EDF5032

Numeracy and Mathematics Education in the Primary Years

Assessment Task 2

Namrata Adsul

Student ID – 28201620

The Maths Assessment Interview (MAI) took place on 5th October 2017 at a Spring Holiday Club setting, right before the start of the last term of school. The student is in Grade 2 and is seven years old. She is referred to as 'T' throughout the paper. Her current growth points(GP) are 5240 and next GP targets are 6351.

ASSESSMENT(APPENDIX) AND ANALYSIS

Domains	**Counting**	**Place Value**	**Addition and Subtraction**	**Multiplication and Division**
Student's response	Stopped at Q6-b – 20, 27, 39, 41, 47, 54	Answer to Q13 – 100- imagined 10/20/30 before 100. Q14 – 604 Stopped at Q-15 – 397	Stopped at Q24-e. Incorrect response was for Q24-b – 19 minus 15= 13.	Stopped at Q30-a as she didn't stop sharing by 1 even when asked to stop twice.
Growth point achieved	5	2	4	0
Observations and comments	Her understanding of skip counting is good – adding 7 to 20 at the start and adding 7 correctly after 47	Her ten-frame understanding is only restrictive to 2-digit numbers – Q-14 and Q-15, but a	Strategies used for addition are restricted to counting on. At the same time, her incorrect	She wasn't able to and/or aware of any other way of distributing the teddies without placing them on

	to 54, as well as correct responses to Q5-a, b and Q6-a. This is also indicative of the fact that she has a sound understanding of grouping and then adding in order to count from a particular number and is able to abstract numbers through basic/ lower-level mental computations. However, when the number changed from an easier multiple (10,5) to a more complicated or higher one (3,7), she found it confusing or challenging to add 7 further after 27. In addition, correct responses to Q4-a, d, e and Q5-a suggest that she has a very good number	much-needed skill to understand place value as one of the key ideas to developing understanding of place value is grouping or trading by tens (p.169). This also leading to reflection of another key idea related to positioning of numbers within a number in her accurate response to Q9-a, where she was able to write 4-digit numbers. Good number sense has probably allowed her to reach that stage of comprehending basic place value concepts of units, tens, hundreds and thousands. However, number lines are clearly a weakness, especially with three-digit numbers. She	attempt to answer Q24-b suggests that she uses the on-paper method of arranging numbers one above the other to subtract 2-digit numbers. Thus, it confused her with taking away 1 from 1 in her head. Nonetheless, she is able to solve addition problems by counting on in mostly all the questions and counting backwards for subtracting single digits from two-digit numbers. Both are reflective of her building/ in progress understanding of number lines.	the mats one by one. When asked to explain her thinking for Q29-a, she said that 2 and 2 in cars on the left equals 4 and then 4 plus 4 equals 8. In this case, she does recognise multiplication to be repeated addition but this type of additive mentality to multiply might (most certainly) not help when dealing with higher value or two-digit numbers.

	sense, with respect to application of ten frames.	over-estimated the distance from 0 to the actual number.		
Next learning target	GP 6 – Extending and applying counting skills from a non-zero starting point using bigger single-digit numbers.	GP 3 – Using her basic place value knowledge, extend her understanding of 2-digits on number lines to interpret three-digit numbers on a number line, specifically in terms of their increasing and decreasing quantitative value.	GP 4 – Build understanding and use of derived strategies for addition and subtraction such as near doubles, adding 9, building to the next ten and fact families.	GP 1 or 2 – Using multiplicative structures to find the answer when all objects are modelled or perceived in the form of arrays.

OPEN TASK

Topic:Number - Counting	**Levels**: Grade 2-3
Key Mathematics Knowledge being explored and constructed: Whole numbers, number sense, number lines, addition and subtraction strategies, skip counting, counting from 'x'. **Curriculum content descriptions (ACARA, 2017):** Investigate number sequences, initially those increasing and decreasing by twos, threes, fives and tens from any starting point, then moving to other sequences(ACMNA026).	**AusVELS/Australian Curriculum Learning Area: Mathematics** **Content Strand:** Number & Algebra **Proficiency Strand:** Understanding, Fluency, Problem Solving and Reasoning

Group, partition and rearrange collections up to 1000 in hundreds, tens and ones to facilitate more efficient counting (ACMNA028). Solve simple addition and subtraction problems using a range of efficient mental and written strategies (ACMNA030). Describe patterns with numbers and identify missing elements (ACMNA035). Solve problems by using number sentences for addition or subtraction (ACMNA036).	**Models/Equipment/Resources Required:** Lego blocks with four studs – each group should have minimum 50 of either or both for the launch. Number charts of 100. **Vocabulary to develop:** Doubling, times, increasing, decreasing, greater than, smaller than, equal to, two-digit and three-digit numbers, multi-digit numbers, grouping, equal groups, quantitative value of a number, friends of tens **Links to other contexts**: Your father gives you $1 on the first day of school and double of that on the second day because you are getting better at helping out at home. On the third day, you again get double of $2 (amount received on second day) and the same continues from then on for 10 days. How much money will you have at the end of those 10 days?

