

NEWSLETTER

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UNDERSTANDING MISTAKES AND MISCONCEPTIONS

When mathematical ideas no longer work.

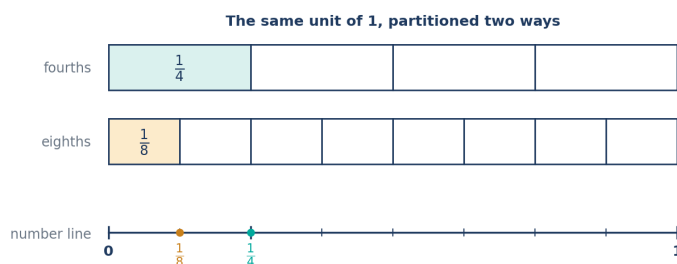
In today's edition, we explore:

- **One example:** why a student might say $\frac{1}{8}$ is greater than $\frac{1}{4}$
- **Mistake or misconception:** why the difference matters for instruction
- **What to do next:** questions and instruction that help an idea change

Educators!

A student says that $\frac{1}{8}$ is greater than $\frac{1}{4}$ because 8 is greater than 4.

The student may be applying whole-number comparisons to fractions. To investigate, ask the student to identify the unit of 1 and show how it can be partitioned into fourths and eighths. Comparing the size of the resulting fractional units helps establish why $\frac{1}{8} < \frac{1}{4}$.



Mistake or Misconception?

A mistake may be a calculation or recording error. A misconception involves an idea or relationship a student applies too broadly. A calculation error may need specific feedback and practice. A misconception may require students to reconsider the units and relationships they are using. A single answer does not tell us which it is, so ask the student to explain.

Classroom Tips

1. **Ask before correcting.** Ask, "How did you decide?" or "Show me with a model." The explanation shows which idea the student is using.
2. **Find where the idea works.** Identify the quantities and relationships for which the student's reasoning is valid.

3. Make the difference visible. Use a bar model, number line, area model, or place-value representation to show where the idea no longer applies.

What Should Teachers Do Next?

When an incorrect response appears, determine whether the student made a calculation error or is applying an idea that does not fit the situation. Ask students to explain their reasoning when it is unclear. Use representations to examine the units and relationships involved, then provide instruction, feedback, and practice appropriate to the error.

For example, a student who calculates $52 - 16 = 44$ may be subtracting the smaller digit from the larger in each column. Representing 52 as 5 tens and 2 ones, then decomposing one ten into ten ones, shows why the difference is 36. Connect the representation to the written procedure.

What Does the Research Say?

Smith, diSessa, and Roschelle (1993) describe misconceptions as knowledge in transition that instruction can refine and reorganize. In algebra, asking students to explain why incorrect worked examples are incorrect, alongside correct examples, has supported conceptual understanding (Booth et al., 2013). DMTI recommends using these ideas to plan instruction.

Keep developing mathematical thinkers.

More Information

Read DMT Insight 32 and download the Companion at mathsuccess.io/dmtinsights.

To share a classroom example or a question, contact us at contact@dmtinstitute.com.

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

