

# USING MATH MENUS

*Giving students a menu of activities to choose from helps differentiate instruction and engage all learners.*

**Marilyn Burns**



**T**hroughout the years that I've supported classroom teachers' math instruction, teachers have consistently asked me three questions:

- What do I do with students who finish their math assignments more quickly?
- How can I free up time to work with students who need extra help?
- How can I differentiate experiences to support struggling learners while also meeting the needs of students who require additional challenges?

Because these questions come up so often and so regularly, I've named them The Big Three. In this article, I describe a strategy I've used in my own classroom and now use with many teachers that helps address these three questions. Like many good strategies, it requires careful preplanning, but can make a large contribution to teaching and learning.

## **My Adopted Classroom**

As an education consultant, I've come to believe that I can only offer teachers help with questions like The Big Three if I'm directly connected with classroom teaching. And because I'm no longer a full-time classroom teacher, I've found that the best way for me to continue to improve my teaching practice is to engage regularly with one class in a school so that I'm part of their math learning and their teacher's planning.

Most recently I adopted a 4th grade class at John Muir Elementary School in the San Francisco Unified School District. The teacher, Sara Liebert, has been teaching at the school for five years and has been a wonderful collaborator. We've also received guidance from my colleague Lynne Zolli, retired after 41 years as a classroom teacher in the district. It's been a dream situation. I've enjoyed teaching, observing, and learning from students, and I've enjoyed helping Sara plan her math instruction.

Like most elementary teachers, Sara is responsible for teaching her 4th graders all subjects, and she typically does a good deal of planning in the evenings. When planning for math, she usually reviews students' work from the day before and then prepares for the next day's lesson—an arduous enough regimen that typically doesn't leave time to plan for The Big Three.

Lynne and I offered Sara a strategy that would help her address The Big Three when planning classroom instruction. That strategy was math menus.

The flow of pathways



Students in Sara Liebert's 4th grade class at John Muir Elementary School play Pathways.

### What Is a Math Menu?

A math menu is a list of math options posted on a sheet of chart paper for all to see. The options can include problems, investigations, games, and other activities that promote students' understanding, support their reasoning, or provide practice with the content and skills they've been learning. Sometimes I introduce a menu with just one or two choices, and then add to the list as I introduce new content. I typically have seven or eight options, at most, on the menu.

Using math menus gives teachers a solution for each of the challenges posed by The Big Three. Math menus provide students who finish in-class assignments more quickly with a way to be productively engaged. It's sort of a math counterpart to having students read silently when they finish class work. A teacher can also have the

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entire class work on items from a menu independently for a period of time, freeing time for that teacher to work with individuals or small groups. And a math menu can offer a variety of experiences at a range of levels of difficulty to meet different students' needs. A particular menu item might also include variations that further allow for differentiation.

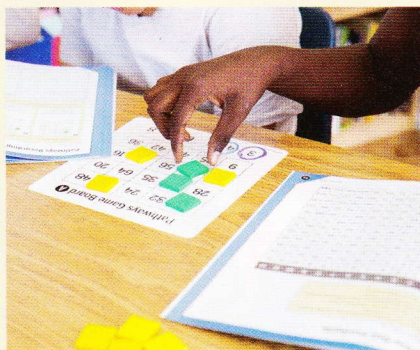
Some menu choices should be designed for students to

## The Game of Pathways

Games make great items on a math menu. One popular game that helps students get comfortable with multiplication facts is Pathways. A Pathways gameboard is a 4 x 5 grid with numbers in each square that are each a product of two of the factors written below the grid.

Two players play on the same board. Each player's goal is to "X off" a connected "pathway" of squares from one side of the grid to the other, as in a variation on Bingo. The first player chooses two factors, then marks the square that contains the product of those factors. The second player has to change one of the factors just used, then mark the product of *those* two factors. Play continues, each player changing one of the factors from the previous move. Whoever completes a pathway first wins.

Choosing factors calls for strategic thinking—for instance, to pick factors whose product would block an opponent's path. To see several sample gameboards and for more detail on how to play Pathways, see this post on Marilyn Burns' Math Blog: <http://marilynburnsmathblog.com/wordpress/the-game-of-pathways>.



complete individually, providing a way to assess each student's progress. For other activities—typically those meant to help students explore something new, extend an experience, or deepen understanding—students can work in pairs. Some teachers mark each task with an "I" or a "P" so students are clear whether it's an individual or partner activity. Games that students play in pairs give learners a way to practice skills, apply reasoning, and use strategic thinking—and are especially good menu items because they encourage revisits. We generally ask students to play any game on the menu at least four times and with at least four different classmates.

