CCGPS Frameworks Student Edition

Mathematics

Fourth Grade Unit One
Whole Numbers, Place Value, and Rounding in Computation

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"Making Education Work for All Georgians"

Unit 1
WHOLE NUMBERS, PLACE VALUE, AND ROUNDING

TABLE OF CONTENTS

Culminating Task

OVERVIEW

In this unit students will:

- read numbers correctly through the millions
- write numbers correctly through millions in standard form
- write numbers correctly through millions in expanded form
- identify the place value name for multi-digit whole numbers
- identify the place value locations for multi-digit whole numbers
- round multi-digit whole numbers to any place
- solve multi-step problems using the four operations

Although the units in this instructional framework emphasize key standards and big ideas at specific times of the year, routine topics such as estimation, mental computation, and basic computation facts should be addressed on an ongoing basis. The first unit should establish these routines, allowing students to gradually enhance their understanding of the concept of number and to develop computational proficiency.
To assure that this unit is taught with the appropriate emphasis, depth, and rigor, it is important that the tasks listed under "Evidence of Learning" be reviewed early in the planning process. A variety of resources should be utilized to supplement the tasks in this unit. The tasks in these units illustrate the types of learning activities that should be utilized from a variety of sources.

CRITICAL AREAS OF FOCUS

In Grade 4, instructional time should focus on three critical areas:
1. Developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends.

2. Developing an understanding of fractions equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers.

3. Understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, particular angle measures, and symmetry.

STANDARDS FOR MATHEMATICAL CONTENT

Use the four operations with whole numbers to solve problems.
MCC4.OA.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

MCC4.OA.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.

MCC4.OA.3 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.

Gain familiarity with factors and multiples.

MCC4.OA.4 Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

Generate and analyze patterns.

MCC4.OA.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself

Generalize place value understanding for multi-digit whole numbers.

MCC4.NBT.1 Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.*

MCC4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

MCC4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.

Use place value understanding and properties of operations to perform multi-digit arithmetic.

MCC4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.

MCC4.NBT.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

MCC4.NBT.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

STANDARDS FOR MATHEMATICAL PRACTICE

Mathematical Practices are listed with each grade's mathematical content standards to reflect the need to connect the mathematical practices to mathematical content in instruction.
The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education.
Students are expected to:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

*****Mathematical Practices 1 and 6 should be evident in EVERY lesson. *****

ENDURING UNDERSTANDINGS

- The value of a number is determined by the place of its digits.
- Whole numbers are read from left to right using the name of the period.
- Numbers are written using commas to separate periods.
- Using rounding is an appropriate estimation strategy for solving problems and estimating.
- Rounded numbers are approximate and not exact.
- A number can be written using its name, standard, or expanded form.
- Multiplication may be used to find the total number of objects when objects are arranged in equal groups.
- One of the factors in multiplication indicates the number of objects in a group and the other factor indicates the number of groups.
- Products may be calculated using invented strategies.
- Unfamiliar multiplication problems may be solved by using known multiplication facts and properties of multiplication and division. For example, 8 x 7 = (8 x 2) + (8 x 5) and 18 x 7 = (10 x 7) + (8 x 7).
- Multiplication may be represented by rectangular arrays/area models.
- There are two common situations where division may be used: fair sharing (given the total amount and the number of equal groups, determine how many/much in each group) and measurement (given the total amount and the amount in a group, determine how many groups of the same size can be created).
- Some division situations will produce a remainder, but the remainder will always be less than the divisor. If the remainder is greater than the divisor, that means at least one more can be given to each group (fair sharing) or at least one more group of the given size (the dividend) may be created.
- How the remainder is explained depends on the problem situation.

- The dividend, divisor, quotient, and remainder are related in the following manner: dividend = divisor x quotient + remainder.
- The quotient remains unchanged when both the dividend and the divisor are multiplied or divided by the same number.
- The properties of multiplication and division help us solve computation problems easily and provide reasoning for choices we make in problem solving.

