MULTIPLYING TWO-DIGIT NUMBERS USING THE AREA MODEL

GENERAL INFORMATION

Background
According to the Australian Curriculum by the end of Year 4 students should be able to recall their multiplication facts up to 10 x 10. This is often an area of much concern for students, parents and teachers. From here students move to multiplying 1-digit numbers by 2-digits numbers, then onto 2-digit by 2-digit and beyond. This material will focus on the use of the Area Model.

Australian Curriculum Link(s):
- Recall multiplication facts up to 10 × 10 and related division facts (ACMNA075)
- Solve problems involving multiplication of large numbers by one- or two-digit numbers using efficient mental, written strategies and appropriate digital technologies (ACMNA100)

Year Level(s): 4 – 5

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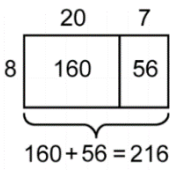
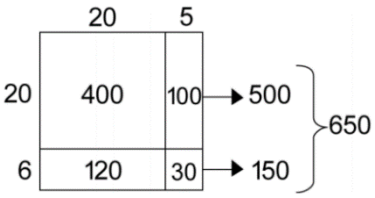
Details:
- Use mental strategies to recall multiplication facts for multiples of two, three, five and ten then extend to other numbers
- Relate 'doubling' to multiplication facts for multiples of two, e.g. 'Double three is six'
- Recognise and use the symbols for multiplied by (×), divided by (÷) and equals (=)
- Model and apply the commutative property of multiplication, e.g. 5 × 8 = 8 × 5
- Use the area model to solve 1-digit by 2-digit problems, e.g. 27 x 8
- Use the area model to solve 2-digit by 2-digit problems and beyond, e.g. 25 x 26

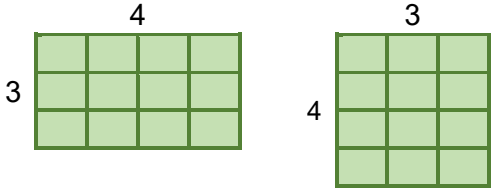




POSSIBLE ACTIVITIES

Getting started
Before moving onto multi-digit multiplication, it is important that students have a strong understanding of their multiplication facts up to 10 x 10. Most students will give an honest assessment of their ability to recall multiplication facts, often happily identifying the facts they feel less confident about, e.g. *I have trouble with my sevens.*
Many students will know more facts than they realise, particularly since multiplication is commutative, e.g. 3 x 7 = 7 x 3, so the number of facts that students know can often by doubled. At schools, commutativity is often referred to as turn around facts, flip facts or reverse facts. This relationship between these facts can be modelled using an array.

For example: Show that 3 x 4 = 4 x 3



The use a 10 x 10 multiplication grid may assist students to keep track of what facts they are able to confidently recall. To assist students with strategies for less familiar facts and to access a multiplication grid, check out our AMSI Schools Multiplication Strategies:
https://calculate.org.au/2020/02/19/multiplication-strategies/

Area Model

The area model uses students' knowledge of place value and ability to partition numbers to help them solve multi-digit multiplication problems.

For example: Solve 34 x 56

	50	6	
30	1500	150	1650
4	200	24	+ 224
			1874

∴ 34 x 56 = 1874

Khan Academy has a good video demonstrating how to use the area model to solve problems and also includes some practise questions. https://www.khanacademy.org/math/4th-engage-ny/engage-4th-module-3/4th-module-3-topic-c/v/area-model-for-multiplication

James Tanton, an Australian educator working in the US, has an informative video showing the relationship between the Area Model and the more traditional vertical algorithm.
https://www.youtube.com/watch?v=Sfi4QUlQ4co

Questions

- What facts do you know? What facts are you less confident with?
- What facts do you feel you still need to practice?
- What about turn around facts? How can we show the relationship between turn around facts?
- How can we partition numbers? e.g. 25 = 20 + 5
- How can we use partitioning to help us solve multi-digit multiplication problems?
- What is the relationship between the area model and the traditional vertical algorithm?

Games

The following games may help students to practise their multiplication facts:

- MULTO (Multiplication Bingo): https://calculate.org.au/2020/04/20/multo-multiplication-bingo/
- Multiplication Toss (Area Dice Game): https://calculate.org.au/2020/04/20/multiplication-toss-area-dice-game/

Additional Resources

Toy Theater has several engaging games related to multiplication.
https://toytheater.com/category/math-games/multiplication/

Listen to our AMSI Schools Multiplication Matters MathsTalk podcasts**:** https://calculate.org.au/mathstalk-podcast/

FURTHER INFORMATION

Australian Mathematical Sciences Institute. (2011). *The improving mathematics education in schools (TIMES) project: Multiplication of whole numbers.* Retrieved from http://amsi.org.au/teacher_modules/multiplication_of_whole_numbers.html

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NSW Government Education Standards Authority. (2018). *Mathematics K-10: Rationale.* Retrieved from https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/mathematics/mathematics-k-10/rationale