We typically have students complete all the items on a given menu, but give them the opportunity to

**Math menus are a math counterpart to having students read silently when they finish class work.**

choose the order in which they try the tasks and which tasks they'd like to revisit. Sometimes, however, we direct the class to a particular item—for example, if we want students to engage with a certain activity so that they are prepared for an upcoming class discussion.

Activities on a menu may all focus

on a particular topic—such as multiplication—or may draw from a range of topics, including some that students learned earlier. A teacher can add menu items as new experiences are introduced and instructional content shifts, and cross out options that are no longer appropriate. When the paper becomes full or messy with crossed-out items, start over on a new sheet.

It's essential that menu options are familiar enough to students that they can work independently, and it's beneficial if some options offer variations that make for easier access for some and more of a challenge for others. Students' choices often reveal their academic comfort level.

### A Lesson to Strengthen Addition and Subtraction Skills

To see how a math menu can extend concepts or skills explored in a lesson, let's look at a lesson from early in the school year in Sara Liebert's class—and the task she and I added to our menu as a follow-up. As I describe this lesson, I note places where the careful planning I had done helped things go effectively.

Our focus was on bolstering our 4th graders' understanding of place value and their mental reasoning skills with addition and subtraction. To focus on the benchmark number of 100, I wrote three numbers on the board—50, 70, and 80—and this direction: *Add or subtract, using each number once, to equal the target number 100.*

There's more than one way to get the target number of 100 by following these directions (actually, there are three ways). I knew this because I'd solved the problem myself and written down all the possible solutions during my planning. I find that when planning lessons, it's important to solve ahead of time any problems the lesson will involve, so I can anticipate student responses and be prepared to

offer suggestions if they get stuck.

I didn't tell the students that multiple ways were possible; instead, I had them work with a partner to come up with a way to solve the problem. Then I led a class discussion in which students shared their answers.

During our discussion, two solutions emerged. One student reported that he and his partner first added 80 and 70 to get 150, and then subtracted 50 to get 100. Other students reported using the same solution. I wrote two equations on the board:

$$80 + 70 = 150$$

$$150 - 50 = 100$$

Then I asked, "Did anyone find a different way?" Two girls reported that they had started with subtraction. As they explained their procedures, I recorded two equations on the board to represent how they reasoned:

$$70 - 50 = 20$$

$$80 + 20 = 100$$

I asked again if anyone had found a different way. When no one raised a hand, I told them, "I found another way. I'll give you a few minutes to see whether you and your partner can think of it. If not, I'll share what I figured out."

It wasn't long before several students figured out the third way, and I recorded their solution:

$$80 - 50 = 30$$

$$70 + 30 = 100$$

I confirmed for the class that these were the only three solutions I had found. Then, I returned to each set of two equations and modeled for the class how I could have recorded each solution with just one equation. This gave me the opportunity to introduce the notation of parentheses. I told the students, "Parentheses are math punctuation. They aren't absolutely necessary here, but they help to show what you did first." I wrote an equation using parentheses for each solution:

$$(80 + 70) - 50 = 100$$

$$(70 - 50) + 80 = 100$$

$$(80 - 50) + 70 = 100$$

At this point, I gave the students a follow-up problem to work on individually. I wrote on the board the numbers 40, 60, and 80 and this direction: *The target number is 100. Your task is to figure out and record three different ways to add and subtract, using each number once, to reach the target number.*

Planning and including time for in-class assignments that students do individually is an essential component of structuring good math lessons. Individual work is important for assessing students' understanding and monitoring their progress. In contrast to worksheets, which usually just have students practice procedures, well-planned assignments call for evidence of how students reason.

For instance, the individual work of two students on this assignment, shown in Figure 1, reveals something about their thinking and how much each student has learned. Mikala used two equations to represent each of the

three ways she solved the problem.

Brayon wrote one equation for each way and used parentheses, which I had just introduced to the class.

