



Modernizing, Motivating, and Mastering Mental Mathematics

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Minnesota Academic Standards

Multiplication / Division

Gr	Strand	Standard	No.	Benchmark
3	Number & Operation	Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world and mathematical problems using arithmetic.	3.1.2.3	Represent multiplication facts by using a variety of approaches, such as repeated addition, equal-sized groups, <u>arrays</u> , area models, equal jumps on a number line and skip counting. Represent division facts by using a variety of approaches, such as repeated subtraction, equal sharing and forming equal groups. <u>Recognize the relationship between multiplication and division.</u>
3	Number & Operation	Add and subtract multi-digit whole numbers; represent multiplication and division in various ways; solve real-world and mathematical problems using arithmetic.	3.1.2.5	Use <u>strategies</u> and <u>algorithms</u> based on knowledge of place value, equality and properties of addition and multiplication to multiply a two- or three-digit number by a one-digit number. <u>Strategies may include mental strategies, partial products, the standard algorithm, and the commutative, associative, and distributive properties.</u> For example: $9 \cdot 26 = 9 \cdot (20 + 6) = 9 \cdot 20 + 9 \cdot 6 = 180 + 54 = 234$
4	Number & Operation	Demonstrate mastery of multiplication and division basic facts; multiply multi-digit numbers; solve real-world and mathematical problems using arithmetic.	4.1.1.1	Demonstrate <u>fluency</u> with multiplication and division facts.
4	Number & Operation	Demonstrate mastery of multiplication and division basic facts; multiply multi-digit numbers; solve real-world and mathematical problems using arithmetic.	4.1.1.3	Multiply multi-digit numbers, using <u>efficient</u> and <u>generalizable procedures</u> , based on knowledge of place value, including standard algorithms.
4	Number & Operation	Demonstrate mastery of multiplication and division basic facts; multiply multi-digit numbers; solve real-world and mathematical problems using arithmetic.	4.1.1.6	Use <u>strategies</u> and <u>algorithms</u> based on knowledge of place value, equality and properties of operations to divide multi-digit whole numbers by one- or two-digit numbers. <u>Strategies may include mental strategies, partial quotients,</u> the commutative, associative, and distributive properties and repeated subtraction. For example: A group of 324 students is going to a museum in 6 buses. If each bus has the same number of students, how many students will be on each bus?
5	Number & Operation	Divide multi-digit numbers; solve real-world and mathematical problems using arithmetic.	5.1.1.1	Divide multi-digit numbers, <u>using efficient and generalizable procedures</u> , based on knowledge of place value, including standard algorithms. Recognize that quotients can be represented in a variety of ways, including a whole number with a remainder, a fraction or mixed number, or a decimal.
6	Number & Operation	Multiply and divide decimals, fractions and mixed numbers; solve real-world and mathematical problems using arithmetic with positive rational numbers.	6.1.3.1	Multiply and divide decimals and fractions, <u>using efficient and generalizable procedures</u> , including standard algorithms.

NUMBER FACT STRATEGIES

ADDITION

- Count-on 1, 2 and 0
- Double and near doubles
- Make ten

SUBTRACTION

- Think addition

MULTIPLICATION

- Use tens (5s)
- Make generalizations (1s and 0s)
- Use doubles (2s, 4s and 8s)
- Build up/down (9s and 6s)

DIVISION

- Think multiplication

TEACHING SEQUENCE

- INTRODUCE (see page 3)
- REINFORCE (see page 3)
- PRACTICE (see page 5)
- EXTEND (see page 5)

The Introduce Stage

Introduce
the
strategy

This stage involves the use of concrete materials and pictorial representations to model the strategy.

At this first stage, ORIGO resources also include **contextual situations** to provide meaning.



The Reinforce Stage

Introduce
the
strategy



Reinforce
the
strategy

This stage provides the opportunity for the students to assimilate and internalize the strategy.

It is an additional link using pictorial models between the introductory work and the symbolic.