What do the students need to notice about the mathematics, imagine and simulate?	What simulation and practice will increase fluency?
Keeping counting as the base domain for the activity, children are forced to move away from simple counting on addition strategy due to the increasing quantitative complexity of numbers to be added (or even multiplied). They start with single-digit and the task makes them move to 3-digit numbers to get to the end. Although the task seems insignificant at first, it grows at an alarming rate, since doubling has little effect on small numbers but an increasingly enormous effect as the number grows larger (Reys et al., 2012, p.190). Therefore, students need to be able to double numbers using efficient addition or multiplication strategies, while noticing patterns or apply algebraic number sentences. Simultaneously, explore the concept of commutativity while adding, and equal grouping when multiplying. Knowledge of equal grouping is further extended by the teacher to explain division.	To extend the same question, which numbers have to be doubled more than four times? Which numbers have to be doubled less than four times? Find differentiating patterns between odd and even numbers for the above. Coupled with this, students can also be introduced to number charts (of 100), wherein they are asked to detect patterns. Additionally, they can also be asked to predict numbers in a step structured empty boxes layout with minimum two given numbers.

Open Task for Investigation	Open Task with an Enabling Prompt	Open Task with an Extending Prompt	Assessment Strategies
I doubled a number four times to reach a number above 100: 7 14 28 56 112. What other numbers have to be doubled four times to reach a number above 100? (Lilburn & Sawcazk, 2011)	I doubled a number four times to reach a number above 20: 3 6 12 24 What other numbers have to be doubled four times to reach a number above 20?	I halved the number 128 four times to reach a single digit number: 128 64 32 16 8. What other numbers have to be halved four times to reach a single-digit number? Which two-digit numbers have to be tripled three times to reach a number above 100? Can use calculator.	**Key questions:** o Could you use a table or diagram to help structure your findings? o How are you going to make these guesses? Are you going to begin with a number greater than or smaller than seven? o Are you adding or multiplying the two numbers? How many times are you adding the first time? And then the second time? (and so on) o Can you show me the answer another way? **Observe**: Mainly, look for students' understanding level and categorise them into – no understanding evident, made an

			attempt but shows limited understanding, acceptable but incomplete, clear understanding and goes beyond expectations (Lilburn & Sawcazk, 2011). **Listening for:** Use of words such as times, groups, expanding quantity, or other vocabulary that involves explanation of operational strategies used. **Record:** Children make connections and look for common patterns by recognizing increasing values of numbers.

LESSON STRUCTURE

As the MAI progressed to other domains, certain connected aspects became more visible, explaining reasons behind T's mathematical understanding. Overall objective of this open task is under the Counting domain, while addressing issues in place value with respect to multi-digit numbers, as well as addition and subtraction. It was also important for her to work on aspects in the first domain, and then move up in order to understand multiplication and division better as doubling is also understanding that the number is multiplied by two or is repeated two times, so it is not just adding them together but as the number increases, more equal groups of the same number are being formed.

LAUNCH –

Before students delve into the main task, this warm-up stage allows them to recollect concepts learned in the past and start with a prepared state of mind. Children are asked to make a 2D Lego pyramid in a group of two to three of varying capabilities starting from any number of blocks (preferably more than ten to reach a better understanding) or techniques. In relation, the main aim of this launch activity is for them to understand the underlying concept of doubling and observe the increasing or decreasing quantitative value of numbers. According to Gervasoni (2002, p.10), one strategy to develop number sense is provoking the development of powerful visual images for children. Using Lego pieces, children are able to look at the recurring visual patterns, inadvertently, understanding the number's visual quantity. In addition, research carried out by Helme & Teese (2011) suggests that students prefer more hands-on approaches to learning. Therefore, in this case, learning mathematical concepts by building Lego structures relates to play-based learning and keeps them truly engaged.

