+Examining Samples of Student Work

There are few things as valuable as collaboratively examining samples of student work. When teachers examine and discuss work with colleagues, it helps everyone involved develop a better understanding of grade-level standards. This in turn makes a teacher's professional judgment more reliable, and increases the reliability of the grades he or she assigns to individual students.

But more importantly, when teachers examine student work with the goal of learning as much as possible about where students are in their understanding of mathematical concepts, they are better able to provide feedback and adjust instruction to meet the diverse learning needs in their classrooms.

An answer provides little information on its own. If it is right, we may not know what path the student took to get there. If two students both answer **19 + 6** correctly, but one counted on his fingers while the other knew that the problem could be solved using **20 + 5**, we would need to know that in order to move learning forward for both students. And if a student answered the question wrong, we would want to know more about what she does know, so we have a starting point to address gaps in understanding. When the information we need is not evident in the work, we may choose to have an assessment conversation with the student to learn more.

Included in this section are samples of student work from two activities. Following the samples are brief commentaries. Before reading the commentaries, consider examining the work yourself, and if possible discussing it with a colleague. Keep the following questions in mind:

- What does this student understand already?
- Where do there seem to be misconceptions or gaps?
- What other information do you require? Do you need to ask for something more?
- What are possible next steps?

The questions above can act as a guide when you examine the work of your own students. Remember, when the learning is not clearly visible, be prepared to go back to the student for more information.

Set 1

Question:

$$28 + 38$$

What are some different ways you could solve this question?

Curriculum Outcomes:

Grade 2, Number, Outcome 9

Demonstrate an understanding of addition (limited to 1- and 2-digit numerals) with answers to 100 and the corresponding subtraction by:

- using personal strategies for adding and subtracting with and without the support of manipulatives
- creating and solving problems that involve addition and subtraction
- using the commutative property of addition (the order in which numbers are added does not affect the sum)
- using the associative property of addition (grouping a set of numbers in different ways does not affect the sum)
- explaining that the order in which numbers are subtracted may affect the difference.

[C, CN, ME, PS, R, V]

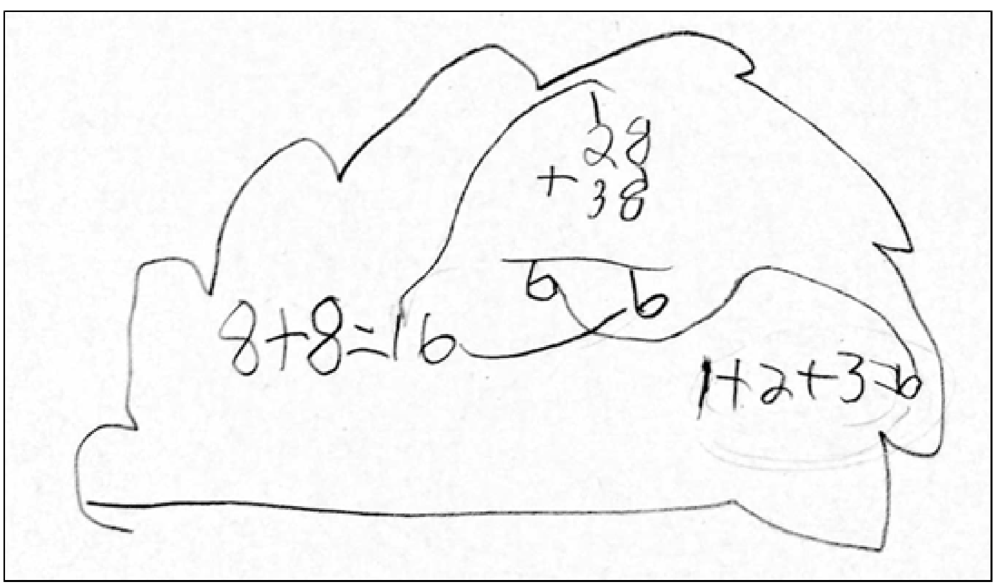
Grade 3, Number, Outcome 6

Describe and apply mental mathematics strategies for adding two 2-digit numerals, such as:

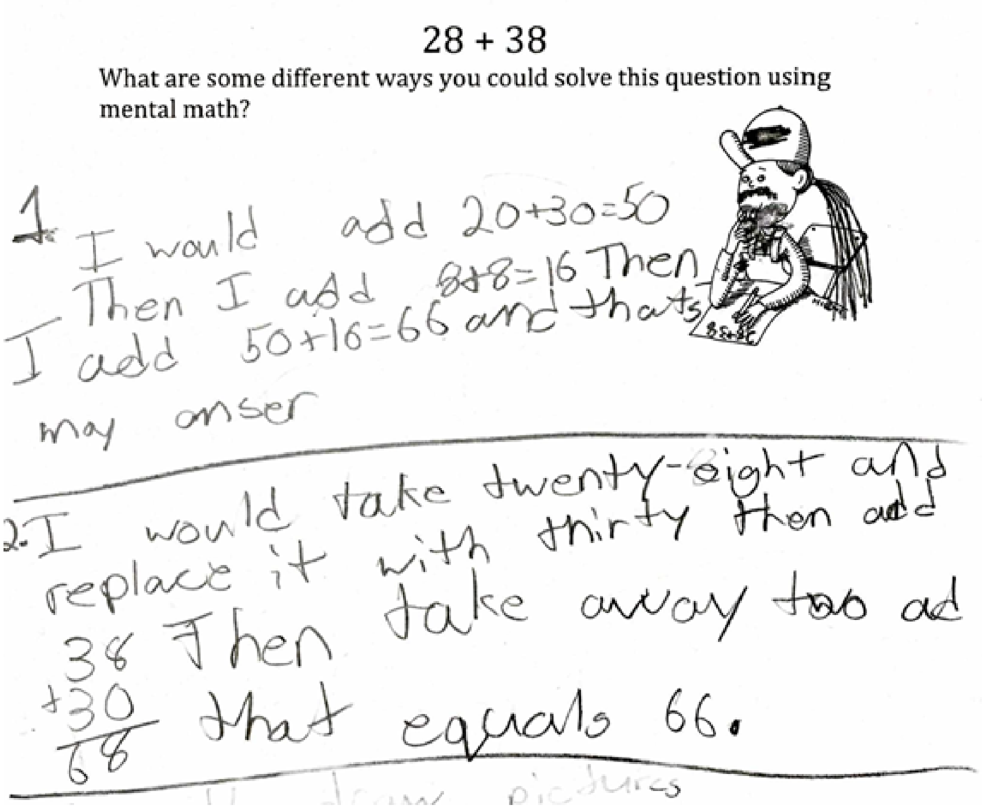
- adding from left to right
- taking one addend to the nearest multiple of ten and then compensating
- using doubles.

[C, CN, ME, PS, R, V]

Set 1 Sample A



Set 1 Sample B


28 + 38

What are some different ways you could solve this question using mental math?

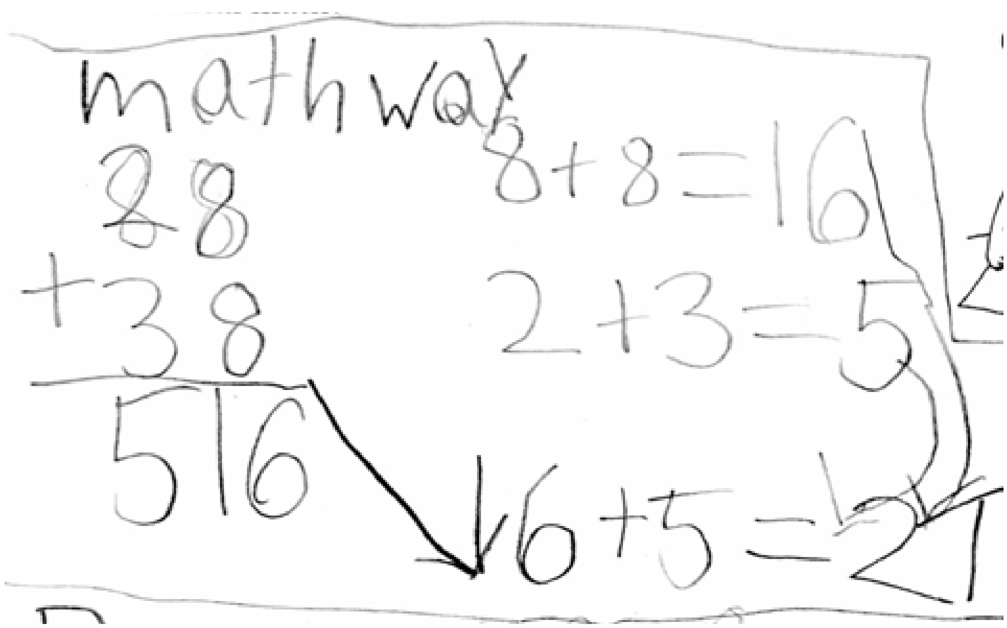
1. I would add 20+30=50 Then I add 8+8=16 Then I add 50+16=66 and thats may onser