### Extending the Lesson to the Math Menu

Looking over the student work from this in-class assignment helped Sara, Lynne, and me decide that this kind of exploration would be appropriate to include on the class's math menu. We saw that doing more of these kinds of problems would provide additional numerical practice and would be easily accessible to all but a few struggling students. So we created a menu option called Three Ways. To ensure that this option would serve the needs of all our students, even the strugglers, we created 40 problems that used different target numbers, ranging from 20 to 500, and were of varying levels of difficulty. We organized the problems into four sets—with the first set having the easiest problems and the fourth the most difficult—with 10 problems in each set, wrote each problem on an index card (using a different color card

FIGURE 1. Two Students Work on a "Three Ways" Task

Mikala's work shows three ways to reach a target of 100 using the numbers 40, 60, and 80. She lists the numbers at the top: 40, 80, 60. Below, she shows three equations:  $80 - 40 = 40$ ,  $40 + 60 = 100$ , and  $80 - 60 = 20$ ;  $20 + 20 = 100$ . There is also a vertical line separating the first two equations from the last one, and another vertical line to the right of the last one.

Mikala

Brayon's work shows three ways to reach a target of 100 using the numbers 40, 60, and 80. He lists the numbers at the top: 40, 80, 60. Below, he shows three equations:  $(80 + 60) - 40 = 100$ ,  $(80 - 40) + 60 = 100$ , and  $(60 - 40) + 80 = 100$ . The equations are written in a vertical column.

Brayon

Directions to this problem read, "The target number is 100. Figure out and record three different ways to add and subtract, using each number (40, 60, and 80) once, to reach the target number."

*Student work used with permission.*

for each set), and numbered the cards from 1 to 40 in order of difficulty.

Because we had two students who were sorely in need of the special intervention we were providing, we included problems with smaller numbers—for example, a target of 20 with 8, 2, and 14 as the three numbers to use. At the same time, we provided options for students who would benefit from challenging problems—for example, a target of 150 with 75, 95, and 130 as the numbers to use, or a target of 200 with 350, 100 and 250.

When we added Three Ways to the menu, we explained to students that it was an individual task that would help us learn how each of them was doing with adding and subtracting multi-digit numbers. We showed students how the problems were organized, and then told them that they had to solve 10 problems and could choose any problems from any of the sets we had prepared. I advised students, “You might choose some problems with smaller numbers to ease into the task, and then try some with greater numbers. Or jump into problems with greater numbers that give you more of a challenge. Be sure to let us know if you choose a problem that stumps you.”

Over the years of working with students in math classes, I’ve learned that giving students options for what to work on is wonderful for making them feel empowered and in control of their learning. Also, students’ choices reveal valuable information about their confidence, caution, willingness to take risks, and more.

Even though students choose their problems, I sometimes ask a student who I think could handle more of a challenge to try a particular activity. Or I suggest something to the whole class. For the Three Ways task, I suggested that if any students wanted a challenge even greater than trying the

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most difficult problem set, they could try to solve all the problems. This option was especially interesting to a few students. For instance, Carl wrote for his daily reflection, “I’m wondering how many days, weeks, or months it would take us to finish the Three Ways.” No student completed all 40 problems, but several did more than the minimum of 10.

The students enjoyed the Three Ways problems, and we enjoyed watching them get much-needed practice with addition and subtraction. Although a worksheet of straightforward problems to solve would have provided practice, this task gave students more opportunities to reason numerically as they tried different ways to add and subtract the numbers.

### **A Caveat—and an Added Benefit**

Although math menus are a great way to address The Big Three, like any organizing system for managing instruction, they will only be as effective as the quality of the math lessons you teach and the tasks you create for menus. Our litmus test for both math lessons and menu options is that they involve students in thinking, reasoning, and making sense. And on math menus, we strive to include tasks that are accessible to all students but have the potential to challenge the most able and confident.

As an extra benefit, math menus

are a terrific help when you have to miss a day of school and make lesson plans for a substitute. We all know how tough it is to make plans for a sub—who might be unfamiliar with your class and the work the students have been doing—that will result in effective use of students’ learning time. When I taught middle school math to five different classes each day, I prepared my students for days when I would be away by using math menus. Students knew there was a folder in my desk labeled “For the Sub,” which included a brief description of our math menu and the names of students in each class assigned to help get work on the menus going. Students understood the routine and enjoyed the opportunity. It was always a positive experience for both the students and the subs.

This school year, I’m working with Sara Liebert’s class again as 5th graders, essentially the same class as last year with a few new students. Sara introduced a menu to begin the year, to help students become familiar with the routine. She taught several math games students could play with partners, included a problem for them to tackle, and gave some routine practice problems. While students worked on the menu, Sara spent time interviewing the new students to find out more about their understanding and skills, and worked with learners she knew needed more support. I’m excited about helping these students continue their math learning. ■

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