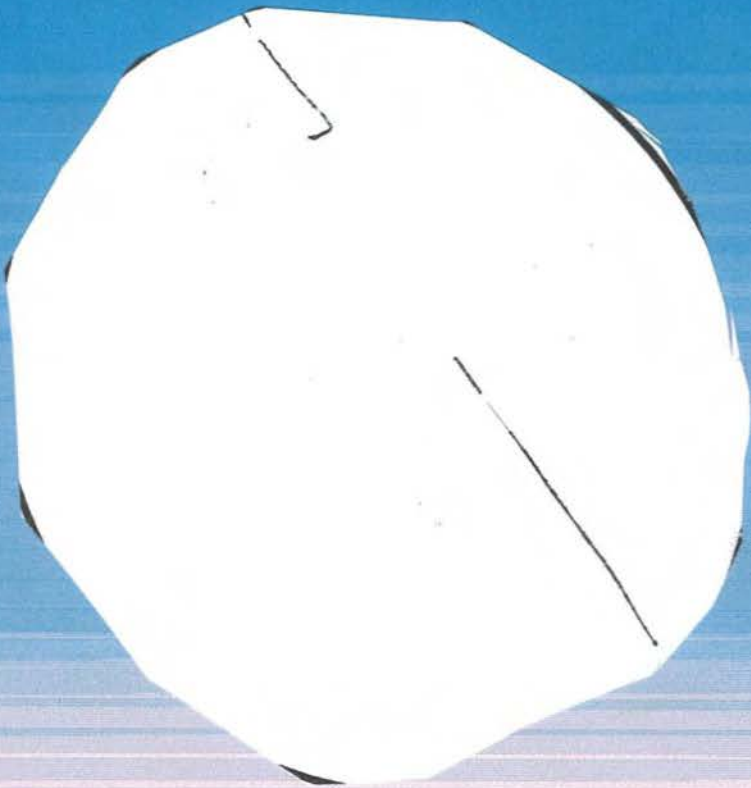
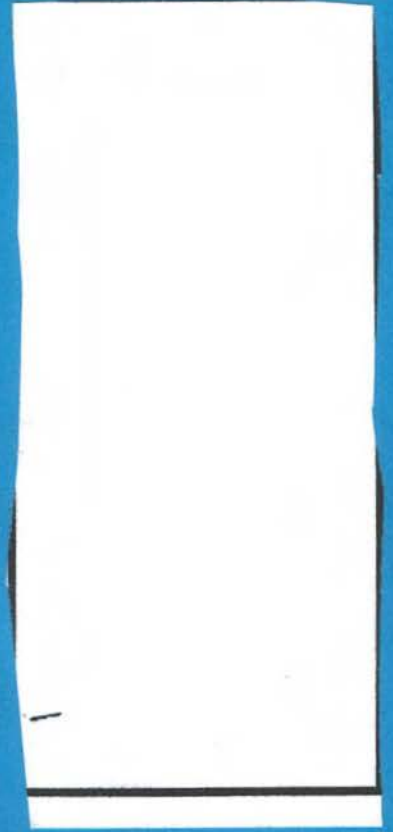
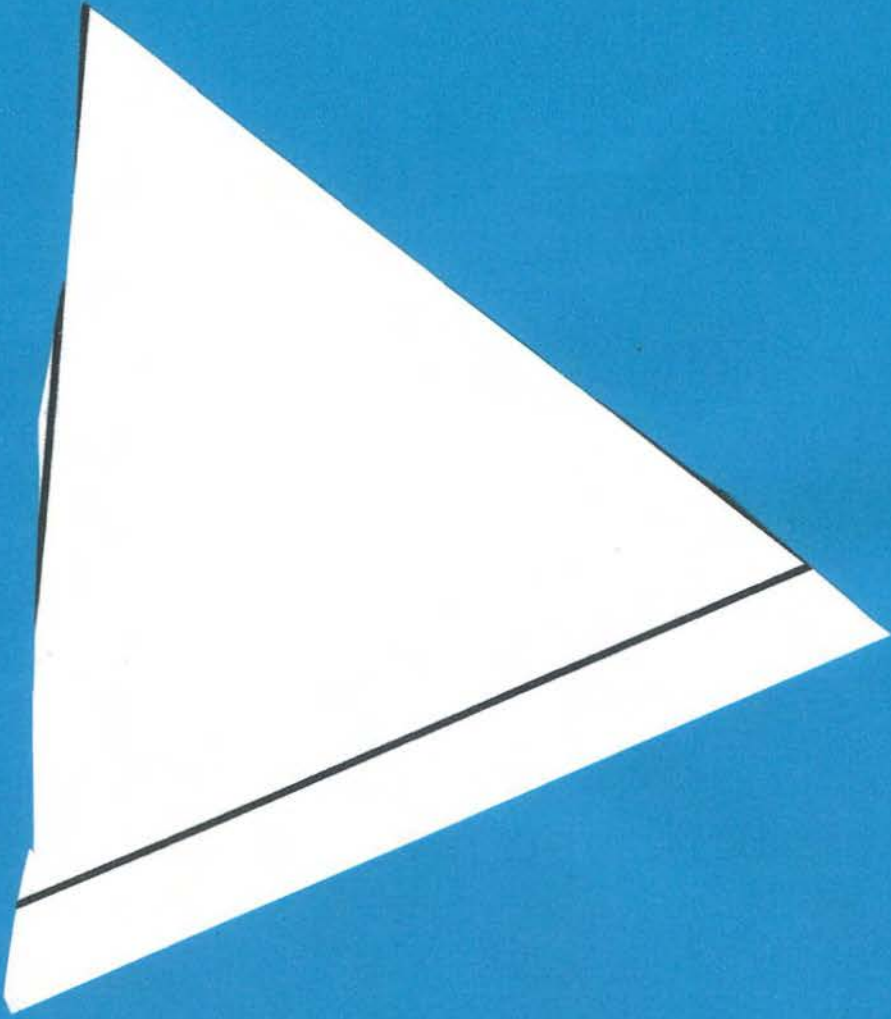
Pre-Test

