Robert Townson Primary School

Working Mathematically Project

Open - ended Problems

Early Stage 1 to Stage 3

10
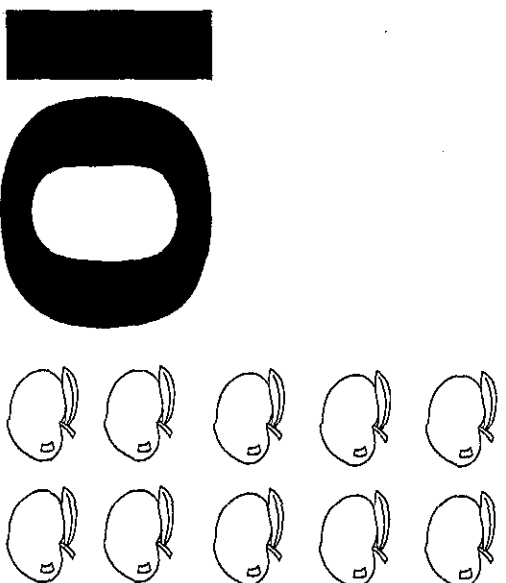
Early Stage 1

Open-ended maths problems

Question 1

Provide small groups of students a pile of unifix blocks. Ask children to make as many towers of 10 as they can using 2 colours. Photograph child and their towers. Question children as to what they have made. Children who have completed this task easily may be asked if they can make a tower of 10 using 3 colours. Teacher to record notes about children and the processes they used on proforma sheet.

Question 2

Children are given a stencil with 10 towers already pre-drawn on it. Some towers have 10 blocks, others have more. Children are asked to use 2 colours to colour towers of 10. Teacher to note children who were unable to cut off at 10 and those who did not use 2 colours to show partitions. More capable students may use 3 colours to show 10.

Question 3

Children are given the problem, there are 4 tails. How many dogs and how many cats could there be? Children are provided with A3 paper to draw their solutions and can label their drawings.

Name: _____

Class: _____ Date: _____

Qu 1 Towers of 10 using unifix blocks

Notes:

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Assessment task:

Qu 1 Using unifix blocks, make towers of 10 using 2 colours
Qu 2 Colour combinations to 10 using a pre-drawn stencil
Qu 3 There are 4 tails. How many dogs and how many cats could there be?

Stage: Early Stage 1

Strand	Substrand	Question	Pre-Basic	Basic	Sound	High
WM	Number Addition	Qu 1	Children don't have concept of 10. Don't have 10 blocks.	Children make only 1 combination to 10, using 2 colours.	2 – 3 combinations to 10.	4 – 5 combinations to 10.
WM	Number Addition	Qu 2	No meaningful representation of 10.	Children can partition and cut off at 10. (Only with the towers of 10) Children will show 1 – 2 ways of making 10.	Children can partition and cut off at towers greater than 10. Children will show more than 3 ways of making 10.	Children can demonstrate multiple ways of making 10 ie using 3 colours to make 10.
WM	Number Addition	Qu 3	No understanding of problem. Unable to draw solutions.	Children can draw 1 combination only.	Children are able to draw 2 – 4 combinations.	Children are able to draw all 5 combinations to solve problem.

Post test - June

## Assessment task: Stage: Early Stage 1

Qu 1 Make combinations to 10 using plastic teddies on teddy tummy boards.

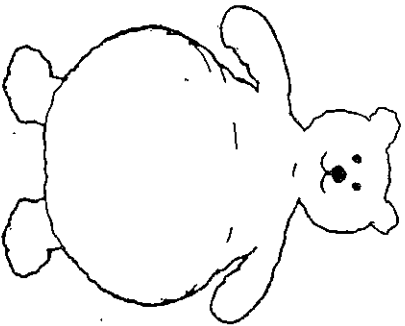Qu 2 Record combinations to 10 on teddies worksheet.

| Strand	Substrand	Question	Pre-Basic	Basic	Sound	High
WM	Number Addition	Qu 1	Students don't have concept of 10. Don't count out 10 teddies.	Students make only 1 combination to 10.	Students make 2 - 3 combinations to 10.	Students make 4 - 5 combinations to 10.
WM	Number Addition	Qu 2	Students unable to correctly record number sentences on worksheet.	Students may be unable to record number sentence correctly, although they have demonstrated a combination to 10 using plastic teddies.	Students record matching number sentences on their worksheet to show their combinations to 10.	Students record all number sentences correctly to show their combinations to 10.