REINFORCE: Five and Tens Facts

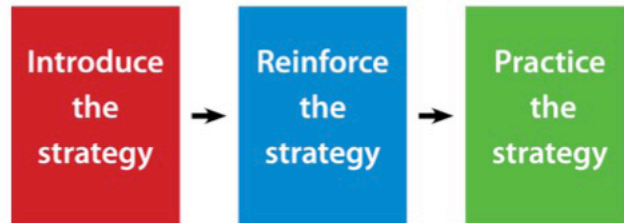
TENS OR FIVES

$2 \times 10 = \underline{\quad}$ $2 \times 5 = \underline{\quad}$	$4 \times 10 = \underline{\quad}$ $4 \times 5 = \underline{\quad}$	$7 \times 10 = \underline{\quad}$ $7 \times 5 = \underline{\quad}$	$3 \times 10 = \underline{\quad}$ $3 \times 5 = \underline{\quad}$	$2 \times 10 = \underline{\quad}$ $2 \times 5 = \underline{\quad}$
$6 \times 10 = \underline{\quad}$ $6 \times 5 = \underline{\quad}$	$2 \times 10 = \underline{\quad}$ $2 \times 5 = \underline{\quad}$	$8 \times 10 = \underline{\quad}$ $8 \times 5 = \underline{\quad}$	$5 \times 10 = \underline{\quad}$ $5 \times 5 = \underline{\quad}$	$1 \times 10 = \underline{\quad}$ $1 \times 5 = \underline{\quad}$
$9 \times 10 = \underline{\quad}$ $9 \times 5 = \underline{\quad}$	$8 \times 10 = \underline{\quad}$ $8 \times 5 = \underline{\quad}$	$3 \times 10 = \underline{\quad}$ $3 \times 5 = \underline{\quad}$	$7 \times 10 = \underline{\quad}$ $7 \times 5 = \underline{\quad}$	$5 \times 10 = \underline{\quad}$ $5 \times 5 = \underline{\quad}$
$3 \times 10 = \underline{\quad}$ $3 \times 5 = \underline{\quad}$	$7 \times 10 = \underline{\quad}$ $7 \times 5 = \underline{\quad}$	$6 \times 10 = \underline{\quad}$ $6 \times 5 = \underline{\quad}$	$2 \times 10 = \underline{\quad}$ $2 \times 5 = \underline{\quad}$	$9 \times 10 = \underline{\quad}$ $9 \times 5 = \underline{\quad}$
$8 \times 10 = \underline{\quad}$ $8 \times 5 = \underline{\quad}$	$1 \times 10 = \underline{\quad}$ $1 \times 5 = \underline{\quad}$	$9 \times 10 = \underline{\quad}$ $9 \times 5 = \underline{\quad}$	$4 \times 10 = \underline{\quad}$ $4 \times 5 = \underline{\quad}$	$7 \times 10 = \underline{\quad}$ $7 \times 5 = \underline{\quad}$

Cube A: 6, 5, 4, 3, 2, 1

Cube B: 9, 9, 8, 8, 7, 7

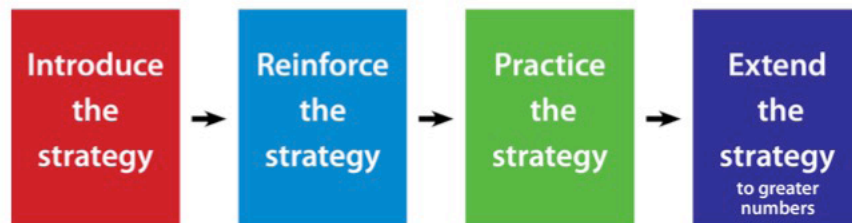
The Practice Stage



This stage aims to develop accuracy and 'speed' of recall.

In this stage, a range of different types of written and oral activities is used.

The Extend Stage



This stage moves the strategy to examples beyond the number fact range, including computation with decimals.

PRACTICE: Five and Tens Facts

Times Tussle

20	50	25	50	10	30
70	30	10	90	45	80
35	40	25	40	15	45
80	15	50	100	90	35
45	25	20	40	50	100
45	25	30	20	30	15
70	60	35	60	20	40

Nice and Easy

30×3	50×3	70×3	90×3
30×4	50×4	70×4	90×4
30×6	50×6	70×6	90×6
30×7	50×7	70×7	90×7
30×8	50×8	70×8	90×8
30×9	50×9	70×9	90×9

Cube A: 15, 15, 25, 35, 45, 45

Cube B: 6, 8, 12, 14, 16, 18

Nice and Easy Too!

90	150	210	270
120	200	280	360
180	300	420	540
210	350	490	630
240	400	560	720
270	450	630	810