Following is each Indigenous student's pre-test that identified their misconceptions and outlined the level of prompting that was required for them to complete the task.

Nita

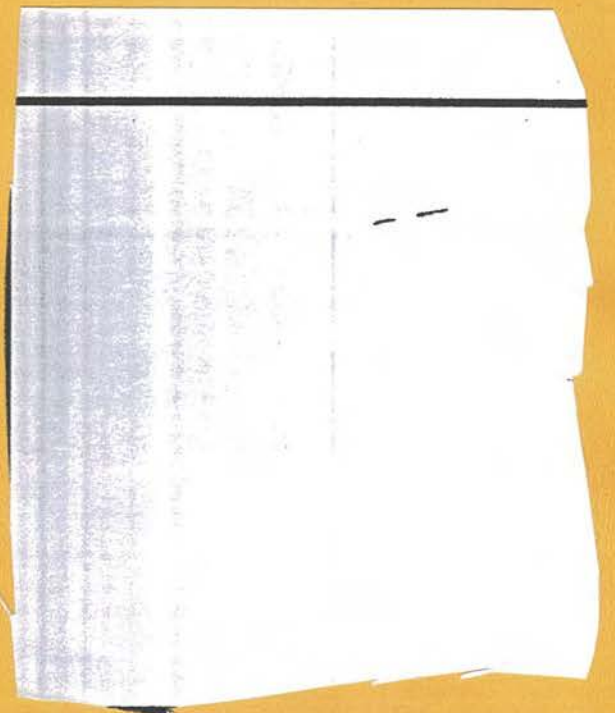
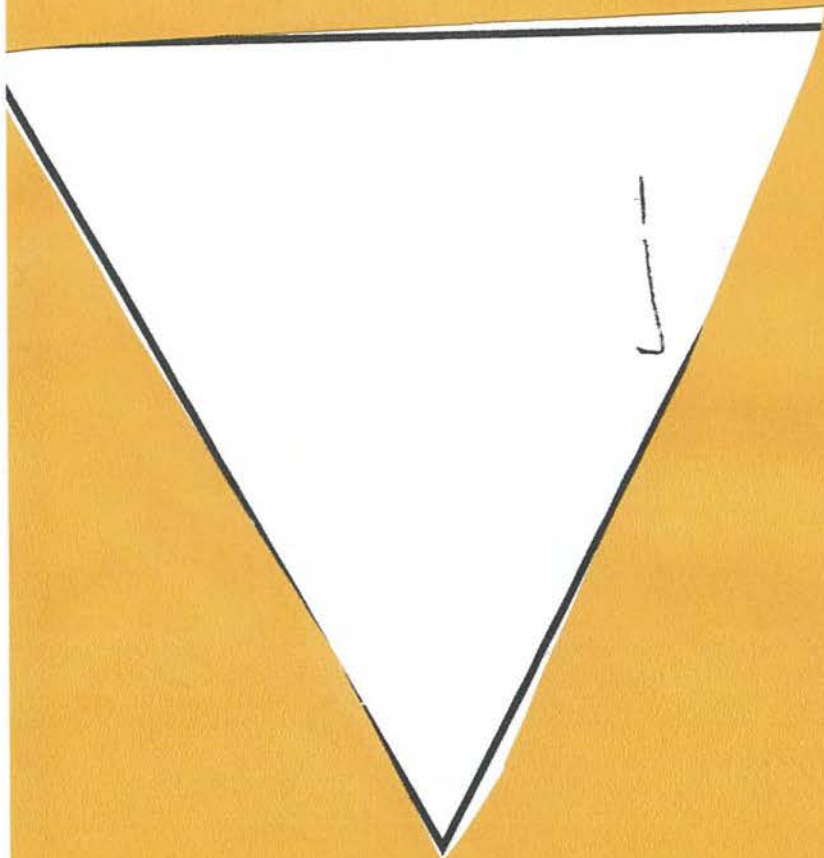
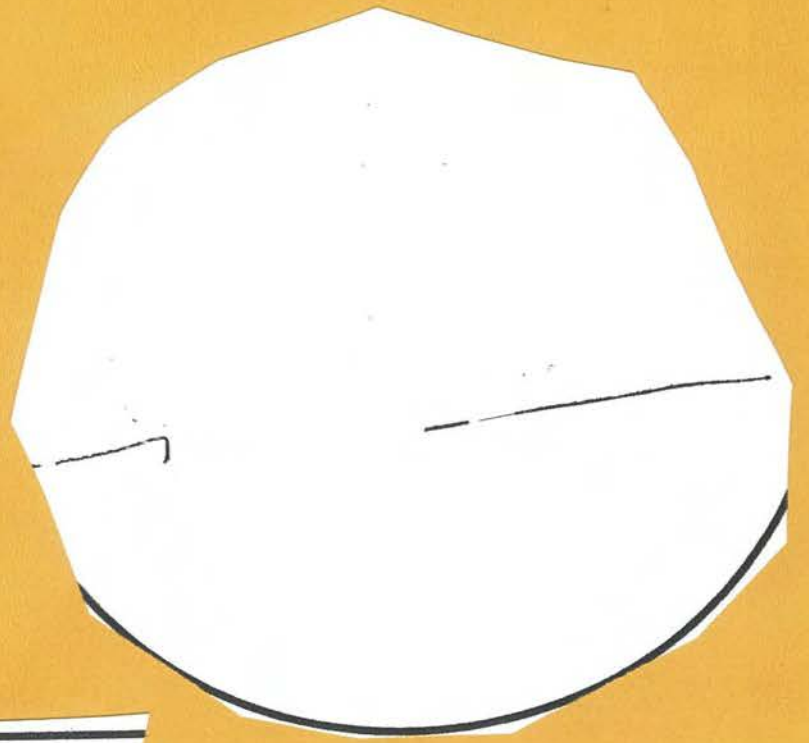