During this process, role of the educator is to give children the freedom and space to interpret mathematical concepts in their actions. They will be asked to look for patterns while and after they are done building. The key question is – Which Lego studs are doubling in other rows? In the example illustrated by me below, the first block (4 studs) doubles to two blocks with 8 studs in the

next row, after which it doubles to four blocks and 16 studs in the row after the next. On the other side, 12 studs double to 24. This is an observation children should be able to make with the help of the educator's prompting questions.

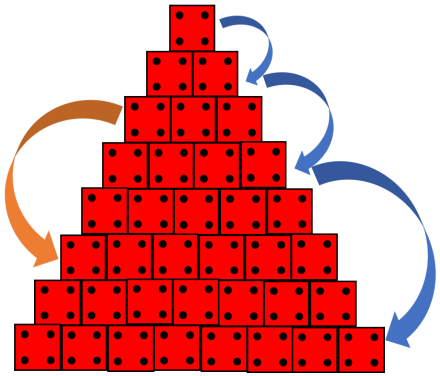

Fig. 1. (Image by Author) The four dots denote the number of studs on the square Lego block.

Additionally, starting from the base, the number of Lego studs continue decreasing or from the top, they go on increasing. The educator tries to develop this understanding further by asking questions such as whether the increase or decrease in number is consistent or varying. Furthermore, if they go on adding the same number of blocks on top of one another, they are just going to end up making a cube. The number has to reduce every layer. In this case, the teacher can ask students to explain the choices made and help them picture other ways of building the structure, without actually telling them what to do.

INTRODUCE THE OPEN TASK –

It is important to display the open-ended question on the board for students to clearly view every aspect of it. Moreover, the teacher

needs to confirm if the class has understood what they need to do before allowing them to proceed with the task (Sullivan, 2004).

As soon as the open-ended task question is posed, allow children to interpret the meaning and method of doubling a number four times before any suggestions or directions are given (Sullivan, 2004). Over-explanation of tasks during lessons stop students from taking risks they are required to take (Sullivan, 2013, p.619). Discussions in groups with peers will be promoted instead as it encourages collaborative thinking and a platform to justify their approaches. Such expectations related to the classroom environment should be made explicit before the students start working on the task.

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SUPPORTING STUDENTS' EXPLORATIONS DURING THE TASK –

The MAI enables teachers to identify children's current mathematical knowledge, and locate children's zone of proximal development (ZPD) within a framework of growth points (Gervasoni, 2006, p.178). Thus, the open task designed based on this principle allows students to extend their current learning potential through engagement with peers and educators. They are allocated into groups of two to three with varying capabilities (created by teachers) in order to use scaffolding as a tool to mediate engagement of all participants when they are given a chance to have conversations about possible mathematics strategies instead of conventional means of using grid books and pens individually (Hunter, 2010, cited in Gervasoni, Hunter, Bicknell, Sexton, 2012). In fact, Hunter's study showed that explicit pairing or grouping resulted in the students achieving more than they would independently (2010, cited in Gervasoni et al., 2012, p. 194).

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The open task requires them to explore counting strategies not currently familiar or known to them. The key role of the educator throughout the execution of this task would be to engage with children in order to extend their current thinking, in T's case, become fluent at counting from a bigger non-zero number, thereby learn to use other operational strategies. This will be mainly done through open-ended questions that would challenge children's thinking. The aim is to make them reason with mathematical concepts utilising their current knowledge and ask questions that make them reflect on possibilities of applying existing strategies to

get answers. Asking questions that have more than one possible answer foster higher-level thinking because they encourage students to develop their problem-solving expertise at the same time as they are acquiring mathematical skills (Sullivan, 2004, p.4). As a team, they should also be applying observed inferences from the launch.

Doubling is more than skip counting or counting from a non-zero number by a given number, which is why students might find the task challenging. However, it is imperative they try different approaches for identification of appropriate strategies while the educator only scaffolds their learning. This type of a challenging task requires students to connect different aspects of mathematics together and be persistent at devising solution strategies (Sullivan et al., 2013), a much-needed attitude for children to meaningfully engage with mathematics.