ESSENTIAL QUESTIONS

- How are large numbers estimated?
- How are multiplication and division related to each other?
- How are remainders and divisors related?
- How can a remainder affect the answer in a division problem?
- How can I combine hundreds, tens and ones in two or more numbers efficiently?
- How can I effectively explain my mathematical thinking and reasoning to others?
- How can I ensure my answer is reasonable?
- How can I mentally compute a division problem?
- How can I round to help me find a reasonable answer to a problem?
- How can I use the situation in a story problem to determine the best operation to use?
- How can rounding help me compute numbers?
- How can we compare large numbers?
- How can we describe a pattern?
- How can we determine the relationships between numbers?
- How can we find evidence to support our conclusions?
- How can we organize our work when solving a multi-step word problem?
- How can we tell which number among many large numbers is the largest or smallest
- How can we use clues and reasoning to find an unknown number?
- How can we use patterns to solve problems?
- How do digit values change as they are moved around in large numbers?
- How do I determine the factors of a number?
- How do I identify composite numbers?
- How do I identify prime numbers?
- How do multiplication, division, and estimation help us solve real world problems?
- How do people use data to make decisions in their lives?
- How does estimation keep us from having to count large numbers individually?
- How does numerical data inform us when choosing a place to live?
- How does the value of digits in a number help me compare two numbers?
- How does understanding place value help me explain my method for rounding a number to any place?
- How is skip counting related to identifying multiples?
- How will diagrams help us determine and show products?
- What are compatible numbers and how do they aid in dividing whole numbers?
- What are factors?
- What are multiples?
- What are some simple methods for solving multiplication and division problems?

- What determines the value of a digit?
- What determines the value of a number?
- What effect does a remainder have on my rounded answer?
- What happens in division when there are zeroes in both the divisor and the dividend?
- What information is needed in order to round whole numbers to any place?
- What is a sensible answer to a real problem?
- What is the difference between a prime and a composite number?
- What is the meaning of a remainder in a division problem?
- What kinds of things are large numbers used to measure?
- What patterns do I notice when I am multiplying whole numbers that can help me multiply more efficiently?
- What patterns of multiplication and division can assist us in problem solving?
- What real life situations require the use of multiplication?
- What strategies can I use to help me make sense of a written algorithm?
- What strategies help me add and subtract multi-digit numbers?
- Why is it important for me to be able to compare numbers?

CONCEPTS/SKILLS TO MAINTAIN

It is expected that students will have prior knowledge/experience related to the concepts and skills identified below. It may be necessary to pre-assess in order to determine if time needs to be spent on conceptual activities that help students develop a deeper understanding of these ideas.

- Ordering large numbers with a conceptual understanding of multiplication
- Understanding when and how multiplication may be used to represent phenomena
- Utilize the properties and patterns of multiplication (including the commutative, associative, and identity properties)
- With strategies for multiplication using it properties. For example, 3 x 6 is 6 doubled and one more set of 6; 7 x 4 = (2 x 4) + (5 x 4)
- Fluently multiply within 100
- Fluently divide within 100
- Fluently add and subtract within 1000 using strategies

SELECTED TERMS

The terms and symbols are often misunderstood. These concepts are not an inclusive list and should not be taught in isolation. However, due to evidence of frequent difficulty and misunderstanding associated with these concepts, instructors should pay particular attention to them and how their students are able to explain and apply them.

Teachers should present these concepts to students with models and real life examples. Students should understand the concepts involved and be able to recognize and/or demonstrate them with words, models, pictures, or numbers.

Definitions for these and other terms can be found on the Intermath website, a great resource for teachers. Because Intermath is geared towards middle and high school, grade 3-5 students should be directed to specific information and activities. http://intermath.coe.uga.edu/dictnary/homepg.asp
The terms below are for teacher reference only and are not to be memorized by the students.

- algorithm
- composite
- digits
- dividend
- divisor
- division (repeated subtraction)
- estimate
- expanded form
- factors
- multiplicand
- multiplier
- multiples
- numbers
- numerals
- partition division (fair-sharing)
- period
- place value
- prime
- product
- properties
- quotient
- remainder
- rounding

STRATEGIES FOR TEACHING AND LEARNING

- Students should be actively engaged by developing their own understanding.
- Mathematics should be represented in as many ways as possible by using graphs, tables, pictures, symbols, and words.
- Appropriate manipulatives and technology should be used to enhance student learning.
- Students should be given opportunities to revise their work based on teacher feedback, peer feedback, and metacognition which includes self-assessment and reflection.
- Students should write about the mathematical ideas and concepts they are learning.

EVIDENCE OF LEARNING

By the conclusion of this unit, students should be able to demonstrate the following competencies:

- Read multi-digit whole numbers.
- Write multi-digit-numbers.
- Recognize numbers in standard, expanded, and word form.
- Round multi-digit numbers to any place.
- Compare rounded multi-digit numbers and express their relationship using >, <, or =.
- Estimate sum and/or difference of numbers apply estimation to solve problems and determine when it is necessary or appropriate to apply estimation strategies.