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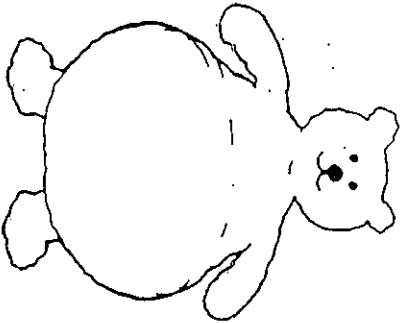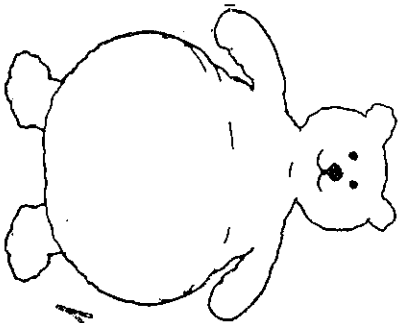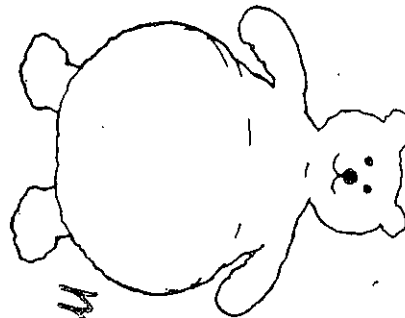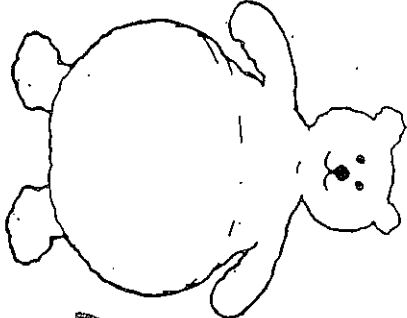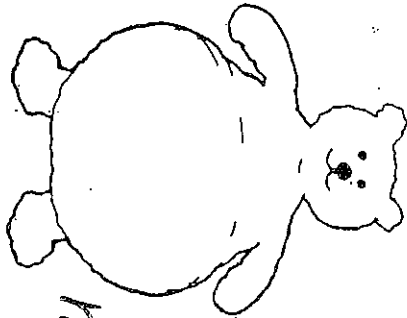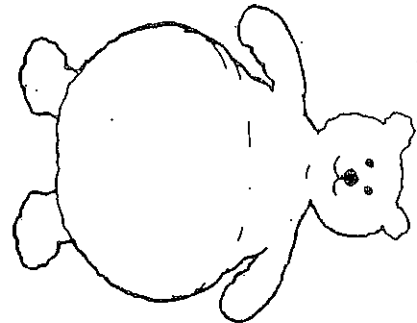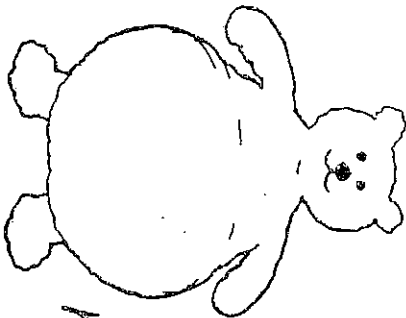
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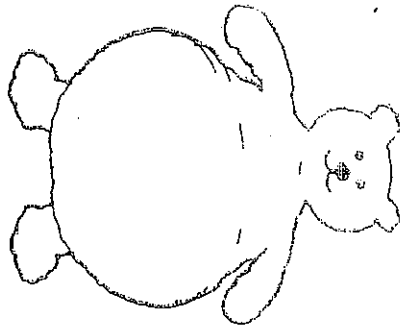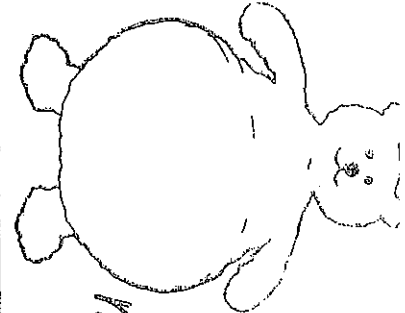
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Name: _____

Class: _____   Date: _____

Qu 1 Make combinations to 10 using teddy
tummies and plastic teddies.

Record combinations to 10 on teddies worksheet.

Notes:

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Name: _____   Class: _____

Yesterday I put some counters into groups with the same number in each group. I cannot remember the groups, but I remember that there were 12 counters. What might the groups have been?