A key idea introduced in the activity is 'guessing' the numbers apart from seven. Reys et al. (2012, p.126) argues that guessing can be a powerful strategy, also part of acquiring good problem-solving skills if students incorporate what they know into their guesses – that is, if their guesses are educated guesses rather than wild guesses. Will the children start with a number larger or smaller than seven? If the child does not begin with a number either smaller and close to seven or bigger than seven, he or she is not applying already known knowledge from previous work. Quantitatively, it is going to take more than thirty groups (doubling a number four times) of two to add up to more than 100. The guess-and-check strategy requires T to make an educated guess of knowing that two is a smaller number and that she should go for a bigger number instead. They need to estimate to decide if their solution is a reasonable answer. Under the problem-solving proficiency, children are verifying that their answers are reasonable.

WHOLE GROUP REVIEW –

In the whole group review stage, students are encouraged to share their findings as well as describe their mathematical thinking. The teacher should write or display every group's responses on the board, giving equal emphasis to all for further discussion (Sullivan, 2004). This review stage allows the educator to assess the success of the activity and find out causes of errors, if any

(Sullivan, 2004). Most importantly, the use of discussion and argumentation of discourse supports student learning according to studies by Cooper & Warren (2008, cited in Sullivan et al., 2012). Through debates, students are able to connect findings to general mathematical rules. Furthermore, these findings are taken to the next stage of the lesson.

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CLOSING PLENARY or TEACHER SUMMARY OF THE KEY MATHEMATICAL IDEAS –

For the closing plenary, students' newly-acquired understanding is re-enforced by relating it to other mathematical concepts, as well as connecting it to the real world in a social setting. Later, the number lines and hundred charts extend their thinking to a more advanced level (Reys et al., 2012, p.141).

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Key mathematical idea of Counting as the focus domain was chosen because according to Reys et al. (2012) counting on is an essential strategy for developing advance addition strategies – counting forwards in ones, or even twos, fives and other multiples, are strategies that may be used to solve addition problems. Moreover, provoking children to move beyond using basic counting strategies is an important aspect of primary school mathematics programs to increase fluency – more powerful strategies include skip counting, using doubling facts, using near doubles, etc. It is therefore important to give children the opportunity to solve problems at a level of difficulty that challenges their current understanding and provokes them to use more powerful strategies (Gervasoni, 2002, p.6). T's counting on techniques to solve addition and subtraction worked for smaller numbers but as soon as the numbers increased, she found it difficult. Using powerful strategies will enable her to build fluency in adding and subtracting two-digit numbers as well as start to develop multiplicative thinking capabilities, wherein she can use the same grouping strategies for bigger numbers instead of repeated addition (Gervasoni, 2002, p.9). This understanding will be discussed by the teacher while demonstrating the strategies to double numbers for the open task.

Another important connection would be to recognise the property of commutativity as the class adds the same numbers – Question: Adding the same numbers to double gives us an answer, is it the same when we add two different numbers? Try it out.

In order to support development of the above, Reys et al. suggests that number line supports understanding of addition and subtraction. Recognising counting on addition on the number line, results in developing other strategies such as building to the next ten, along with doubling to make near doubles for addition (Reys et al., 2012, p.152). Final connection is made to the number line also to build 3-digit number knowledge (Place Value GP3). It was observed that by the beginning of Grade 2, children build an understanding of Place Value at GP 2. However, a study by the research team suggested that by Grade 3, 50% of the students remain at the same GP level. Inability to move forward could is related to interpretation of the quantitative value of numbers (Gervasoni & Parish, 2011, p.320). One way to make numerical judgements of quantity is through construction of a mental number line to understand multi-digit numbers, as they arrange numbers in an increasing order from the smallest to the largest (Gervasoni & Parish, 2011; Griffin & Case, 1997; Griffin et al., 1994, cited in Gervasoni & Parish, 2011, p.316). Prior to mental placement though, physically placing them on the number line will help T understand their position on the number, whether it is farther away or closer to zero based on the number's increasing or decreasing quantitative value. As all children learn in different ways, modelling the maths is important to make everyone understand. Hence, the Lego blocks will be used to elaborate the same idea by placing the pyramid structure as shown below.

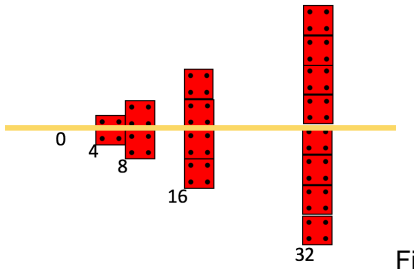

Fig.2. (Image by Author)

Finally, students will be asked to write notes about their understanding of mathematical concepts learned through engagement with the task. To check if every child's learning in the ZPD is scaffolded, incomplete sentences should be said for them to complete.