2. I would take twenty-eight and replace it with thirty then add 38 Then take away two ad

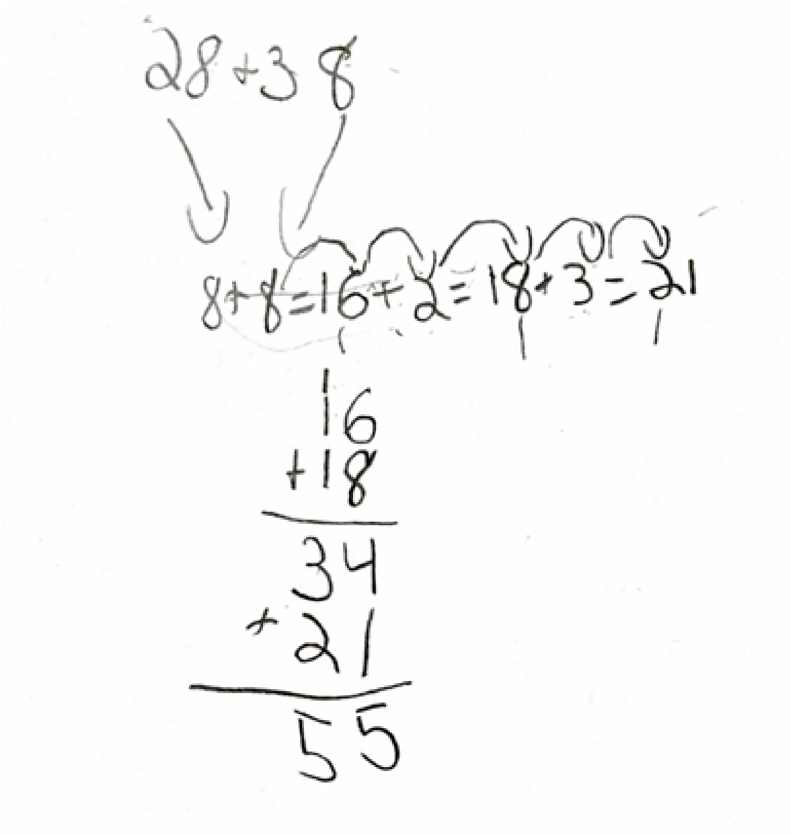
+30
68 that equals 66.

draw pictures

Set 1 Sample C



Set 1 Sample D



Set 1 Question:
28 + 38
What are some different ways you could solve this question using mental math?

Commentary:

Set 1 Sample A

This student has used a traditional addition algorithm to solve the problem, and then provided an equation to show which numbers he added for each step. There is no indication that he understands the place value meaning of "1+2+3=6" (i.e. that the numerals represent 10+20+30=60), so I would ask him about that. I would also be interested in knowing if he has any other strategies for calculations like these. If he is not able to use a compensation strategy yet, that's one I might have him explore, because it would be very suitable for this question.

