+Multi-Grades

Video: Number Strings to Encourage Multiplication Strategies - Part 1

Video: Number Strings to Encourage Multiplication Strategies - Part 2

+Grade Two

Mental Math

7. Illustrate, concretely and pictorially, the meaning of place value for numerals to 100. [C, CN, R, V]

Resources

James Tanton's Exploding Dots - Intro to Base Ten System Videos, etc.
Place Value Game
Place the Penguin Online Game

+Grade Three

Mental Math

5. Illustrate, concretely and pictorially, the meaning of **place value for numerals to 1000.** [C, CN, R, V]

*Please note that children need to focus on the number **value, not just placement of the digits**. Children should be able to identify tens within "hundreds" Eg. 321 - contains **32 tens** not just "2" tens (student misconception), as there are also tens in hundreds. Patterning activities with digit cards that focus on adding and subtracting tens, and/or hundreds and how this affects the **value** of the number as it changes are good ways to check.*

Resources

James Tanton's Exploding Dots - Intro to Base Ten System Videos, etc.
Place Value Game
Place the Penguin Online Game
Mathwire.com - Various Place Value activities for Grades 3-6

11. Demonstrate an understanding of multiplication to 5 × 5 by:

- representing and explaining multiplication using equal grouping and arrays
- creating and solving problems in context that involve multiplication
- modeling multiplication using concrete and visual representations, and recording the process symbolically
- relating multiplication to repeated addition relating multiplication to division. [C, CN, PS, R]

Clarification: Understand and recall multiplication facts to 5 × 5.

Resources

Multiplication/Division Questions: This site allows you to choose a variety of questions depending on students' level to practice. It allows students to use mental math strategies and non-traditional methods to solve questions. Any question type circled in orange is free. Any question type circled in red is part of the paid version.

Video: Splitting Multiplication and Distributive Property of Multiplication
Smart Notebook Lesson and Game - Intro to Multiplication Using Penguins
Repeated Subtraction Game - Using Number Lines

12. Demonstrate an understanding of division (limited to division related to multiplication facts up to 5 × 5) by:

- representing and explaining division using equal sharing and equal grouping
- creating and solving problems in context that involve equal sharing and equal grouping
- modeling equal sharing and equal grouping using concrete and visual representations, and recording the process symbolically
- relating division to repeated subtraction
- relating division to multiplication. [C, CN, PS, R]

Resources

Multiplication/Division Questions: This site allows you to choose a variety of questions depending on students' level to practice. It allows students to use mental math strategies and non-traditional methods to solve questions. Any question type circled in orange is free. Any question type circled in red is part of the paid version.

Problem Solving Division Question: Selling Cupcakes

+Grade Four

Mental Math

1. Represent and describe whole numbers to 10 000, pictorially and symbolically. [C, CN, R, V]

Resources

*Please note that children need to focus on the number place and "**value**", **not just placement of the digits**. Children should be able to identify tens within "hundreds" Eg. 321 - contains **32 tens** not just "2" tens (student misconception because this denotes place of the digit not "Value"),* *(continued on next page)*

as there are also tens in hundreds, thousands, ten thousands, etc. Patterning activities with digit cards that focus on adding and subtracting tens, hundreds (or higher) enable students to see how this affects the ***value*** *of the number as it changes.*

James Tanton's Exploding Dots - Intro to Base Ten System Videos, etc.

Mathwire.com - Various Place Value activities for Grades 3-6

4. Apply the properties of 0 and 1 for multiplication and the property of 1 for division. [C, CN, R]

Resources

Multiplying by Zero - Math Is Fun Good examples of what occurs when 0 is a multiplicand.

Classroom Activities for Teaching Multiplying by 0 or 1

Bean Bags - Divide students into small groups and provide each group with clear plastic baggies and small counters, such as blocks or dried beans. Then write multiplication sentences with 0 or 1 on the board, such as 3 x 1 = __ or 10 x 1 = __. Have students use the baggies and beans to solve the number sentences. Then have one group member put a different number of beans into the baggies and challenge the other group members to come up with the number sentence.