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APPENDIX:

Mathematics Assessment Interview Record Sheet

Student Name: T **Date of MAI:** 5th October 2017

Grade: 2 **School:** _____ **City/Town:** _____

Interviewer Name: Namrata Adsul

Date of Last MAI: _____ **Previous Growth Point Profile:** _____

Comments: Comment on relevant factors or observations (attitude, confidence, oral language, difficulties, integration/special needs)

Current Growth Point- 5240
Target Growth Point- 6351

Section A – COUNTING Growth Point 5

Growth Point 1 or GP 2

1. Teddy task
a. Estimate 22 b. Actual 33
Error sequence (if any) _____
c. How many teddies? 33 correct count ☑
d. How many now? 32 ☑ (*one less* / recounts)

Growth Point 3

2. Forwards/backwards/breaking sequence
a. 1 ⟶ 32☑ _____(error sequence)
b. 53 ⟶ 62☑ _____(error sequence)
c. 84 ⟶ 113☑ _____(error sequence)
d. 24 ⟶ 10☑ _____(error sequence)
e. 10 ⟶ 1 ☑ _____(error sequence)

3. More and Less
a. One more than 56 ☑_____
b. One less than 56 ☑_____

Growth Point 4 (with bold strategies)

4. Counting from 0 by 10s, 5s, 2s.
a. 10s ☑ reached 100 then 200 later corrected herself (0-110)
b. 5s ☑ 245 (0-45)
c. 2s ☑ 30 (0-30)
d. 5 more than 35 40 ☑
☉ ***Known fact / 5more***
• Count on by ones
• Skip count from 0
e. 10 less than 70 60 ☑
☉ ***Known fact / 10 less***
• Count back by ones
• Skip count up to

GP 5

5. Counting from *x* by 10s, 5s
a. 23-103 (10s) ☑ 103
b. 24-44 (5s) ☑ 44

Growth Point 6

6. Counting from *x* by *y*
a. 11-35 (3s) ☑ 35
b. 20-55 (7s) ☐ 20, 27, 34, 41, 48, 54

7. Counting money
Method_____
a. Stated total ($2.85) $_____ ☐
b. Money needed for $5 ($2.15)_____☐

DETOUR (ALSO RECOMMENDED FOR BEGINNING OF FOUNDATION YEAR)

F1) Simpler counting tasks/more or less/conservation
a. Sort by one attribute (colour) ☐
b. Count a collection of 4 ☐
c .Identify one group out of two as 'more ' ☐
d. Make a set, cardinal number 5 ☐
e. Conserve number: (i) Teddies moved ☐__ (ii) Hiding ☐__
f. How many blue teddies (5+3) screened ☐____
g. How many blue teddies (5+3) not screened ☐____

F2) Location/pattern/ordinal number
a. Follow directional language instruction
beside ☐ behind ☐ in front of ☐
b. Name colour pattern ☐
c. **Match pattern** ☐
d. **Continue pattern** ☐ ***uses unit of repeat (e.g., GYBB)/ uses repeating elements, e.g., after G is Y, after Y is B etc/) / looks at start of sequence, then next & next, but not aware of repeat unit/ random-no ref to pattern/ repeats last element/ uses pattern elements but diff order/ pattern in reverse/ other***
e. Explain pattern ☐_____
f. Ordinal number (i) 3rd ☐ _____ (ii) 5th ☐ _____

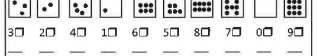
F3) Subitising/matching numerals to quantities/ ordering/one-to-one correspondence/part-part-whole
a. Recognise quantities without counting (subitising)
2☐ __ 4☐__0☐__5☐__3☐__9☐__4☐__3☐__
b. Match numerals to quantities
2☐ __ 4☐__0☐__5☐__3☐__9☐__4☐__3☐__
c. Order numeral cards 1 –5 ☐_____
d. Order numeral cards 1 –9 ☐_____
e. Order numeral cards 0 –9 ☐ _____
f. Show 6 fingers ☐_____
another way? ☐_____ another way? ☐_____
g. Identify 'more than 'numbers
(i) 1 more 4 ☐___(ii) 1 more 10 ☐___ (iii) 1 more 15 ☐__
h. Identify 'less than' numbers
(i) 1 less 3 ☐__ (ii) 1 less 12 ☐___ (iii) 1 less 20 ☐____
i. One to one correspondence of straws and cups
prediction ____ correct sharing _____☐
j. Order shortest to longest candles (with 3) ☐
k. Order shortest to longest candles (with 4) ☐