Set 1 Sample B

This student has solved the problem using two different strategies. For the first, he combined the tens, combined the ones, and then added 50+16. For the second strategy, he changed 28 to 30, added that to 38, then subtracted the extra 2 from 68 to get his answer. He shows flexibility in the way he works with numbers, and a clear understanding of place value. His written explanations are easy to follow, but a next step for this student might be to try representing the strategies using mathematical symbols alone.

Set 1 Sample C

This student tried two different methods to solve the problem, and got two very different wrong answers. He first used the traditional algorithm (the "math way"), but rather than regrouping 16 into a 10 and 6 ones, he simply recorded 16 underneath the addends. This meant that, when he added 2+3 in the tens place, he recorded the total of 5 in what was now the hundreds place, giving him an answer of 516. For his second method, the student decomposed the numbers into individual digits, but then treated them all as ones, which resulted in an answer of 21. Both misconceptions show that the student is not applying any understanding of the place value meaning of the digits. It might be worthwhile to have this student represent the numbers using ten frames or base ten materials before beginning the calculations.

Estimation is a valuable starting place for any student beginning a calculation. I might have asked all the students to consider whether they would expect the final answer to be more or less than 50, say. This helps the students focus on the meaning of the numbers, and makes it more likely that they will reflect on the reasonableness of their solution.

Set 1 Sample D

Like the previous student, this student decomposed the number into individual digits, then added them without accounting for place value. However, I would suggest she realized the answer was not reasonable, and so kept looking for other numbers to add until the answer made more sense. (Of course, I can't know this for sure without asking her to explain.) If this is true, the student is showing good number sense. I might see what she could do with questions like 20+30, then 28+30, before trying more like 28+38.

Set 2

Question:

3 5 7   19 26 325

Choose one of these numbers   and one of these numbers.

Create and solve a multiplication problem using your two numbers.
Use numbers, words, and/or drawings to make your strategy clear.

Curriculum Outcomes:

Grade 4, Number, Outcome 6

Demonstrate an understanding of multiplication (2- or 3-digit by 1-digit) to solve problems by:

- using personal strategies for multiplication with and without concrete materials
- using arrays to represent multiplication
- connecting concrete representations to symbolic representations
- estimating products
- applying the distributive property.

[C, CN, ME, PS, R, V]

Grade 5, Number, Outcome 4

Apply mental mathematics strategies for multiplication, such as:

- annexing then adding zero
- halving and doubling
- using the distributive property.

[C, CN, ME, R, V]

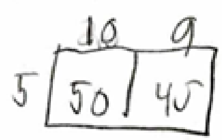
Set 2 Sample A

3 (5) 7 — Choose one of these numbers

(19) 26 325 — and one of these numbers.

Create and solve a multiplication problem using your two numbers.
Use numbers, words, and/or drawings to make your strategy clear.

thayers 5 peeple and 19 hockey cards and



50+45=95

if 10x5=50 and 5x9=45 so the anser is 95.

Set 2 Sample B

3 (5) 7 (19) 26 325

Choose one of these numbers and one of these numbers.

Create and solve a multiplication problem using your two numbers.
Use numbers, words, and/or drawings to make your strategy clear.

Katelyn had five friends and nineteen Cookies each friend wanted Some Cookies how many cookies would each friend get?

This is how I would figer it out. So I would Multiply 5X19 witch =95

Set 2 Sample C

3 (5) 7   19 26 (325)

Choose one of these numbers   and one of these numbers.

Create and solve a multiplication problem using your two numbers.
Use numbers, words, and/or drawings to make your strategy clear.

5×325=

Cash has 325 dollars and he needs to buy 5 things

325
+325
650
+325
975
+325
1300
+325
1625

3 5 7 19 26 325

Choose one of these numbers and one of these numbers.

Create and solve a multiplication problem using your two numbers.
Use numbers, words, and/or drawings to make your strategy clear.

I had 19 frend's that came to my Party I gave them 5 itums in each bag how many itoms did I give owt in all?

$5 \times 19 = 95$

Set 2 Question:
Choose one of these numbers (3, 5, 7) and one of these numbers (19, 26, 325).
Create and solve a multiplication problem using your two numbers. Use numbers, words, and/or drawings to make your strategy clear.

