Curriculum Analysis: Math In Practice, Grade 4

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Overview

Analysis of the Math in Practice curriculum revealed that it aligns with multiple key best practices for effective mathematics education:

- Activation of and connection to prior knowledge (NCTM, 2014; Van de Walle, Karp, & Bay-Williams, 2016)
- Creating and interacting with models and visual representations (Woodward et al., 2012) and use of varied representations (Goldin, 2003)
- Higher-order questions that stimulate thinking (Marzano, Pickering, & Pollock, 2001)
- Engaging students in productive math talk (Stein & Smith, 2011)
- Concrete-Representational-Abstract instruction (Agrawal & Morin, 2016)
- Students generate story problems to represent the equation of interest (Drake & Barlow, 2007; Whitin & Whitin, 2008)

References

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Exploring the Instructional Progression

Grade 3 — Previous
Concept of multiplication; area model
Multiplying by 10
Exploring distributive property

Grade 4 — Now
Using place value concepts and properties to multiply 1-digit by multi-digit and 2-digit by 2-digit numbers

Grade 5 — Next
Use standard multiplication algorithm to multiply multi-digit numbers
Extend multiplication understanding to decimals

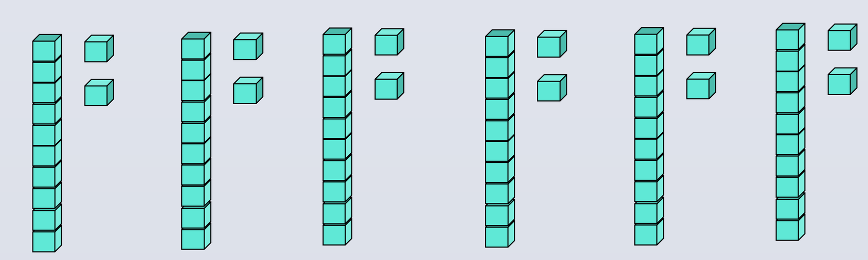
Activating & Building on Prior Knowledge

At the beginning of the lesson, students play a game to revisit multiplying by multiples of 10, a skill that provides the foundation for multiplication with a 2-digit factor.

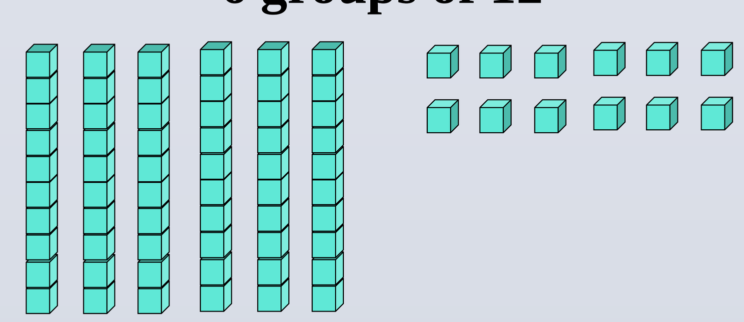
Next, students extend the area model they used in third grade to multiply single digit factors by a 2-digit factor.

Models and Visual Representations

First students use concrete models like base-ten blocks to represent a multiplication problem like 6 x 12 to understand that 6 groups of 12 is the same as 6 groups of 10 and 6 groups of 2:

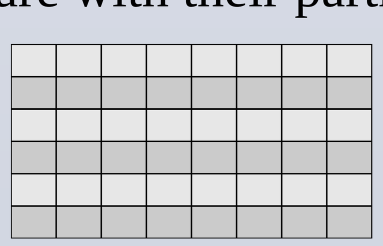


6 groups of 12

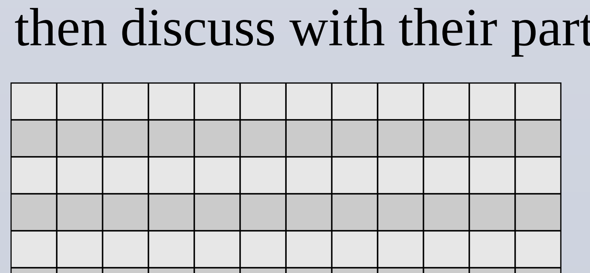


6 groups of 10 & 6 groups of 2

Next, students use grid paper to show a single digit multiplication problem like 6 x 8 with an area model, then share with their partners and discuss:



Then students use grid paper to show 6 x 12 with an area model, then discuss with their partners:



Guiding questions:

How did you find the product? (might have counted squares, but may have used other strategies like 6 x 10 and 6 x 2)

If students broke apart the factor, discuss their thinking. If not, prompt them to explain a strategy to use if you forget a multiplication fact as a way to guide them to think about breaking a factor apart.

Is there a way to break apart 6 x 12 to make it easier to solve? (Partners discuss)

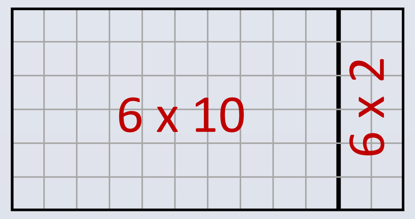
Probe further:

Why would you break apart the 12?