Section B – PLACE VALUE Growth Point 2

Growth Points s 1 2 3& 4

8. *Reading numerals*: 1- 4 digit numbers
a. All ☑ 1st difficulty _____
b. Cards ☐ problem cards _____
c. ***Interpreting 1-digit numbers***
7 teddies ☐
d. How many now? ____☐ (***one less*** / recounts)

e. *Quantities to 10:* (circle strategy used)



3☐ 2☐ 4☐ 1☐ 6☐ 5☐ 8☐ 7☐ 0☐ 9☐
sub count sub count sub count sub count sub count sub count sub count sub count sub count sub count

9a. *Writing numerals* (Calculator)
All ☑ 1st difficulty _____
9b. *Reading numerals*: 1-4+ digit numbers
1st difficulty _____

10. *Ordering tasks* – 1- 4 digit numbers
1-digit ☐ 2-digit ☐ 3-digit ☐ 4-digit ☑

Growth Point 2 (with bold strategies)

Interpreting 2-digit numbers:
11. Bundling (circle strategy used)
a. Correct bundling ☑
☉ ***3 tens and 6 ones that's 36***
• *10, 20, 30, 31, 32, 33, 34, 35, 36*
• *1, 2, 3 tens and 1-6 ones, that's 10, 20, 30, 31-36*
• *counts by ones*
• other_____
b. How many now? 26 ☑
☉ ***26, that's one less ten OR that's 2 tens and 6 ones***
• *10, 20, 21, 22, 23, 24, 25, 26*
• *1, 2 tens and 1-6 ones, that's 10, 20, 21-26*
• *counts by ones*
• other _____

12. 2-digit number line: Answer 50 ☑ *(45-55)*
Explanation 50 in the middle ☑

GP 3 (+ OS - O10)

Interpreting 3-digit numbers:
13. 3-digit number line: Answer 120 ☐ *(130-170)*
Explanation imagined 10/2020 before 100 ☐
14. Some more
10 more than 592 604 ☐ *(602)*
15. Some less
10 less than 408 397 ☐ *(398)*

GP 4 (+OS-10)

Interpreting 4-digit numbers:
16. Ten more
10 more than 2791 _____☐ *(2801)*
17. One hundred less
100 less than 3027 _____☐ *(2927)*

Growth Point 5

Extending and Applying Place Value Knowledge:
18. Capital cities
a. Reading Darwin's population *(127 532)* ☐
b. Reading Hobart's population *(214 705)* ☐
c. Reading Melbourne's population *(4 077 036)* ☐
d. Correct nomination of 4th largest *(Perth)*
Explanation using place value _____☐
19. Number lines
a. Estimate on 0 –100 line *(55 –75)* _____☐
b. Estimate on 0 –2000 line *(400 –600)* _____☐
c. Estimate on 39 –172 line *(65 –95)* _____☐
d. Estimate on 0 –1,000,000 line
(700,000 –800,000) _____☐

NOTES

Section C – ADDITION & SUBTRACTION
Growth Point 4

GP 1 or GP 2

20. Counting on
a. Answer 13 ☑ (circle strategy used)
⊙ ***Count on (either 9,10,11,12,13 or 4,5,6,7, 8…,12,13)***
• ***Basic/Derived Strategy or Known fact***
• Count all (1,2,3,4,5,6,7,8,9,10,11,12,13)
• Other _____

GP 1

b. Answer _____ ❒
•Count all (1,2,3,4,5,6,7,8,9,10,11,12,13)
•Other _____

Growth Point 3 (*hold* strategy in Q23 *at least*)

21. Count back/ modelling all (8 –3)
a. Answer 5 ☑ (circle strategy used)
• ***Basic/Derived Strategy (e.g., known fact 5+3=8)***
⊙ ***Count back all, in head (7,6,5 or 8,7,6,5)***
• ***Count back all, with fingers only used to keep track (7,6,5 or 8,7,6,5)***
• Modelling all (shows 8 fingers, then takes away 3)
• Other _____

b. Answer _____ ❒
• Modelling all (shows 8 fingers, then takes away 3)
• Other _____