Commentary:

Set 2 Sample A
The student created a problem using what seems to be a division situation (5 people and 19 hockey cards). The method he used to multiply the chosen numbers seems to make sense to him, and he has explained it clearly. A next step would be to have him look back at his problem context, pose an actual question to go with the situation he proposed, and then consider whether or not his answer makes sense for that question. It would probably be a good idea to require a sentence answer for problems like these. Answering a "word problem" using a sentence has the benefit of pushing students to reflect back on the problem and connect the answer they get to the question asked.

Set 2 Sample B
This student has also created a division context for her problem, including a question that clearly requires division to solve. It's interesting to note that the students who completed the activity had recently been working on division. This probably explains why a significant number of them wrote division problems, but attempted to solve them using multiplication. Asking students to create problems of their own is one way to help uncover this confusion, which may not be obvious if the students only solve division problems during the "division unit". It may lead you to regularly provide students with mixed problems, even when your instruction is focused on one particular operation.
This student reached a correct solution for the multiplication equation, but has not provided any evidence of how the solution was derived. She may have counted by 5s, using her fingers to keep track, or solved it mentally using the distributive property – (10x5)+(9x5). It is even possible she used a known fact – 20x5 – and subtracted one group of 5. The only way to find out is to ask her about it.
If you already know this student has the skills and understanding in place to do this kind of problem mentally using an appropriate strategy, it is not required that she provide detailed explanations for every calculation. But if you don't know, you need to find out.

Set 2 Sample C
Another example of a division context, with no explicit question. I wonder if the student has not written the question because he realizes that it wouldn't make sense to use multiplication to answer it? Another opportunity for a conversation to find out.
He has used repeated addition to solve 5x325, which is a strategy that makes sense to him and leads to a correct answer. The class has not had much experience multiplying 3-digit x 1-digit numbers, and this might explain his use of addition. He was one of the few students to choose 325 as one of the numbers for the problem, which seems to indicate a willingness to take a risk. If he has a strategy in place for 2-digit numbers (such as, for example, the strategy used by the first student), a next step might be to ask him if he could think of a way to apply something similar to a 3-digit number.

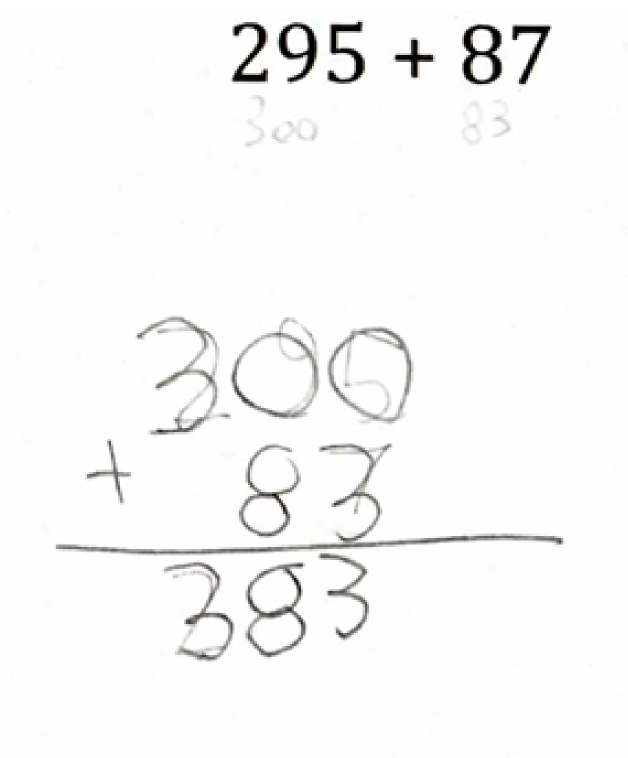
Set 2 Sample D

This student has created a problem using an appropriate multiplication context. She represented the problem with a diagram, and I would infer that she counted by 5s to find the answer. She has shown a clear understanding of the process of multiplication as repeated addition. Now she needs help to develop a more efficient strategy for calculating the answer.