- Estimate the products of a 2- or 3-digit number multiplied by a 1- or 2-digit number.
- Represent multiplication and division using a rectangular area model.
- Understand that multiplication may be used in problem contexts involving equal groups, rectangular arrays/area models, or rate.
- Multiply up to a 4-digit number by a 1- or 2-digit number using strategies.
- Solve division problems using strategies.
- Divide whole-numbers quotients and remainders with up to four-digit dividends and remainders with up to four-digit dividends and one-digit divisors.

TASKS

The following tasks represent the level of depth, rigor, and complexity expected of all fourth grade students. These tasks or tasks of similar depth and rigor should be used to demonstrate evidence of learning. It is important that all elements of a task be addressed throughout the learning process so that students understand what is expected of them. While some tasks are identified as a performance task, they also may be used for teaching and learning.

Scaffolding Task	**Constructing Task**	**Practice Task**	**Performance Tasks**
Tasks that build up to the constructing task.	Constructing understanding through deep/rich contextualized problem solving tasks	Games/activities	Summative assessment for the unit

Task Name	**Task Type/Grouping Strategy**	**Content Addressed**
Building 1,000	Constructing Task *Individual/ Partner Task*	Making and Naming Large Numbers
Relative Value of Places	Constructing Task *Partner/ Small Group Task*	Relative size of numbers
Number Scramble	Practice Task *Individual/Partner Task*	Making and Naming Large Numbers
Ticket Master	Practice Task *Individual/Partner Task*	Ordering Larger Numbers
Nice Numbers	Constructing Task *Partner/Small group Task*	Rounding, Four Operations
Estimation as a Check	Constructing Task *Individual/ Partner Task*	Rounding, Adding, Subtracting multi-digit numbers
Making Sense of the Algorithm	Constructing Task *Individual/Partner Task*	Fluently subtracting multi-digit numbers
Reality Checking	Constructing Task *Individual/ Partner Task*	Ordering, Adding, Subtracting and Rounding multi-digit numbers
At the Circus	Constructing Task *Individual/ Partner Task*	Using Partial Products to Multiply

School Store	Constructing Task *Individual/ Partner Task*	Using Properties of Multiplication to Multiply
Sensible Rounding	Constructing Task *Partner/Small Group Task*	Rounding
Compatible Numbers to Estimate	Constructing Task *Individual/Partner Task*	Using compatible numbers to divide
Brain Only	Scaffolding *Individual/Partner Task*	Patterns in Multiplication and Division
What is 2500 ÷ 300?	Constructing *Individual/Partner Task*	Dividing with zeros
My Son is Naughty	Constructing Task *Partner Task*	Finding Factors
Finding Multiples	Scaffolding Task *Individual Task*	Finding Multiples
Investigating Prime and Composite	Scaffolding Task *Partner Task*	Prime and Composite Numbers
Prime vs. Composite	Practice Task *Individual Task*	Prime and Composite Numbers
The Factor Game	Practice Task *Individual/Partner Task*	Ordering Decimals
Number Riddles	Constructing Task Individual/Partner Task	Factors and Multiples
Earth Day Project	Constructing Task *Individual/Partner Task*	Generating Rules
Culminating Task: It's in the Number	Performance Task *Individual Task*	Calculation and Estimation with Whole Numbers
Culminating Task: School Newspaper	Performance Task *Individual Task*	Multiplication, Division and Rounding

<u>Constructing Task:</u> Building 1,000

STANDARDS FOR MATHEMATICAL CONTENT

MCC4. NBT.1 Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right.

MCC4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
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BACKGROUND KNOWLEDGE

This task helps pre-assess students' previous knowledge and misconceptions about place value and number sense. The strategies they use to solve the problem demonstrate students' understanding about a number of concepts including place value, grouping, computation, number sense, patterns, and mathematical communication.

It is important that students understand that they are actually building the number 10,000. Have students brainstorm inexpensive and appropriate materials to build with. It is also a good idea to let parents know what you are doing and to ask them for donations. You will need to provide ample space for students to build and store their designs.

ESSENTIAL QUESTIONS

- How do digit values change as they are moved around in large numbers?
- What determines the value of a digit?
- How does estimation keep us from having to count large numbers individually?
- How are large numbers estimated?