Jacob

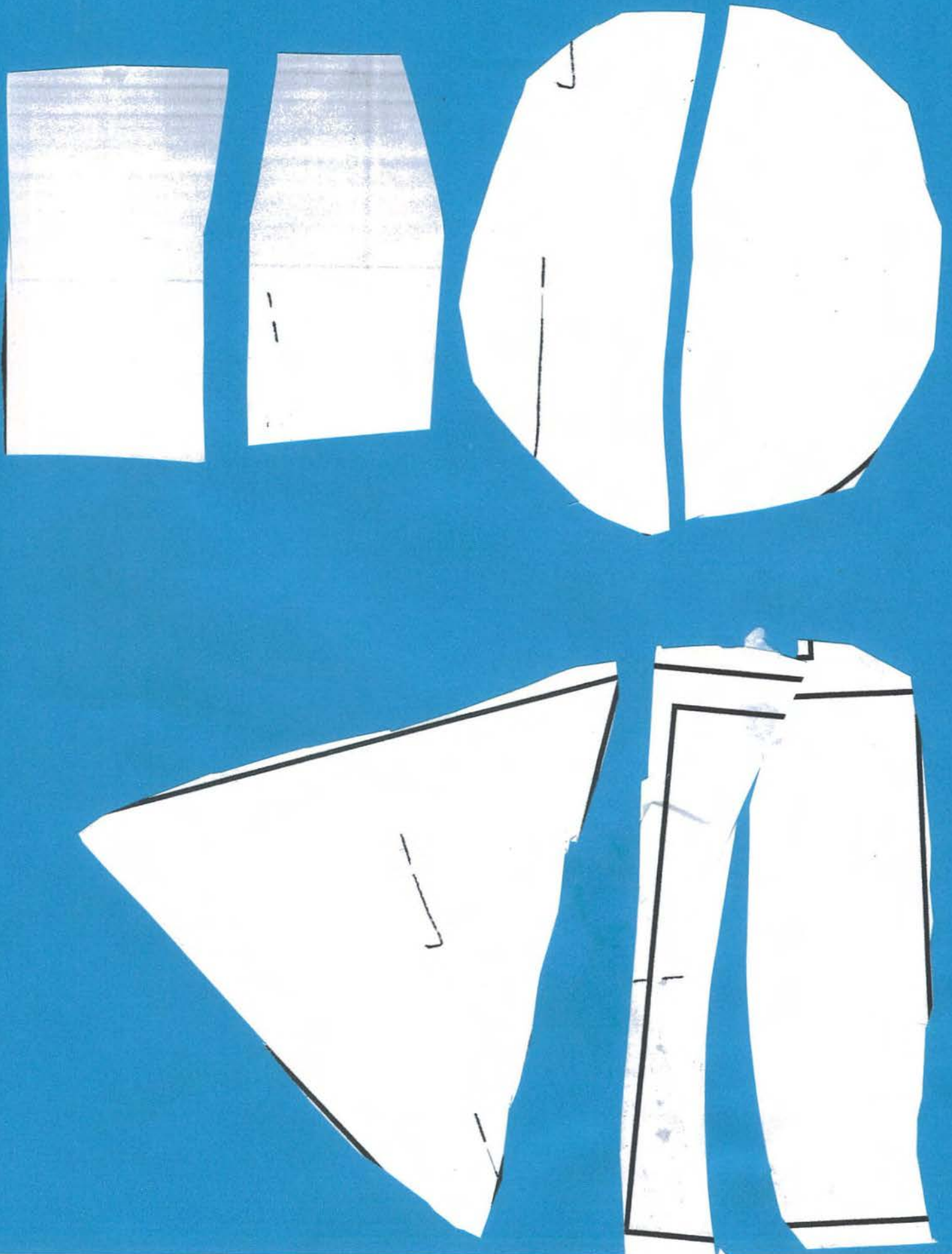


• When prompted to cut shapes in half he made small cuts around the edge of the shapes