Which way will breaking apart the 12 make it easiest for you to solve 6 x 12?

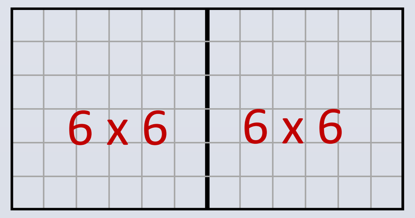
Flexible Strategies

Various ways to decompose 12 to make it easier to multiply 6 by 12:



$12 = 10 + 2$

$6 \times 12 = \underbrace{6 \times 10}_{60} + \underbrace{6 \times 2}_{12}$



$12 = 6 + 6$

$6 \times 12 = \underbrace{6 \times 6}_{36} + \underbrace{6 \times 6}_{36}$

Increasing the Level of Abstraction

Next, larger numbers are used to minimize drawing and counting of individual unit squares and problems are presented in the context of a story:

A bookcase has 5 shelves. There are 27 books on each shelf. How many books total are in the bookcase? Make an area model to help solve the problem.

Guiding questions:

Is there a way to break apart 27 to make the problem 5 x 27 easier to solve?

Why did breaking apart 27 the way you did make it easier to solve the problem?

Can you think of another way to break apart 27?

5 x 27

	20	+ 7
5	5 x 20 = 100	5 x 7 = 35

100 + 35 = 135

	10	+ 10	+ 7
5	5 x 10 = 50	5 x 10 = 50	5 x 7 = 35

50 + 50 + 35 = 135

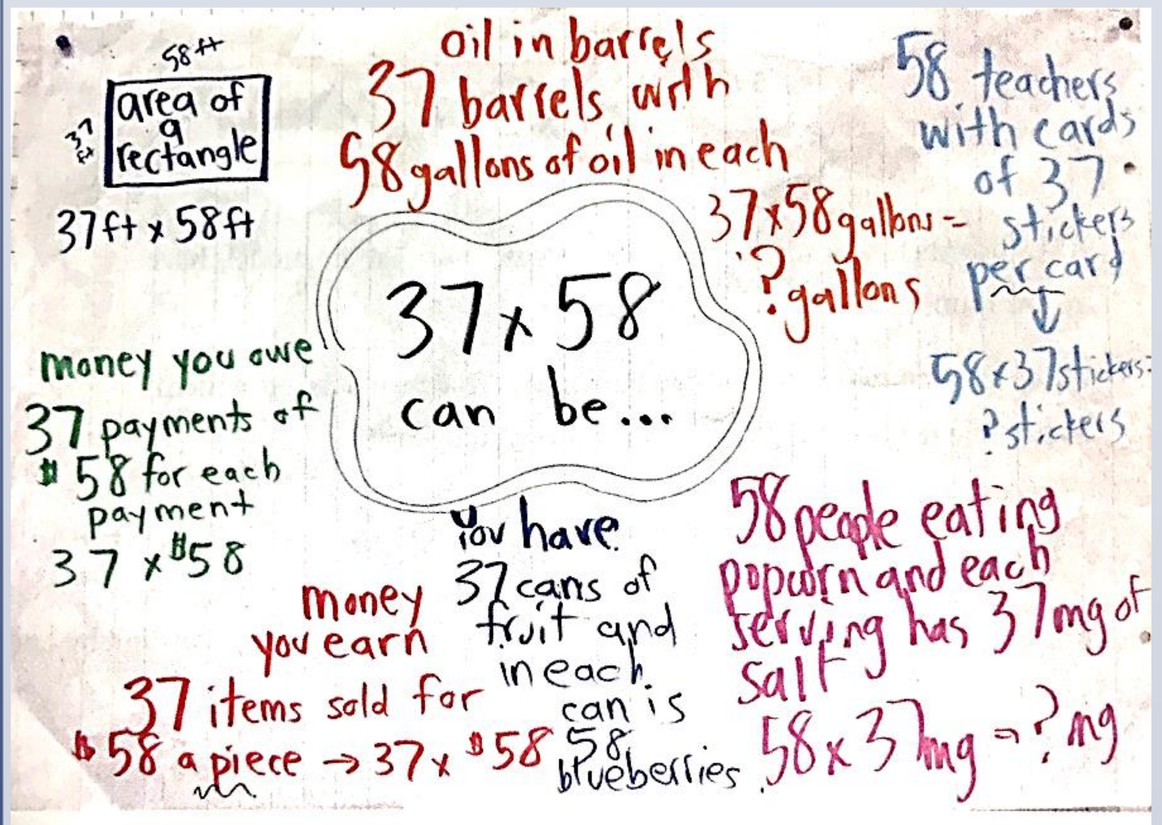
Once students understand decomposition, they can solve problems without the rectangle to guide them:

27 = 20 + 7
5 x 20 = 100
5 x 7 = 35
135

27 = 10 + 10 + 7
5 x 10 = 50
5 x 10 = 50
5 x 7= 35
135

Generating Relevant Story Problems

Students work collaboratively using chart paper to create multiple real-world examples to represent a problem. This is a great wrap up to the unit and assists in reviewing prior to assessment.



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