Giving Students a Choice of Tools for Solving Math Problems

As teachers align their lessons to college- and career-ready standards, some parents are asking why their children need to learn more conceptual math and why they need multiple strategies for solving problems. Some suggest that simply learning the standard algorithm for a math problem (2+2=4, 6×8=48, etc.) is enough.

We agree that students need to learn the set of rules or procedures that can be followed when doing calculations. In some cases, that's the best tool for the job.

But in other instances, students need more options—more tools in their toolbox. There might be better ways of solving the problem. And by knowing multiple strategies, students gain a deeper understanding of mathematics and how to use it in daily life.

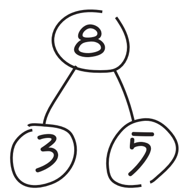
Consider the following three examples….

NUMBER BONDS CAN HELP

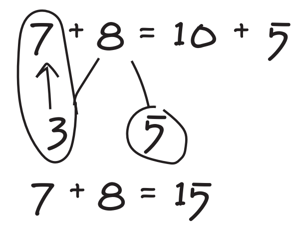
Add 998 and 337.

If you ask a 1st grader to add 998 and 337 and he or she only knows the standard algorithm, he or she will probably struggle to get the answer. This problem is likely too advanced, more like a 2nd- or 3rd-grade problem. But for a 1st grader who knows number bonds, the problem is a cinch.

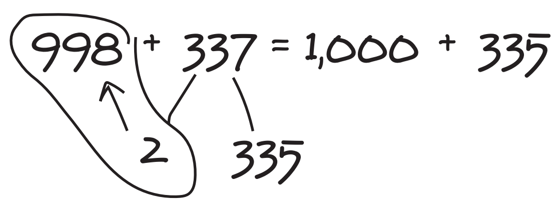
IN KINDERGARTEN, Eureka Math students learn to break numbers into small, manageable units: 3 + 5 = 8, or 8 – 3 = 5, or 8 – 5 = 3.



IN FIRST GRADE, students can see that 7 + 8 is the same as 10 + 5.



Once they see and understand that, they can also quickly solve 998 + 337. Step 1 is to make 998 a more manageable number, such as 1,000. That means adding 2 to 998, which is easily done by breaking 337 into 2 + 335. And then subtracting that 2 from 337.



Then, it's easy to add 1,000 + 335 = 1,335. And 998 + 337 = 1,335.

VISUALIZING FRACTIONS CAN HELP

Which is bigger, 1/3 or 1/4?

Many people, including adults, get this wrong. After all, isn't 4 greater than 3?

One approach, usually taught in 3rd grade, is to use the recipe to find the common denominator, in this case 12.

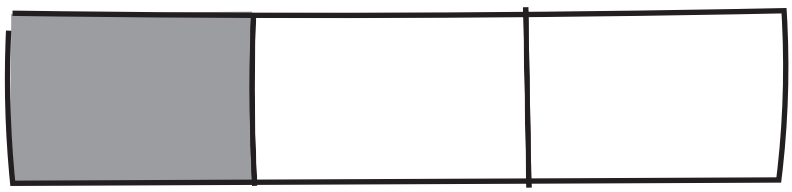
So you would multiply 1/3 by 4/4 to get 4/12.

And you'd multiply 1/4 by 3/3 to get 3/12.

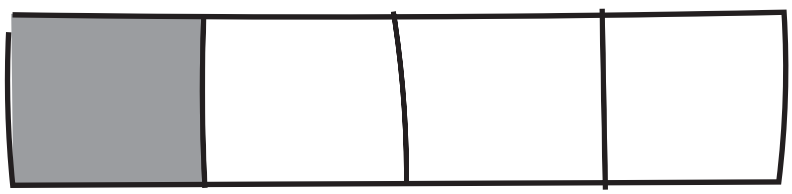
4/12 (1/3) is bigger than 3/12 (1/4).

Try this instead. Being able to visualize the problem gets you to the solution more quickly.

Grab a pencil and paper. Divide a bar into thirds (1/3, plus 1/3, plus 1/3).



Divide the same size bar into fourths (1/4, plus 1/4, plus 1/4, plus 1/4).