Describe and apply mental mathematics strategies, such as:

- skip counting from a known fact
- using doubling or halving
- using doubling or halving and adding or subtracting one more group
- using patterns in the 9s facts
- using repeated doubling to determine basic multiplication facts to 9 × 9 and related division facts. [C, CN, ME, R]

Clarification: Understand and apply strategies for multiplication and related division facts to 9×9. Recall multiplication and related division facts to 7 × 7.

National Library of Virtual Manipulatives Choose Number (3-5) and select from the following options:

- Number Line Arithmetic
- Number Line Bars
- Number Line Bounce
- Number Patterns
- Rectangle Division
- Rectangle Multiplication

Introducing the Doubling Strategy

Multiplication/Division Questions: This site allows you to choose a variety of questions depending on students' level to practice. It allows students to use mental math strategies and non-traditional methods to solve questions. Any question type circled in orange is free. Any question type circled in red is part of the paid version.

Problem Solving Multiplication Question: Eggs

Problem Solving Division Question: Selling Cupcakes

NCTM Resource: must be a member and logged in to access resources
Egg Carton Designs: Constructing Arrays to Begin a Study of Multiplication
http://www.nctm.org/classroom-resources/lessons/Egg-Carton-Designs_-Constructing-Arrays-to-Begin-a-Study-of-Multiplication/

Video: Splitting Multiplication and Distributive Property of Multiplication

Repeated Subtraction Game - Includes Number Line

Application of Understanding

6. Demonstrate an understanding of multiplication (2- or 3-digit by 1-digit) to solve problems by:
- using personal strategies for multiplication with and without concrete materials
- using arrays to represent multiplication
- connecting concrete representations to symbolic representations
- estimating products
- applying the distributive property. [C, CN, ME, PS, R, V]

Resources

Multiplication/Division Questions: This site allows you to choose a variety of questions depending on students' level to practice. It allows students to use mental math strategies and non-traditional methods to solve questions. Any question type circled in orange is free. Any question type circled in red is part of the paid version.

Video Series - Introducing 2 Digit Multiplication
Although this series references 2 digit by 2 digit numbers, the process is exactly the same for 2 digit x 1 digit numbers.
- Part 1: Reviewing Base Ten Blocks
- Part 2a: Question 1 - Building and Solving the Question Concretely
- Part 2b: Question 2 - Building and Solving the Question Concrete
- Part 3: Moving to the Abstract

NCTM Resource: must be a member and logged in to access resources
Multiply and conquer: http://www.nctm.org/classroom-resources/lessons/Multiply-and-Conquer/

Canoe Penguin Game - You are provided with a question and 4 answers. Have students use strategies to solve without solving. For example: 34 x 5 means I should only look at answers that end in 0. Students play against the computer or other students in the world.

7. Demonstrate an understanding of division (1-digit divisor and up to 2-digit dividend) to solve problems by:
- using personal strategies for dividing with and without concrete materials
- estimating quotients
- relating division to multiplication. [C, CN, ME, PS, R, V]

Resources

Multiplication/Division Questions: This site allows you to choose a variety of questions depending on students' level to practice. It allows students to use mental math strategies and non-traditional methods to solve questions. Any question type circled in orange is free. Any question type circled in red is part of the paid version.

Smart Notebook Lesson: The Candy Conundrum - Introducing 2 digit by 1 digit Division with Base Ten Blocks

+Grade Five

Mental Math

1. Represent and describe whole numbers to 1 000 000. [C, CN, V, T] Please note that children need to focus on the number place and "value", not just placement of the digits. Children should be able to identify tens within "hundreds" Eg. 321 - contains 32 tens not just "2" tens (student misconception because this denotes place of the digit not "Value"), as there are also tens in hundreds, thousands, ten thousands, etc. Patterning activities with digit cards that focus on adding and subtracting tens, hundreds (or higher) enable students to see how this affects the value of the number as it changes.