Stage One

Name: _____   Class: _____

The difference between two numbers is 5. What might the two numbers be?

Name: _____   Class: _____

There were 20 legs. How many cows and how many chickens could there possibly be?

Name: Class:

There were 16 legs. How many cats and how many ducks could there possibly be?

Stage 2 Problem 1

Using four 4s and any operation, how many different number sentences can you make?

Use the back of the sheet for any others

RUBRIC FOR OPEN ENDED ASSESSMENT STAGE 2 (LATER)

	LIMITED ACHIEVEMENT	BASIC ACHIEVEMENT	SOUND ACHIEVEMENT	HIGH ACHIEVEMENT	OUTSTANDING ACHIEVEMENT
WHOLE NUMBER (NS 2.1)	Has used four 4s in some number sentences Has used up to 3 digit numbers in number sentences	Has used four 4s in all number sentences Has used up to 4 digit numbers in number sentences Has used a variety of numbers with different place values in number sentences	Has used four 4s in all number sentences Has used up to 4 digit numbers in number sentences Has used a variety of numbers with different place values in number sentences Has used some 5 digit numbers	Has achieved all of the sound outcomes. Has used some 6 digit numbers in number sentences Has used decimal numbers in number sentences Has used fractions in number sentences Has used money in number sentences	Has achieved all of the high outcomes.
OPERATIONS (NS2.2, NS2.3)	Has used a variety of addition and subtraction in number sentences Has calculated some answers to basic number sentences There is no evidence of mathematical thinking	Has used a variety of the 4 operations in number sentences Has used up to 2 different operations in number sentences Has calculated simple operations correctly There is little evidence of mathematical thinking	Has used up to 3 different operations in number sentences Has used brackets to show order of operations Has calculated most simple answers correctly There is some evidence of mathematical thinking	Has used up to 4 different operations in number sentences Has calculated answers to more complex sentences correctly There is evidence of mathematical thinking	The student is able to explain the mathematical thinking to support answers

Year 3

Using three 3s and any operation (+ − x ÷), create as many different number sentences as you can. The number sentences can only include the number 3.

Open Ended Problem – Final *(Less Complex Version)*

Using four 3's and any operation (+ - x ÷) create as many different number sentences as you can. The number sentences can only include the number 3.
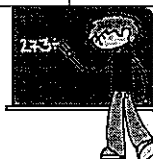
Try to answer some of your questions if you can. The answers can include numbers apart from 3.

	Outstanding	High	Sound	Basic	Limited
Whole Number	* Has achieved all sound outcomes, *Also* Has drawn on other strands. e.g. measurement, patterns.	* Has achieved all sound outcomes, *Also* Used fractions, decimals, money, percentages, roman numerals etc in number sentences.	* Has used 4 3s in all number sentences. * Uses up to 3 digit numbers. * Uses a variety of numbers with different place values in number sentences.	* Has used 4 3s in most number sentences. * Uses up to 2 digit numbers.	* Has used 4 3s in some or no number sentences. * Uses all 1 digit numbers.
Operations	* Has achieved all high outcomes, *Also* Can explain thinking behind all number sentences.	* Has used all 4 operations overall; uses more than one operation in a number sentence. * Uses brackets to show order of operations.	* Has used all 4 operations overall; only one operation per number sentence.	* Has used 2 or 3 operations.	* Has used 1 operation only.
	Outstanding	High	Sound	Basic	Limited
Working Mathemat.	* Evaluates most efficient strategy they used.	* Justifies reasons for using different operations, sequences and symbols, i.e brackets.	* Identifies correct operation and explains the reasoning used.	* Not consistent in explanation of operations used. i.e. cannot explain all operations, cannot explain operations fully.	* Unable to explain what they have written.

Year 4

Using four 9s and any operation, create as many different number sentences as you can. The number sentences can only include the number 9.

Open Ended Problem – Final (More Complex Version)

Using four 9's and any operation create as many different number sentences as you can. The number sentences can only include the number 9.

You need to write the answers to the questions.