Nigel



Louise



Explicit Teaching and Learning

Following the pre-test, students were engaged in a number of learning experiences including explicit teaching taken from both Back to Front Math and C2C.

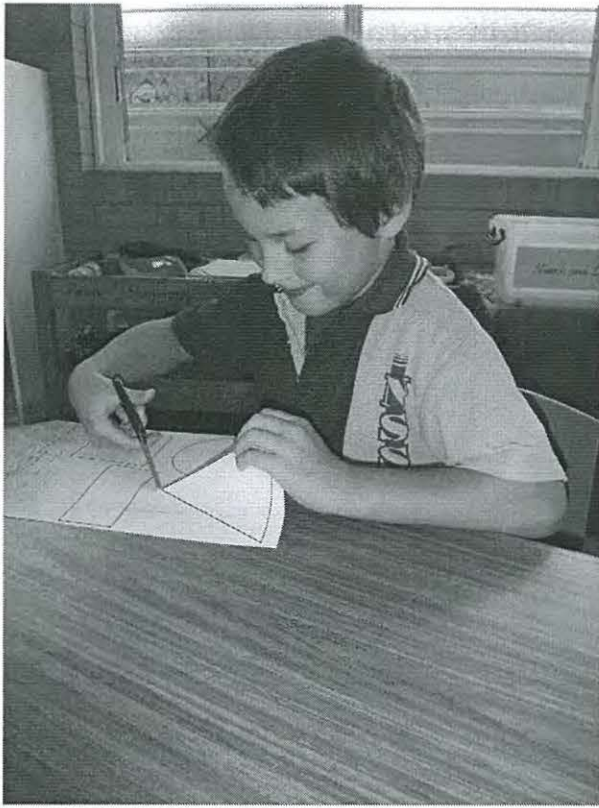
Focus Teaching Time: The teacher explicitly taught the focus concept and points that were required for students to be able to solve the novel problem themselves.

Rotational Activities: Students participated in rotational activities that allowed the teacher time to work with all students in small groups on the Back To Front Math manipulation problems. Other activities included the use of hands-on materials and games that enhanced student understanding.

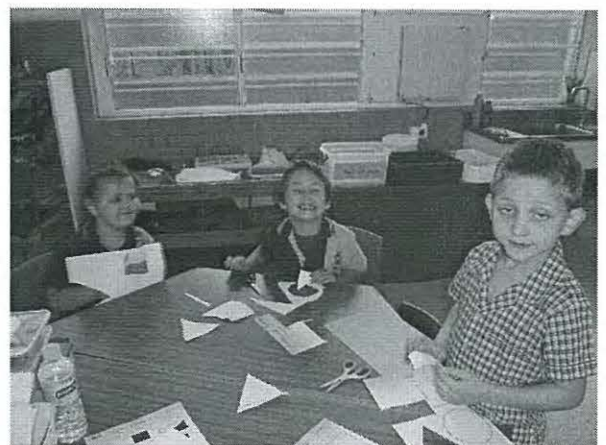
Reflection: Students were given time to reflect on their learning. This skill was modeled to the whole class and there were opportunities for both individual and group reflection.