Resources

National Library of Virtual Manipulatives Choose Number (3-5) and select from the following options:

- Place Value Number Line

Apply mental mathematics strategies and number properties, such as:

- skip counting from a known fact
- using doubling or halving
- using patterns in the 9's facts
- using repeated doubling or halving in order to understand and recall basic multiplication facts (multiplication tables) to 81 and related division facts. [C, CN, ME, R, V]

Clarification: Understand, recall and apply multiplication and related division facts to 9 × 9.

Introducing the Doubling Strategy

Video: Splitting Multiplication and Distributive Property of Multiplication

4. Apply mental mathematics strategies for multiplication, such as:

- annexing then adding zero
- halving and doubling
- using the distributive property. [C, CN, ME, R, V]

Resources

Introducing the Doubling Strategy

Video: Splitting Multiplication and Distributive Property of Multiplication

Multiplication/Division Questions: This site allows you to choose a variety of questions depending on students' level to practice. It allows students to use mental math strategies and non-traditional methods to solve questions. Any question type circled in orange is free. Any question type circled in red is part of the paid version.

Application of Understanding

5. Demonstrate, with and without concrete materials, an understanding of multiplication (2-digit by 2-digit) to solve problems. [C, CN, PS, V]

Resources

Multiplication/Division Questions: This site allows you to choose a variety of questions depending on students' level to practice. It allows students to use mental math strategies and non-traditional methods to solve questions. Any question type circled in orange is free. Any question type circled in red is part of the paid version.

Video Series - Introducing 2 Digit Multiplication

- Part 1: Reviewing Base Ten Blocks
- Part 2a: Question 1 - Building and Solving the Question Concretely
- Part 2b: Question 2 - Building and Solving the Question Concrete
- Part 3: Moving to the Abstract

NCTM Resource: must be a member and logged in to access resources
Times Square: Reinforcing Multiplication Skills Using Factors and Strategy
http://www.nctm.org/classroom-resources/lessons/Times-Square_-Reinforcing-Multiplication-Skills-Using-Factors-and-Strategy/

Canoe Penguin Game - caveat: This is 2 digit by 1 digit. You are provided with a question and 4 answers. However, have students use strategies to solve without solving. For example: 34 x 5 means I should only look at answers that end in 0. Students play against the computer or other students in the world.

National Library of Virtual Manipulatives Choose ***Number (3-5)*** and select from the following options:

- Rectangle Division
- Rectangle Multiplication

6. Demonstrate, with and without concrete materials, an understanding of division (3-digit by 1-digit), and interpret remainders to solve problems. [C, CN, ME, PS, R, V]

Resources

Multiplication/Division Questions: This site allows you to choose a variety of questions depending on students' level to practice. It allows students to use mental math strategies and non-traditional methods to solve questions. Any question type circled in orange is free. Any question type circled in red is part of the paid version.

SmartBoard Lesson: Using Base Ten Blocks to Introduce 3 digit by 1 digit Division

NCTM Resource: must be a member and logged in to access resources
A Squadron of Bugs: Introducing Division with Remainders with a Book
http://www.nctm.org/classroom-resources/lessons/A-Squadron-of-Bugs_-Introducing-Division-with-Remainders-with-a-Book/

NCTM Resource: must be a member and logged in to access resources
How Many Each? How Many Left? : Conceptualizing Division with Large Numbers
http://www.nctm.org/classroom-resources/lessons/How-Many-Each_-How-Many-Left_Conceptualizing-Division-with-Large-Numbers/

National Library of Virtual Manipulatives Choose ***Number (3-5)*** and select from the following options:

- Rectangle Division
- Rectangle Multiplication

Patterns & Relations

3. Solve problems involving single-variable, one-step equations with whole number coefficients and whole number solutions. [C, CN, PS, R]

Resources

Bears in a Bag Activity - Developing Algebraic Understanding

Bears in a Bag Supporting Videos:

- Video 1: Understanding Balance
- Video 2: Working with 1 Bag
- Video 3: Working with 2 Bags
- Video 4: Working with 2 Bags + some
- Video 5: Writing it Out
- Video 6: Solving from the question