MATERIALS

- Building materials such as straws, toothpicks, noodles, string, pennies, paper clips, etc.
- Tape measures, rulers, yardsticks
- Poster board, markers, overheads for presenting, tape, glue, etc.

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments

This activity will allow the teacher to identify students who already have an understanding of 1,000 and how well they understand place value and number sense. Their prior experience has usually been limited to 10's, 100's, and 1,000's. This activity helps students begin to make some connections about place value, as well as gives them a visual perspective and sense of the number 1,000. The students get very excited thinking about what they might use to "build" 1,000 and are quite creative in their selection of materials. If used at the end, teachers will be able to see how well students understand place value and number sense, and use the knowledge of varying levels of student understanding to inform the use of the remaining tasks.

Task Directions

Students will answer the following questions on the student recording form:

- What does 1,000 look like? How long is it? How tall is it? How big is it? How much space will it take up?
- To answer these questions, decide what type of material you would like to use to show 1,000. Next, make a prediction about the size you think your 1,000 will be.
- Next, using words and pictures, explain what you did to make your prediction.

Once students have answered these questions, they will use materials they've chosen to create their model of 1,000. Then they will answer the following questions, and prepare their presentation for their classmates.

- Did your model work to accurately show 1,000? Why or why not?
- What did you learn about 1,000 from this investigation?
- Did you notice any patterns or connections?
- What strategies did you use to create your model?
- When you are finished, plan a presentation of your investigation for the class.

FORMATIVE ASSESSMENT QUESTIONS

- How can you show the relationship between different place values?
- What do you know about 1,000 that you didn't know before?
- How can you show the different place values within 1,000?
- What makes 10 different from 100 and from 1000?

- What do you notice about how different materials work? Are some better than others at showing 1,000? Why or why not?
- Did you notice any patterns or connections?
- What strategies did you use to solve this?
- How can you effectively share what you've discovered?.

DIFFERENTIATION

Extension

- Have students to experiment with larger numbers such as 10,000; 100,000; 100,000,000, etc.

Intervention

- Students may need to begin with 100.

Student Recording Sheet

Name _____ Date _____

Building 1,000

What does 1,000 look like? How long is it? How tall is it? How big is it? How much space will it take up? Describe the model for 1,000 that you will create:

_____

_____

What type of material you would like to use to show 1,000? Make a prediction about the size of your 1,000 model._____

_____

_____

Next, using words and pictures, explain what you did to make a prediction about the size of your model.

_____

_____

_____

After you have created your model, answer the following questions:

Did your model work? Why or why not? What would you do differently next time?

_____

_____

_____

What did you learn from this investigation of 1,000? _____

_____

Did you notice any patterns or connections? _____

_____

_____

What strategies did you use to create 1,000?

_____

_____

_____

When you have completed this task, plan a presentation of your investigation for the class.

Constructing Task: Relative Value of Places

Adapted from Relative Value of Places, nzmaths, Adding, Subtraction and Place Value

STANDARDS FOR MATHEMATICAL CONTENT

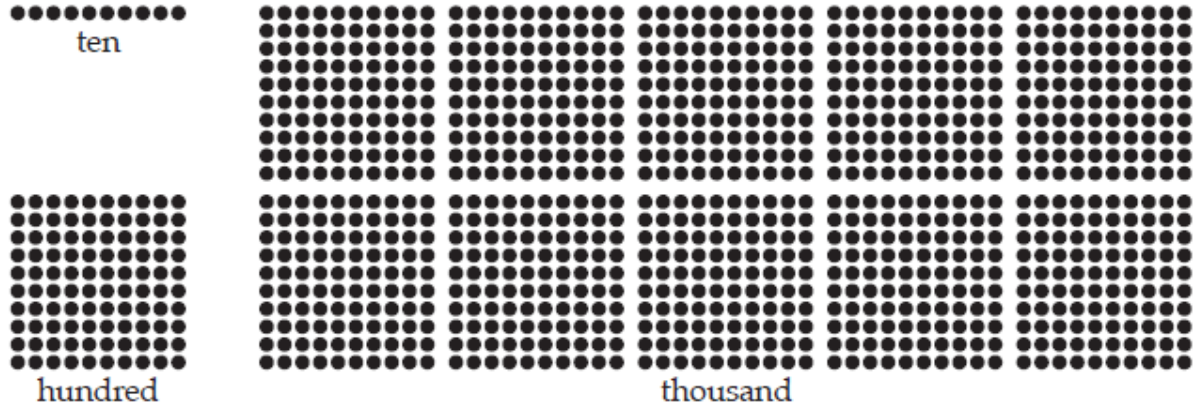
MCC4.NBT.1 Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.
MCC4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
MCC4.OA.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students unfamiliar with dotty arrays will need to become familiar with the representation of 1, 10, 100, 1 000, and so on as arrays of single dots. This will help them to recognize the relative value of the places.