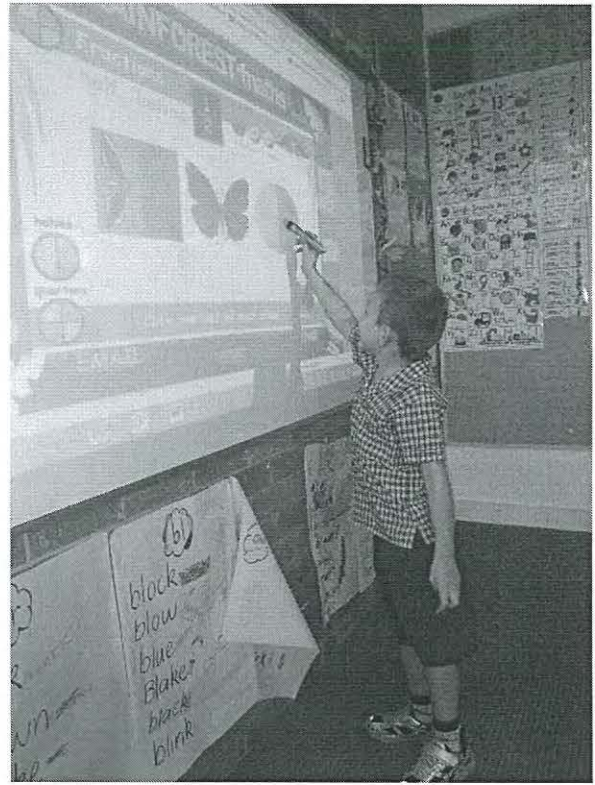
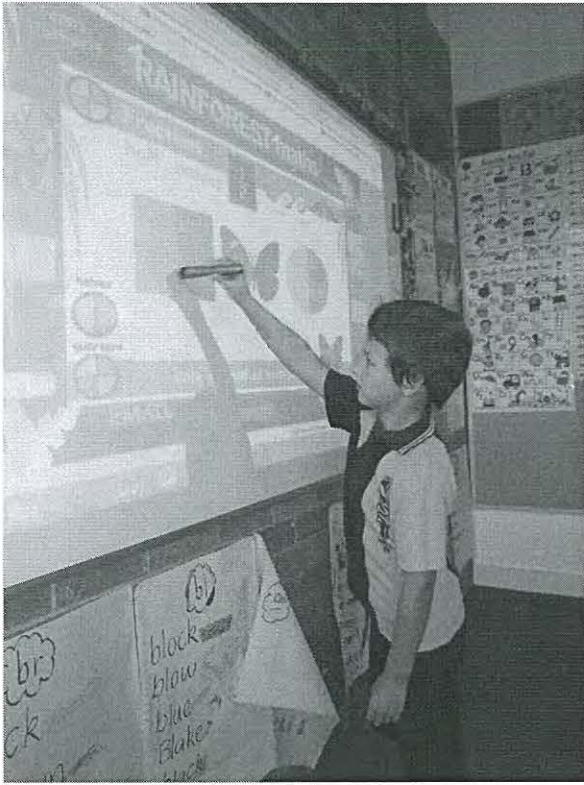
Explicit Teaching and Learning

Following are photos of students engaged in the explicit teaching and learning that were a part of Action Learning Cycle One.

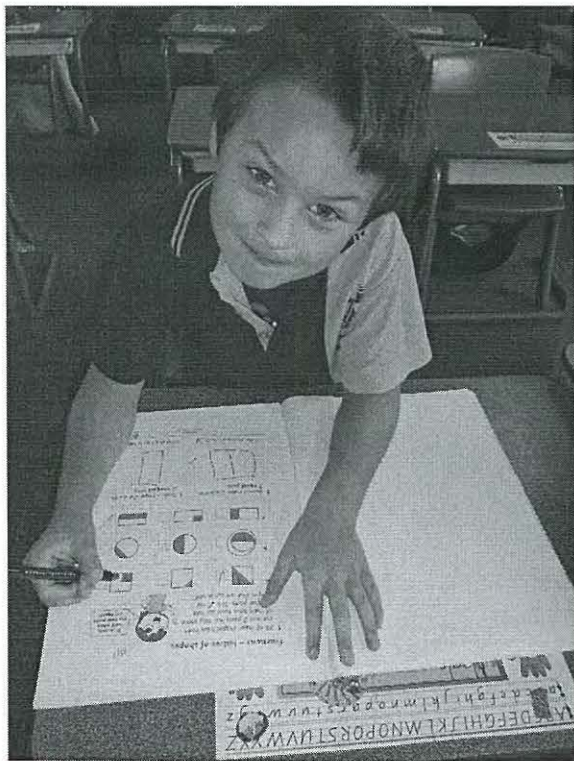


Students experimenting with cutting shapes in half.





Students engaged in rotational activities.



Post-Test

A post-test was conducted at the end of the unit as a means of assessing the change in students' understanding of the concepts and their ability to use problem-solving skills. Students were required to complete a section of Back To Front Math Journal Problem 8 which had not been previously used with students. They had to show which pictures represented a half and which did not.

Results

All students' problem solving, reasoning and understanding improved to some extent. Some students still required prompting on novel problems, for example, shapes that they had not encountered before. This showed that they still had difficulty in transferring their understanding of fractions to a new, or unknown, situation and that their problem solving skills required further development.