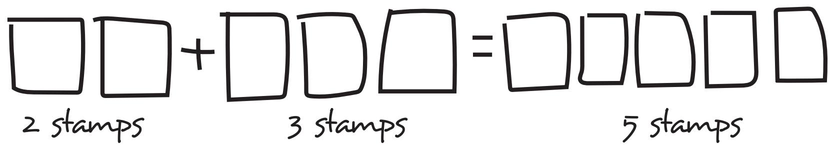
The units in the top bar clearly are bigger than the units in the bottom one, making it visually clear that 1/3 is greater than 1/4.

TAPE DIAGRAMS CAN HELP

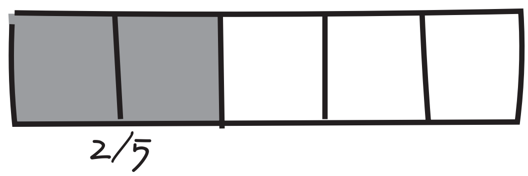
Zoe had some stamps. She gave 2/5 to Lionel. She used 1/3 of the remaining stamps to mail thank-you notes. She had 14 stamps left. How many stamps did she have when she started?

This is a very tough problem to solve if you only know the algebraic approach. But with the use of tape diagrams, a 5th grader can solve it in under a minute.

IN KINDERGARTEN, *Eureka Math* students learn the basic approach of dividing numbers into units, starting with concrete examples such as apples or blocks—or stamps.

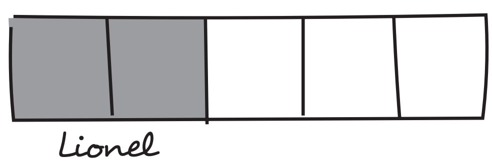


IN 3RD GRADE, they learn the concept of fractions, such as two stamps out of five stamps is equal to 2/5 of the whole number of stamps.

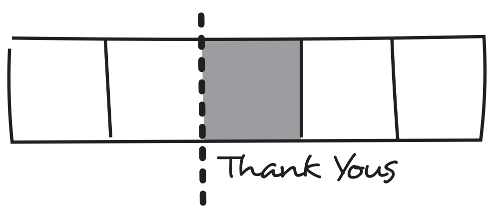


BY 5TH GRADE, students can use this method to easily solve the stamp problem in four steps.

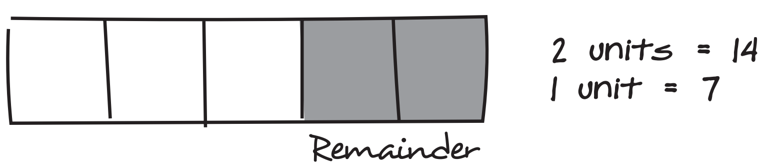
1. Because Zoe gave 2/5 of her stamps to Lionel, you know this can be divided into 5 units, and that Lionel got 2 of those. 3 units remain.



2. You know that 1/3 of the remainder—1 of the 3 units—were used to mail thank-you notes.



3. You know that the remaining two units are 14, and that they're the same size. 14 divided by 2 is 7 stamps in each unit.



4. Multiply 7 stamps by 5 units to get the answer of 35 stamps.

CONCLUSION

We're limiting our students if we give them only one set of tools for solving math problems.

These three examples show what is possible when students learn multiple approaches.

And in districts around the country that are increasingly using *Eureka Math,* there is more evidence every day that students are thriving.

They're loving math.

They're doing well.

And parents and teachers, after some initial concerns, have become among the most persuasive ambassadors for this kind of teaching and learning.

Read more here: http://greatminds.net/case-studies.

ABOUT *EUREKA MATH*

Eureka Math is a comprehensive math curriculum presented in a logical progression from PK through grade 12. This coherence allows teachers to know what incoming students have learned and to prepare them for what comes next. *Eureka Math* connects math to the real world in ways that build student confidence while helping students achieve true understanding. By modeling math problems in more than one way, *Eureka Math* helps ensure that all learners are appropriately challenged and supported. For more information, please visit us here: eureka-math.org