

NEWSLETTER

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BEYOND BORROWING: UNDERSTANDING THE STRUCTURE OF SUBTRACTION

How place-value units are composed and decomposed in multi-digit subtraction.

In today's edition, we explore:

- **Two strategies:** what $43 - 29$ looks like by place value and by counting up
- **Regrouping:** decomposing a unit without changing the quantity, even across zeros
- **Classroom tips:** what students should be able to explain about regrouping
- **The research:** what studies of children's multi-digit strategies and teachers' explanations show

Educators!

Subtraction is often introduced as taking away. Students also use subtraction to compare quantities, find differences, and determine unknown parts.

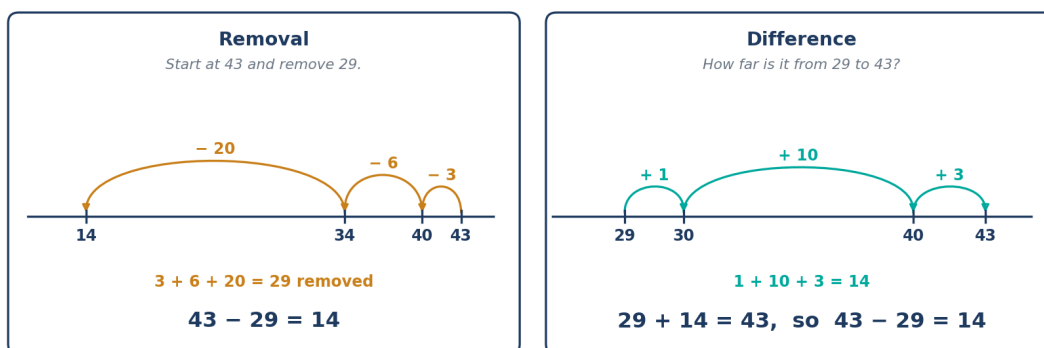
Consider $43 - 29$. One student might decompose a ten and subtract by place value. Another might count up from 29 to 43. Both strategies can produce the same difference, but they use different mathematical relationships.

Understanding these relationships helps students make sense of subtraction and develop efficient methods.

Subtraction as Removal and Difference

Students can solve $43 - 29$ by removing 29 or by counting up from 29 to 43. Both give a difference of 14.

DMT Insight 45 examines removal, difference, and other subtraction situations. This issue focuses on what happens to the units when students regroup.



The difference is the same. Each strategy uses a different relationship.

Regrouping Is Decomposing, Not Borrowing

When students regroup during subtraction, they are not borrowing a digit. They are decomposing a place-value unit into smaller units of equal value. For example, one ten can be decomposed into ten ones without changing the total quantity.

The same reasoning applies across zeros. In $402 - 178$, there are no tens to decompose, so one hundred is decomposed into ten tens, and then one ten into ten ones. Three hundreds, nine tens, and twelve ones are still 402.

Students should use mathematical language to explain which unit was decomposed, how the representation changed, and why the quantity stayed the same.

Classroom Tips

What should students be able to explain?

- 1. What is the unit?** Students name the units in each place before they subtract.
- 2. What does the model show about the units?** Which unit was decomposed, and how many of each unit are there now?
- 3. Why does decomposing a ten not change the quantity?** Three tens and thirteen ones is still 43.
- 4. How does your strategy connect to the subtraction equation?** Counting up from 29 to 43 finds the same difference as $43 - 29$.

What Does the Research Say?

Children build their understanding of multi-digit numbers by connecting number words, written numerals, and quantities structured in tens (Fuson et al., 1997). In a three-year study, children who used invented strategies before learning standard algorithms showed better knowledge of base-ten concepts (Carpenter et al., 1998). In Ma's (1999) study, many U.S. teachers described regrouping as "borrowing," while many Chinese teachers explained it as decomposing a unit of higher value.

Keep developing mathematical thinkers.

More Information

This is a quick overview. To read DMTI Insight 25, watch the video, and download the Companion, go to DMTI Insights at mathsuccess.io/dmtinsights.

How do your students explain regrouping? Share it with us at contact@dmtinstitute.com.

For more information on professional development and curricular resources, visit mathsuccess.io.



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