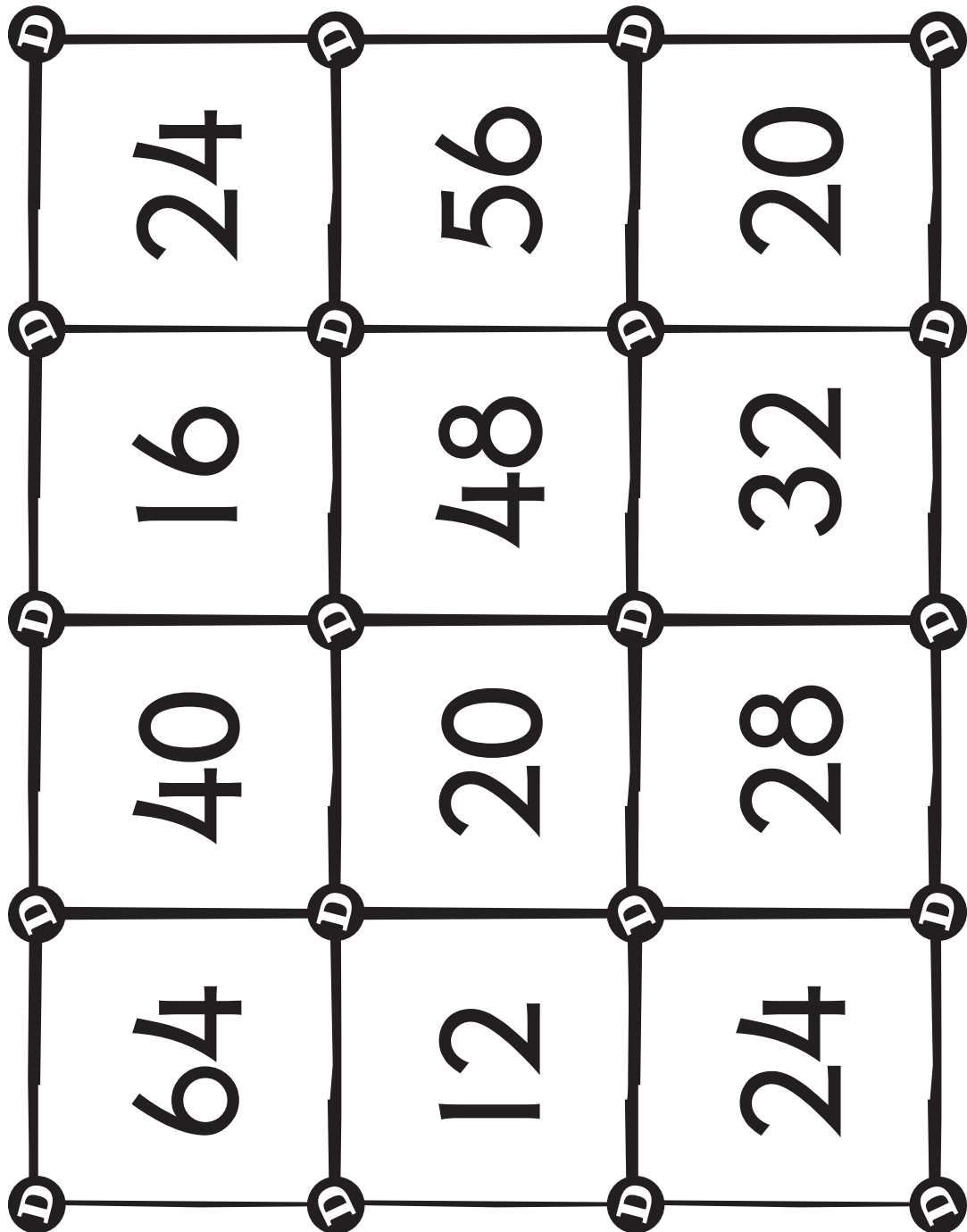
MULTIPLICATION CHART

×	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9
2	0	2	4	6	8	10	12	14	16	18
3	0	3	6	9	12	15	18	21	24	27
4	0	4	8	12	16	20	24	28	32	36
5	0	5	10	15	20	25	30	35	40	45
6	0	6	12	18	24	30	36	42	48	54
7	0	7	14	21	28	35	42	49	56	63
8	0	8	16	24	32	40	48	56	64	72
9	0	9	18	27	36	45	54	63	72	81

- Use tens (5s)
- Make generalizations (0s, 1s)
- Use doubles (2s, 4s, 8s)
- Build up/down (9s, 6s)

REINFORCE: Fours and Eights Facts

Do the D s



Cube A: 3, 4, 5, 6, 7, 8

Cube B:

Burnett, J. & Tickle, B. (2007). *Fundamentals: Purple Level*, page 54. ORIGO Education.

CONNECT MULTIPLICATION AND DIVISION

Take or Tally

Player 1




Player 2

$24 \div \underline{\quad} = \underline{\quad}$	$24 \div \underline{\quad} = \underline{\quad}$
$20 \div \underline{\quad} = \underline{\quad}$	$20 \div \underline{\quad} = \underline{\quad}$
$18 \div \underline{\quad} = \underline{\quad}$	$18 \div \underline{\quad} = \underline{\quad}$
$16 \div \underline{\quad} = \underline{\quad}$	$16 \div \underline{\quad} = \underline{\quad}$
$15 \div \underline{\quad} = \underline{\quad}$	$15 \div \underline{\quad} = \underline{\quad}$
$12 \div \underline{\quad} = \underline{\quad}$	$12 \div \underline{\quad} = \underline{\quad}$
Tally	Tally

Cube A: 2, 3, 4, 2, 3, 4

Cube B: 5, 6, 8, 5, 6, 8

Remainder Race

15 Start	16	17	20	23	25	27
						30
48	46	45	40	38	36	31
50						
52	53	55	56	60	62	63
						65
80 Finish	78	75	73	72	70	68

Rules:

- Use a cube with the numbers 2, 3, 4, 5, 6, and 9.
- Each player places a counter on 15.
- Take turns to roll the cube and **divide** the number in the space by the number on the cube.
- Move the number of spaces equal to the **remainder**.
- Repeat the steps when it is your turn.

