

CONSTRUCTING TASK: Making Sense of the Algorithm

Adapted from: A Written Form of Subtraction, nzmaths, Adding, Subtraction, and Place Value

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

For students who are good at multi-digit addition and subtraction, learning a standard written subtraction is straightforward, provided they understand the core idea that the particular decomposition needed in a given subtraction depends on what is subtracted.

ESSENTIAL QUESTIONS

- What strategies can I use to help me make sense of a written algorithm?

MATERIALS

- Play money if needed
- Base-ten blocks
- Making Sense of the Algorithm recording sheet

GROUPING

Individual or partner

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments:

This task allows students to make sense of the standard algorithm for subtraction. It is important you allow them to grapple with the strategies used by Jane. Through this grappling, students make sense of what Jane did to solve each problem. Through classroom discussion, student understanding will be shared and developed. Therefore, it is not necessary to work them through the methods presented in Jane's work.

After engaging in this task, students should know that it is mathematically possible to subtract a larger number from a smaller number but that their work with whole numbers does not allow this as the difference would result in a negative number.

Task directions:

Students will follow the directions below from the “Making Sense of the Algorithm” recording sheet.

Problems:

1. “To work out $856 - 138$, Jane rearranges 856 as $800 + 40 + 16$. Why does she do this?” Explain, using play money, if necessary. (In the decomposition method of subtraction, there are sufficient hundreds and tens to solve the problem, but there are insufficient ones.) “So find $856 - 138$.”
2. “To work out $856 - 162$, Jane rearranges 856 as $700 + 150 + 6$. Why does she do this?” Explain, using play money, if necessary. (In the decomposition method of subtraction, there are sufficient hundreds and ones to solve the problem, but there are insufficient tens.) “So find $856 - 162$.”
3. “To work out $856 - 168$, Jane rearranges 856 as $700 + 140 + 16$. Why does she do this?” Explain, using play money, if necessary. “So find $856 - 168$.”
4. “To work out $856 - 123$, Jane does not have to rearrange 856 at all. Why not?” Explain, using play money, if necessary. “So find $856 - 123$.”

Now establish a standard written form for subtraction. A good way to do this is to explain why $546 - 278$ requires 546 to be renamed 4 hundreds + 13 tens and 16 ones and link this to the problem below.

$$\begin{array}{r} & & 13 \\ & 4 & 14 & 16 \\ & \cancel{5} & \cancel{4} & \cancel{6} \\ - & 2 & 7 & 8 \\ \hline & 2 & 6 & 8 \end{array}$$

FORMATIVE ASSESSMENT QUESTIONS

- When you write the numbers in expanded form, what do you discover?
- What happens when one number has more or less tens than the other?
- Why do you think Jane rearranged the numbers before subtracting?

DIFFERENTIATION

Extension

- In each of these subtractions, explain how to split up 953 to solve the problem, then find the answers: $953 - 234$; $953 - 184$; $953 - 594$; $953 - 284$; $953 - 388$...

Intervention

- Have students model Jane’s methods using play money or base ten blocks.

Name _____ Date _____

Making Sense of the Algorithm

Directions

Problems:

1. “To work out $856 - 138$, Jane rearranges 856 as $800 + 40 + 16$. Why does she do this?” Explain, using play money or base ten blocks, if necessary.

2. “To work out $856 - 162$, Jane rearranges 856 as $700 + 150 + 6$. Why does she do this?” Explain, using play money or base ten blocks, if necessary.

3. “To work out $856 - 168$, Jane rearranges 856 as $700 + 140 + 16$. Why does she do this?” Explain, using play money or base ten blocks, if necessary.

4. “To work out $856 - 123$, Jane does not have to rearrange 856 at all. Why not?” Explain, using play money or base ten blocks, if necessary.

Now establish a standard written form for subtraction. A good way to do this is to explain why $546 - 278$ requires 546 to be renamed 4 hundreds + 13 tens and 16 ones and link this to the problem below.

$$\begin{array}{r} \overset{13}{4} \overset{14}{1} \overset{16}{6} \\ \cancel{5} \cancel{4} \cancel{6} \\ - 278 \\ \hline 268 \end{array}$$