22. Count down to/count up from (12 – 9)
Answer 3 ☑ (circle strategy used)
• ***Basic/Derived Strategy (e.g., known fact 9 + 3 =12)***
⊙ ***Count down to (12, 11, 10 , 9)***
• ***Count up from (9, 10, 11, 12)***
• ***Fingers used during 'count down to' or 'count up from' only to keep track***
• Count back all (12, 11, 10, 9, 8, 7, 6, 5, 4, 3)
• Modelling all (shows 12 'things ' then takes away 9 'things,' leaving 3)
• Other _____

Growth Point 4 (All 23 correct & at least 3 *bold* strategies)

23. Basic strategies (circle strategy used)
a. 4 +4 8 ☑
⊙ ***Doubles or known fact***
• Count on (4, 5, 6, 7, 8)
• Other _____

b. 2 +19 21 ☑
⊙ ***Commutativity and count on (19, 20, 21)***
• ***Known fact***
• Count on from 2 (2, 3, 4,… 21)
• Other _____

c. 4 +6 10 ☑
• ***Tens fact or known fact***
⊙ Count on (6, 7, 8, 9, 10 ***or*** 4, 5, 6, 7, 8, 9, 10)
• Other _____

d. 27 + 10 37 ☑
⊙ ***Add 10 (27, 37)***
• ***Build to next 10 (to 30 then 7 more)***
• Count on by 1s (27, 28, 29, 30,…37)
• Other _____

e. 10 –7 3 ☑
• ***Known fact or fact family (eg., 7 +3 =10)***
⊙ Count down to (10, 9, 8, 7 or 9, 8, 7)
• Count up from (7, 8, 9, 10 or 8, 9, 10)
• Count back (10, 9, 8, 7, 6, 5, 4, 3) with or without fingers *to keep track only.*
• Modelling all with fingers (shows10 fingers, take away 7)
• Other _____

Growth Point 5 (All 24 correct and at least 3 *bold* strategies)

24. Derived strategies (circle strategy used)
a. 12 – 6 6 ☑
⊙ ***Using doubles or known facts***
• Count back (12, 11,…6)
• Other……..

b. 7 + 8 15 ☑
• ***Near doubles or known fact***
⊙ Count on (7, 8, 9,… 15 ***or*** 8, 9, 10,…15)
• Other _____

c. 19 – 15 13 ☒
•***Fact family or known fact***
• Count down to (19, 18, 17, 16, 15)
• Count up from (15, 16, 17, 18, 19)
• Count back all (19, 18, 17,… 6, 5, 4)
• Other Take away 5 and 1 (in head calculating)

d. 16 + 5 21 ☑
•***Build to next ten (to 20 then 1 more)***
•***Known fact***
• Add units, then plus 10 (11, 21)
⊙ Other counted on from 16

e. 36 + 9 45 ☑
• ***Add 10 take 1 (36,46,45)***
• ***Build to next ten (to 40 then 5 more)***
• ***Known fact***
⊙ Count on
• Other _____

Growth Point 6

Extending & Applying Strategies:
25. Multi-digit strategies
a. 68 + 32 _____ ❒ _____
b. 25 + 99 _____ ❒ _____
c. 100 – 68 _____ ❒ _____
d. Half of 30 _____ ❒ _____
e. Double 26 _____ ❒ _____

26. How many digits? (circle strategy used)
a. 134 + 689 ❒ (less than 1000)
Explanation
• Focus on 100s digit
• Other _____

b. 1246 –358 ❒ *(less than 1000)*
Explanation
• Focus on 100s digit
• Other _____

27. Estimating and calculating addition
a. Estimate _____ *(within range 800 –1000)* ❒
b. Mental answer:____ ❒
c. Written answer:_____ ❒

28. Estimating and calculating subtraction
a. Estimate _____ *(within range 200 –300)* ❒
b. Mental answer:_____ ❒
c. Written answer:_____ ❒

Notes

Section D – MULTIPLICATION & DIVISION
Growth Point 0

GP 1 or GP2 (with *bold* strategies)

Modelling Multiplication & Division:
29. Teddy cars (circle strategy used)
a. Answer 8 ☑ **b.** Alternate Strategy:
•***Skip count by*** _____ •***Skip count by*** _____
•***Known fact*** _____ •***Known fact*** _____
• Count all by 1s • Count all by 1s
⊙ Other 2+2+2+2+1=9 • Other _____

30. Teddies on the Mats (circle strategy used)
a. Estimate 3 **b.** Answer 3 ☑
• ***Uses groups*** • ***Trial & error (using groups)***
⊙ Share by 1s • Other Didn't stop sharing by 1 even when asked to stop twice

Growth Point 3 (with *bold* strategies)