+Grade Six

Mental Math

1. Demonstrate an understanding of place value, including numbers that are:
    - greater than one million
    - less than one thousandth

[C, CN, R, T]

*Please note that children need to focus on the number place and "**value**", **not just placement of the digits**. Children should be able to identify tens within "hundreds" Eg. 321 - contains **32 tens** not just "2" tens (student misconception because this denotes place of the digit not "Value"), as there are also tens in hundreds, thousands, ten thousands, etc.*

*Patterning activities with digit cards that focus on adding and subtracting tens, hundreds (or higher) enable students to see how this affects the **value** of the number as it changes. This type of patterning can easily be adapted to working with **decimals**.*

Resources

National Library of Virtual Manipulatives Choose ***Number (3-5)*** and select from the following options:

- Place Value Number Line
-

K-5 Math Teaching Resources Select from the following options (exemplar materials):

- Comparing Digits
- Representing Decimals
- Place Value Chart to Thousandths
- Hunt for Decimals

3. Demonstrate an understanding of factors and multiples by:

- determining multiples and factors of numbers less than 100
- identifying prime and composite numbers
- solving problems using multiples and factors. [CN, PS, R, V]

Resources

Introducing Prime and Composite Numbers - Simple activity

Introducing Factors - Smartboard Lesson

NCTM Resource: must be a member and logged in to access resources
Chocolate FACTORy: Finding Factors of Numbers 1 through 36
http://www.nctm.org/classroom-resources/lessons/Chocolate-FACTORy_-Finding-Factors-of-Numbers-1-Through-36/

NCTM Resource: must be a member and logged in to access resources
Factor Trail Game: http://www.nctm.org/classroom-resources/lessons/Factor-Trail-Game/

Application of Understanding

2. Solve problems involving whole numbers and decimal numbers. [ME, PS, T]

Resources

K-5 Math Teaching Resources Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

Select from the following options (exemplar materials):

- Interpret Remainder Word Problems
- Multistep Word Problems
- Comparison Problems

4. Relate improper fractions to mixed numbers and mixed numbers to improper fractions. [CN, ME, R, V]
Note: This outcome also appears in the Equality section.

Resources
Using Pattern Blocks to Work with Fractions - teacher instructions start at introducing the blocks to converting between mixed and improper

Demonstrate an understanding of ratio, concretely, pictorially and symbolically. [C, CN, PS, R, V]

Ratio Questions: This site allows you to choose a variety of questions depending on students' level to practice. It allows students to use mental math strategies and non-traditional methods to solve questions. Any question type circled in orange is free. Any question type circled in red is part of the paid version.

6. Demonstrate an understanding of percent (limited to whole numbers), concretely, pictorially and symbolically. [C, CN, PS, R]
Note: This outcome also appears in the Equality section.

Resources
Math Gizmo - Percent and Proportions - LearnAlberta.ca Need to sign in to LearnAlberta for free access to Gizmos (Will open without sign in only when inside any school in Alberta).

8. Demonstrate an understanding of multiplication and division of decimals (1-digit whole number multipliers and 1-digit natural number divisors). [C, CN, ME, PS, R, V]

Resources
Video Series
Although this series references 2 digit by 2 digit numbers, the process is exactly the same for 2 digit x 1 digit numbers.

- Video 1: Renaming Base Ten Blocks for Decimal Work
- Video 2: Refresher on multiplication arrays
- Video 3: Multiplying Decimals using Base Ten Blocks
- Video 4: Multiplying Decimals Abstractly

Intro to Multiplication of Decimals using Base Ten Blocks Smart Notebook Lesson

NCTM Resource: must be a member and logged in to access resources
Getting the (Decimal) Point with Blocks: Multiplying Two Decimals Using Base Ten Blocks
http://www.nctm.org/classroom-resources/lessons/Getting-the-%28Decimal%29-Point-with-Blocks_-Multiplying-Two-Decimals-Using-Base-Ten-Blocks/