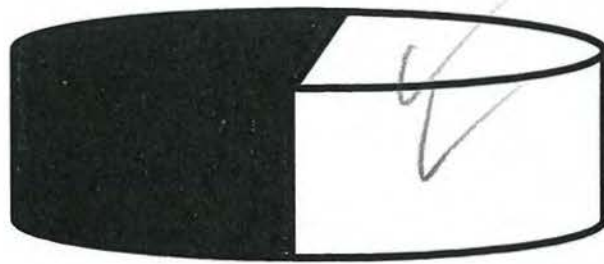
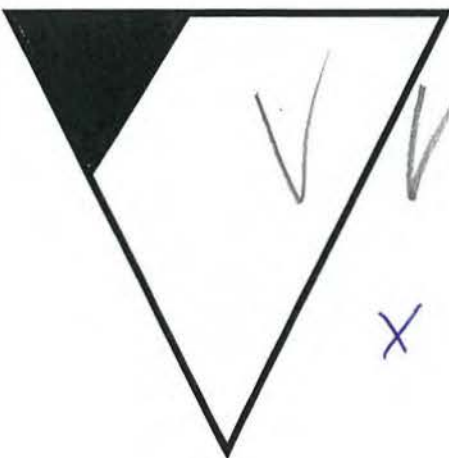
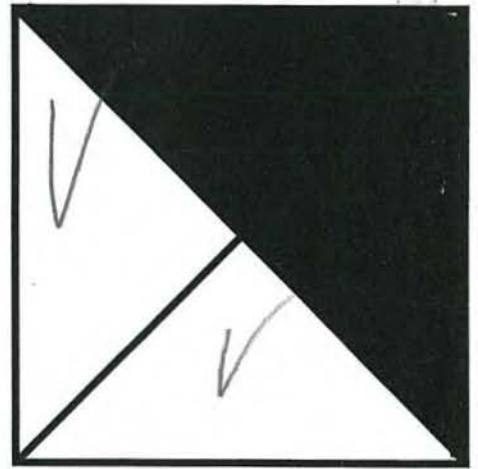
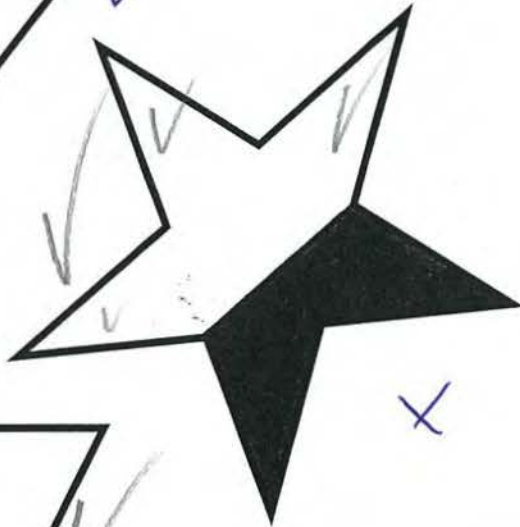
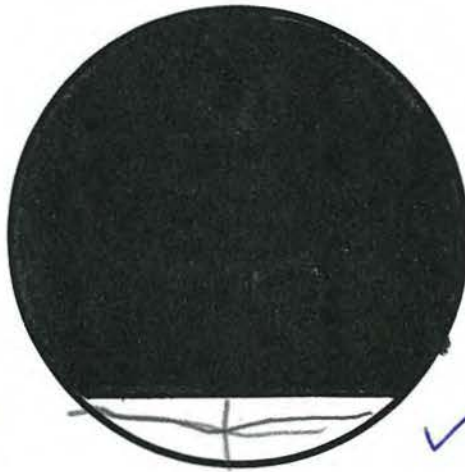
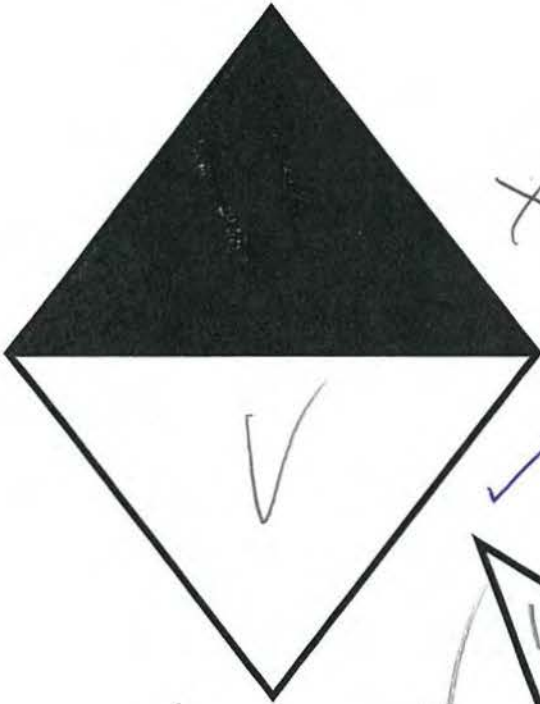
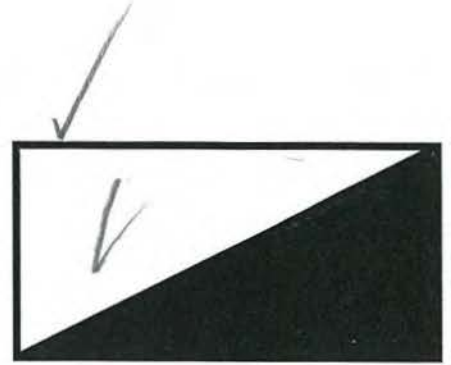
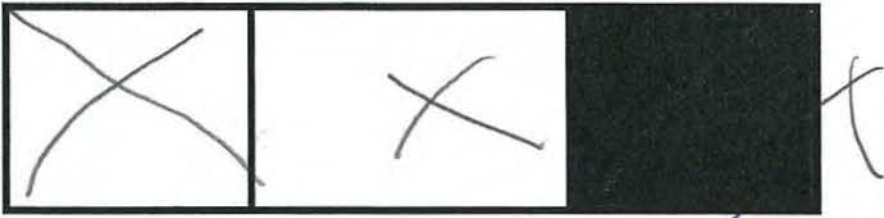
Results

Following are the post-tests of the Indigenous students which clearly show that while they applied their learnt skills of fractions to known and familiar shapes, unknown shapes still presented a problem. This is evidence that further development of problem solving skills is required.