Partial Modelling Multiplication & Division:
31. Unifix train (circle strategy used)
a. Answer_____ ❒ **b.** Alternate Strategy:
•***Skip count by*** _____ •***Skip count*** _____
•***Known fact*** _____ •***Known fact*** _____
• Count all by 1s • Count all by 1s
• Other_____ • Other_____

32. Tennis balls (circle strategy used)
a. Answer_____ ❒ **b.** Alternate Strategy:
•***Skip count by*** _____ •***Skip count*** _____
•***Known fact*** _____ •***Known fact*** _____
• Count all by 1s • Count all by 1s
• Other_____ • Other_____

33. Dots array (circle strategy used)
a. Answer_____ ❒ **b.** Alternate Strategy:
•***Skip count by*** _____ •***Skip count*** _____
•***Known fact*** _____ •***Known fact*** _____
• Count all by 1s • Count all by 1s
• Other_____ • Other_____

Growth Point 4 (with *bold* strategies)

Abstracting Multiplication & Division:
34. Biscuits on a tray (circle strategy used)
Answer _____ ❒
• ***Repeated addition*** • ***Skip count*** • ***Known fact***
• Count all by 1s • Other _____

35. Number of legs (circle strategy used)
a. Answer _____ ❒ **b.** Alternate Strategy:
• ***Skip count by*** _____ • ***Skip count***
• ***Known fact*** _____ • ***Known fact*** _____
• Count all by 1s • Count all by 1s
• Other _____ • Other _____

36. At the movies (circle strategy used)
Answer _____ ❒
• ***Uses groups*** • ***Known fact*** • Share by 1s
• Other _____

Growth Point 5

Multiplication Strategies:
37. Interpreting multiplication
Read _____ ❒ (e.g., 5 times 3)
Correct drawing ❒
• Array • Number line
• Groups • Other
Explanation_____ ❒

38. Multiplication problems
a. 3 x 10 ____❒ c. 10 x 7 ____❒ e. 4 x 30 ____❒
b. 2 x 7 ____❒ d. 3 x 50 ____❒ f. 5 x 7 ____❒

39. Cost of stickers (circle strategy used)
a. Answer _____ ❒ *($3)*
• ***Known fact_____***
• ***Building up from known facts*** *(e.g., 3x$1)* _____
• Skip count
• Other _____
b. Stickers in 6 packets? Answer _____ ❒ *(48)*
• ***Known fact*** _____
• ***Building up from known facts*** *(e.g., 5x8 + 8 or 4x6x2)*
_____
• Skip count
• Other _____

Division Strategies:
40. Interpreting division
Read_____ ❒ (e.g., 12 divided by 4)
Correct drawing ❒
• Draws 12 and partitions into 4 groups of 3 (partitive)
• Draws 12 and partitions into 3 groups of 4 (quotitive)
Explanation _____ ❒
41. Division problems
a. 16 ÷2 _____❒ c. 80 ÷4 ____❒ e. 35 ÷5 ____❒
b. 60 ÷10 ____❒ d. 24 ÷3 ____❒ f. 35 ÷7 ____❒
42. Washing windows (*circle strategy used*)
a. Mental answer ____❒
• ***Known fact*** *(6 minutes)*
• ***Building up from known facts*** (e.g., 24÷8x2)
_____
• Skip count
• Other strategy_____
b. Written answer ___❒
Strategy_____

Extending & Applying Multiplication & Division:
43. Off to the circus *(5 buses)*
Answer _____ ❒ _____
44. Stamp collection (circle strategy used)
a. Mental answer_____❒ *(90 stamps)*
• ***Building up from known facts*** *(e.g., 10x5 +8x5)*
_____
• ***Doubling/ halving*** (e.g., 9x10)_____
• Skip counting (by 5s, by 18s)
• Vertical method (visualised mentally)
• Other strategy_____
b. Written answer_____❒
Strategy_____
45. Trees in an orchard (circle strategy used)
a. Mental answer_____❒ *(7 rows)*
• ***Building up from known facts***
*(e.g., 98÷14=70÷14+28÷14)*_____
• ***Double/double; Halve/halve*** *(e.g., 98÷14=49÷7)*
_____
• Skip counting (by14)
• Other strategy_____
b. Written answer_____❒
• Strategy_____

Growth Point 5 (Can't 0) with *bold* strategies

Growth Point 6 (with *bold* strategies)

Growth Point 7 (with *bold* strategies)