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Core Focus

- Multiplication: Introducing the nines facts and solving word problems
- Division: Introducing the eights, ones and zeros facts
- Data: Working with many-to-one graphs, bar graphs, and line plots

Multiplication

- In this module, students continue making sense of various multiplication and division facts, including extending their knowledge of tens, nines, eights, and ones facts in ways that build on what they have already learned about multiplying with these numbers.

- Of the range of strategies that can be used for the nines facts, the most useful strategy involves starting with a tens fact and **building down** from it. Students start from the more familiar ×10 facts to solve less familiar nines facts.

- For example, an array of dots with 10 rows and 6 columns in each row has 60 dots. When one row is covered or folded back (see below) it leaves 9 rows of 6. The folded-back array shows $60 - 6 = 54$, so $9 \times 6 = 54$. Identifying these connections builds number sense and reasoning.

6.1 Multiplication: Introducing the nines facts

Step In What do you know about this array?

How can you figure out the total number of dots?
Write an equation to describe the array.

What do you know about this array?
How can you use the first array to figure out the total number of dots in this array?

I know 10 sixes is 60, so 9 sixes is 6 less. That's 54.

In this lesson, students use the more familiar tens facts to solve less familiar nines facts.

6.2 Multiplication: Reinforcing the nines facts

Step In Look at each of these nine facts. $9 \times 3 = 27$ $9 \times 4 = 36$ $9 \times 5 = 45$

What do you notice about each product?
What happens when you add the two digits in each product?

When working with the nines multiplication facts, the digits in each product total 9.

Write three more nines facts that you know. Then check to see if the digits in each product total 9.

I know that my nines fact is incorrect if the digits in the product do not total 9.

In this lesson, students explore patterns to reinforce the nines facts.

Ideas for Home

- Practice the tens and nines facts together. Encourage your child to explain how knowing the tens fact makes the nines fact easier to solve. "I know that 5×10 is 50, and $50 - 5$ is 45, so 9×5 is 45."

- Create arrays with pennies to illustrate $10 \times \underline{\quad}$ and then cover one row to illustrate $9 \times \underline{\quad}$.

- Encourage a self-check with nines fact pattern. Say, "When the digits of the total are added together, do they equal 9?" In 51, 5 + 1 equals 6, so 51 can't be a multiple of 9.

Glossary

▸ This array models the **build-down** strategy for $10 \times 3 - 3 = 27$.
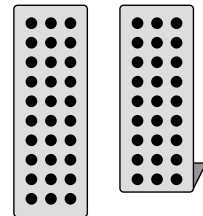
Helpful videos

View these short one-minute videos to see these ideas in action.

www.bit.ly/O1_8
www.bit.ly/O1_5

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Division

- Students connect what they learned about multiplication to develop strategies to divide by eight. Since doubling is convenient in multiplication, halving makes sense for dividing. *Thinking multiplication* is another useful strategy.

- Division with zero can be quite challenging because it does not follow the pattern of other facts. For example, $0 \div A = 0$, regardless of what number we use for A, other than 0 itself: $0 \div 2$, $0 \div 17$, and $0 \div 198$ all equal 0. If we begin with nothing and divide nothing into groups, we have nothing in each group.

- Mathematicians say division by 0 is *undefined*. In other words, it simply cannot be done. For example, with $6 \div 2$, we think $2 \times ? = 6$. The missing number is 3, so $6 \div 2 = 3$. Using the same thinking with $6 \div 0$, we are looking for a number that makes $0 \times ? = 6$ true, but no number can do this. Whenever we multiply by 0, the answer is always 0.

Data

- Collecting data and displaying it in graphs is a way to visually address questions like: *How many? How much? What kind?* Students learn ways to organize data and to display it in charts and graphs. Lessons in this module focus on creating and interpreting **many-to-one picture graphs**, **bar graphs**, and **line plots**.

In this lesson, students are introduced to many-to-one picture graphs where one picture represents ten observations.

Ideas for Home

- Notice when data is displayed in graphs in the newspaper, on websites, or in magazines. Interpret the graph together and ask questions that can be answered by looking at the graph.

Glossary

▸ A **graph** shows the relationships between two or more things using **bars**, **lines** or **dots**, or **pictures**.