Whole and Half

Louise

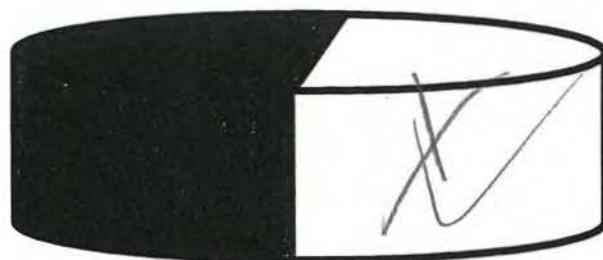
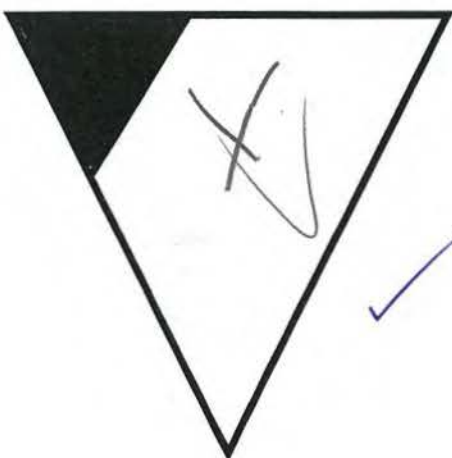
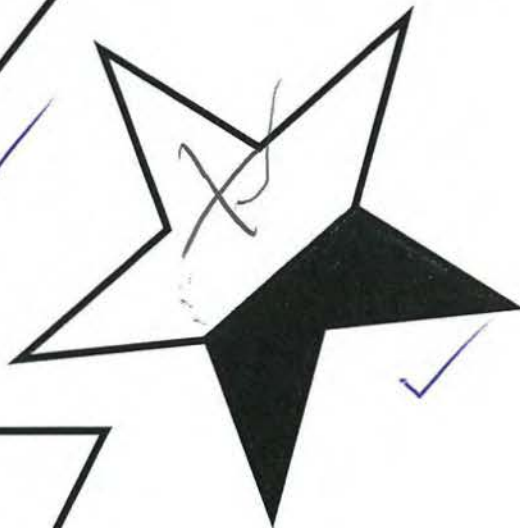
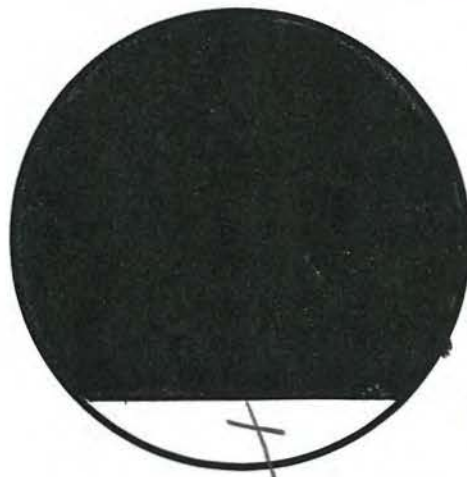
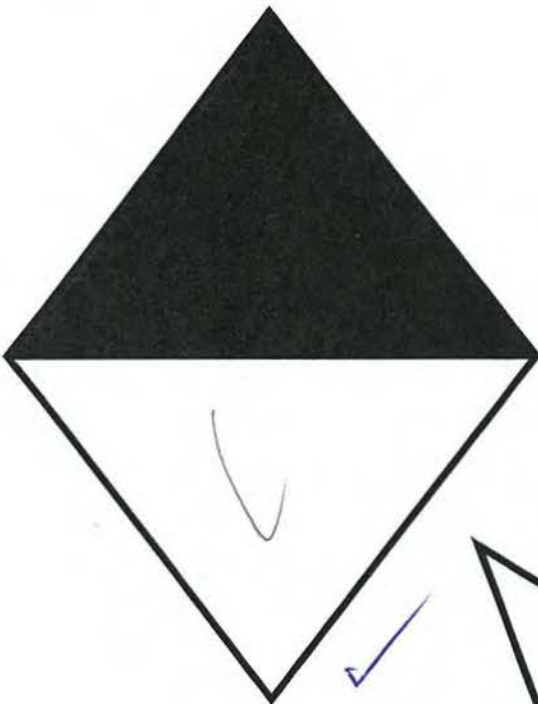
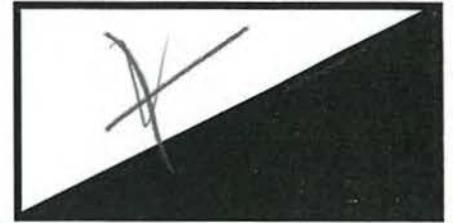
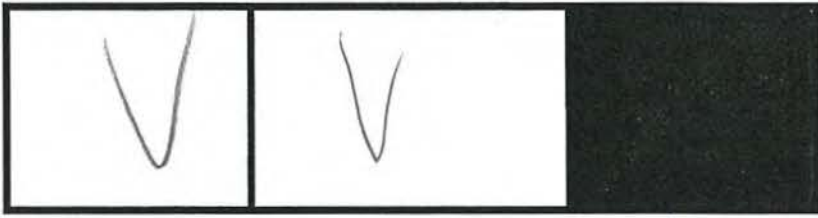
Tick the pictures that show a half.