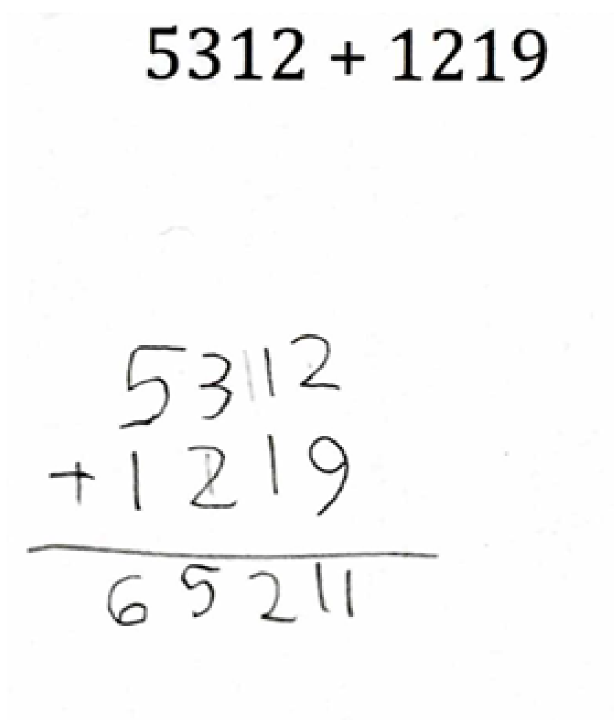
Bonus problems:

Here are 4 more samples from exit passes, each showing a different question, and each with an interesting window into the student's understanding. What can you learn about each student? What would your next steps be?

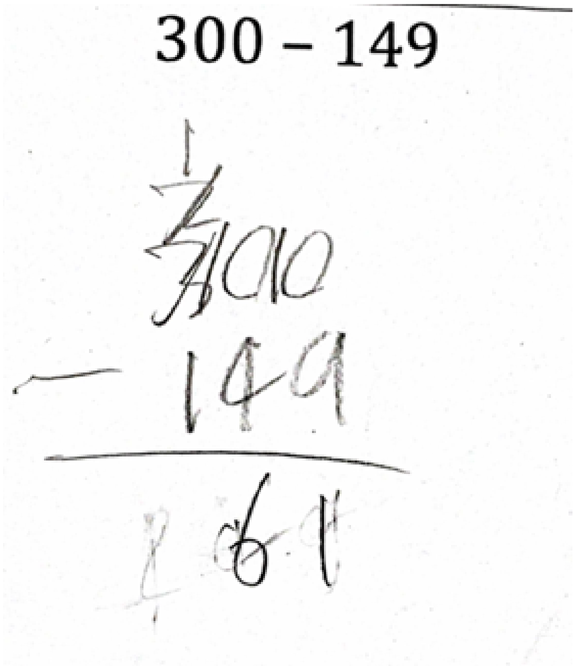
Student A



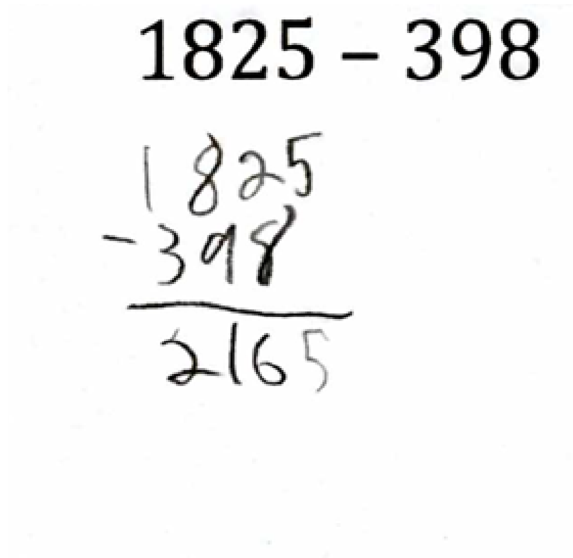
Student B



Student C



Student D



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