		Outstanding	High	Sound	Basic	Limited
Whole Number		* Has achieved all sound outcomes, *Also* Has drawn on other strands. e.g. measurement, patterns.	* Has achieved all sound outcomes, *Also* Used fractions, decimals, money, percentages, roman numerals etc in number sentences.	* Has used 4 9s in all number sentences. * Uses up to 3 digit numbers. * Uses a variety of numbers with different place values in number sentences.	* Has used 4 9s in most number sentences. * Uses up to 2 digit numbers.	* Has used 4 9s in some or no number sentences. * Uses all 1 digit numbers.
Operations		* Has achieved all high outcomes, *Also* Can explain thinking behind all number sentences.	* Has used all 4 operations overall; uses more than one operation in a number sentence. * Uses brackets to show order of operations.	* Has used all 4 operations overall; only one operation per number sentence.	* Has used 2 or 3 operations.	* Has used 1 operation only.
Working Mathemat.		* Evaluates most efficient strategy they used.	* Justifies reasons for using different operations, sequences and symbols, i.e brackets.	* Identifies correct operation and explains the reasoning used.	* Not consistent in explanation of operations used. i.e. cannot explain all operations, cannot explain operations fully.	* Unable to explain what they have written.

Name: _____ Class: _____ Date: _____

Reflection   **Stage 2**

How did you go about answering this problem? Did you have a
strategy? What was it?

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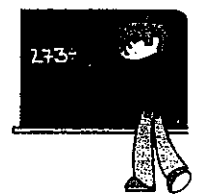_____
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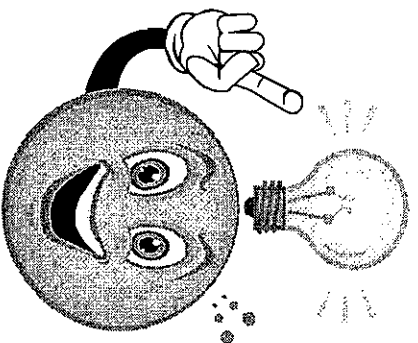
Stage 3

How many different number combinations can you find to solve this problem? The answer is 500. What might the question be?

Stage 3 Open Ended Question
Term 1 2009
Focus ~ 4 Operations and Variety of Responses

Year 5

Outstanding: 4 Basic Operations plus 3/4 additional different responses eg - word problem, Roman Numerals, fractions and decimals, measurement

High: 4 Basic Operations plus 2 additional different responses eg – word problem, Roman Numeral

Sound: 4 Basic Operations

Basic: 3 Basic Operations

Limited: 2 Basic Operations

Year 6

Outstanding: 4 Basic Operations plus 4 additional different and complex responses eg - %, measurement, algebra, median

High: 4 Basic Operations plus 3 additional different responses eg – word problem, Roman Numerals, fractions and decimals

Sound: 4 Basic Operations plus additional response

Basic: 3 Basic Operations plus additional response

Limited: 2 Basic Operations

Stage 3 Open Ended Question
Term 1 2009
Focus ~ 4 Operations and Variety of Responses

Year 5

Outstanding	5
High	5
Sound	25
Basic	29
Limited	25

Total: 89

Outstanding: 4 Basic Operations plus 3/4 additional different responses
eg - word problem, Roman Numerals, fractions, decimals, measurement

High: 4 Basic Operations plus 2 additional different responses eg - word problem, Roman Numeral

Sound: 4 Basic Operations

Basic: 3 Basic Operations

Limited: 2 Basic Operations

Year 6

Outstanding	1
High	7
Sound	18
Basic	37
Limited	24

Total: 87

Outstanding: 4 Basic Operations plus 4 additional different and complex responses eg - %, measurement, algebra, median

High: 4 Basic Operations plus 3 additional different responses eg - word problem, Roman Numerals, fractions and decimals

Sound: 4 Basic Operations plus additional response

Basic: 3 Basic Operations plus additional response

Limited: 2 Basic Operations

Stage 3 Maths Assessment 2009
Open Ended Task No. 3
Number

The answer is 360. What might the question be?

<u>Consider constructing your response from the following areas of numeracy:-</u>

- ❏ Word problems/Number Stories
- ❏ +, -, x, ÷
- ❏ Fractions
- ❏ Decimals
- ❏ Arrays
- ❏ Angles
- ❏ Roman Numerals
- ❏ Number Lines
- ❏ Patterns and Algebra
- ❏ Diagrams
- ❏ Mathematical symbols –
- ❏ Graphs

<u>Achievement</u>

- ○ **Limited** is considered when there is evidence of only one or two operations and no other strategies.
- ○ **Basic** is considered when there is evidence of three operations and at least one other strategy.
- ○ **Sound** is considered when there is evidence of the four operations and at least two other strategies.
- ○ **High** is considered when there is evidence of the four operations and at least four other strategies.