Whole and Half

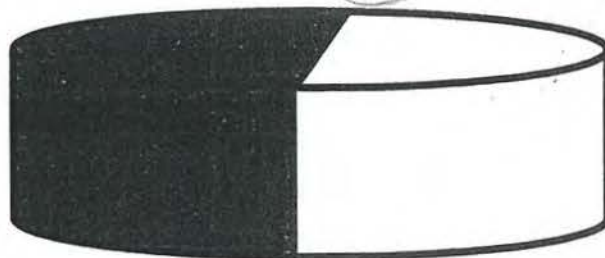
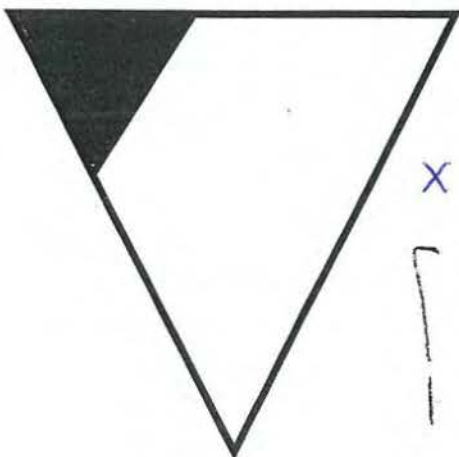
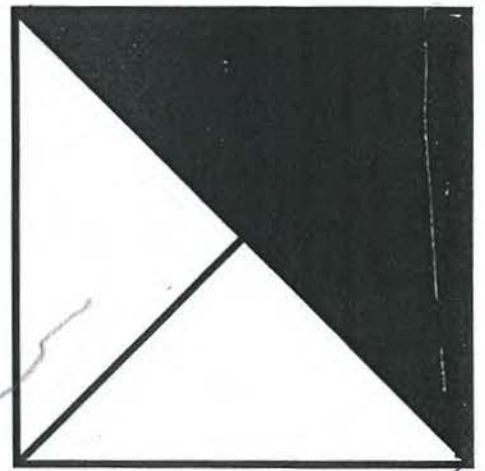
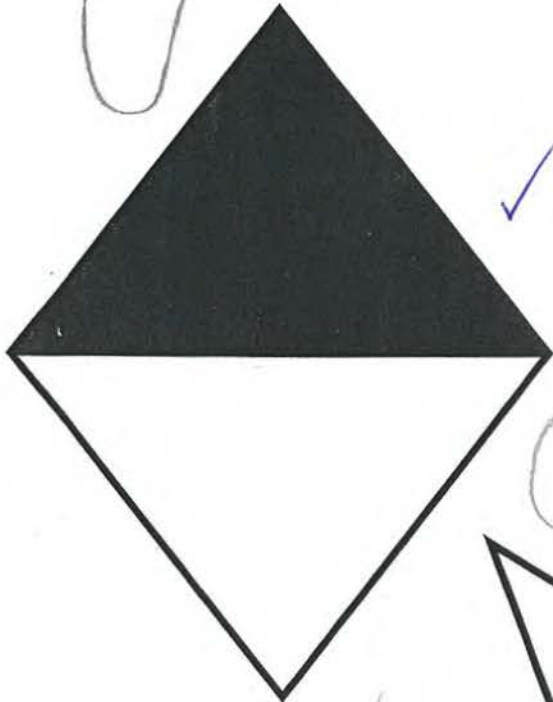
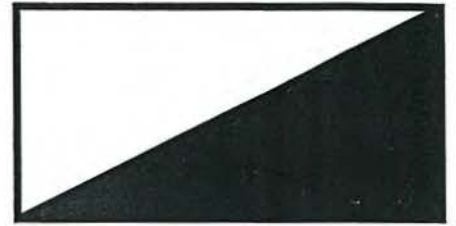
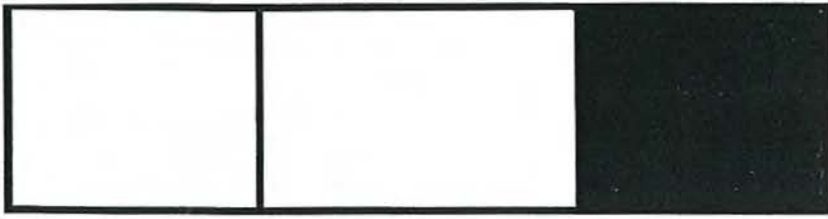
Nita

Tick the pictures that show a half.



Whole and Half

Tick the pictures that show a half.



Whole and Half

Tick the pictures that show a half.