ESSENTIAL QUESTIONS

- What conclusions can I make about the places within our base ten number system?

- What happens to a digit when multiplied and divided by 10?
- What effect does the location of a digit have on the value of the digit?

MATERIALS

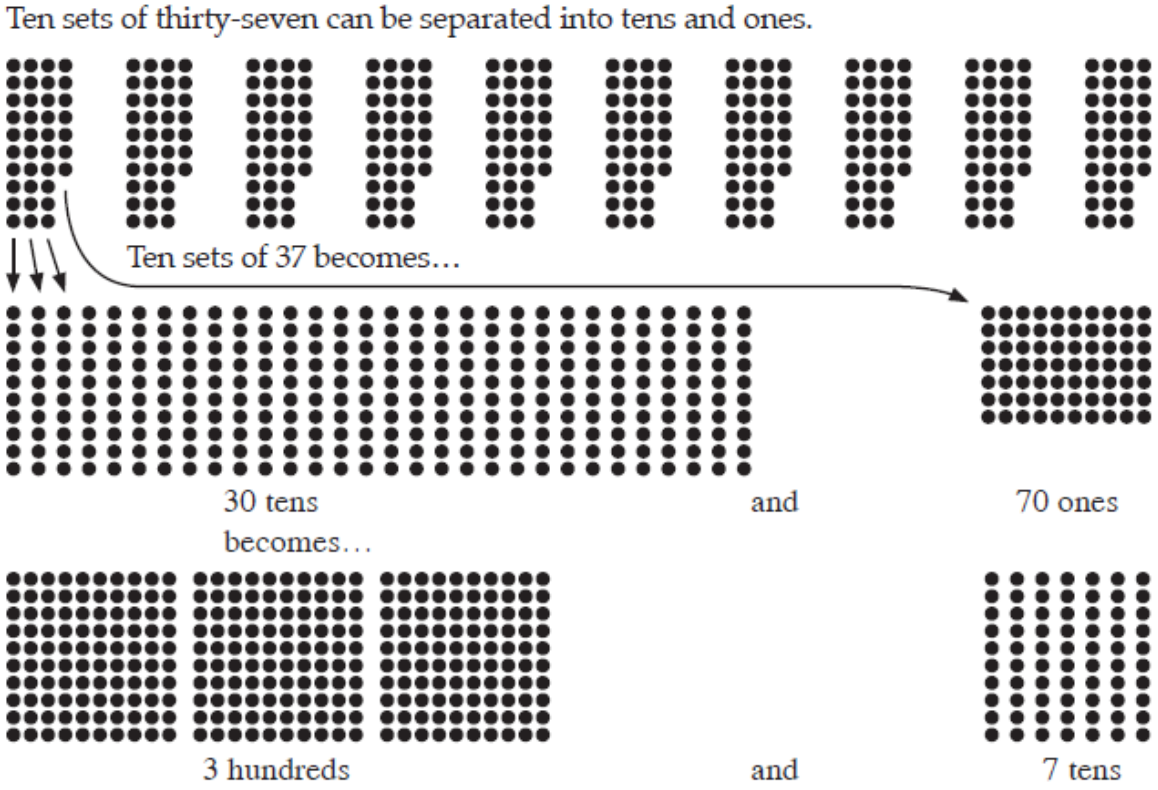
- Large dot arrays

GROUPING

Partner or small group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments:
Ask ten students to make a two-digit number, e.g., 37, using the dotty array pieces.
Pose this problem: "Imagine there are ten students and they each have 37 marbles/apples/dollars."
Put the sets of 37 into a central space. "How many dots is that altogether?"
Some students are likely to have symbolic algorithms, such as "add a zero," that enable them to get an answer of 370. Examine the actions on materials that explain the use of zero as a place holder.
For example:



Using a place value chart, connect 37 with the result of 10 x 37:

Ten Thousands	Thousands	Hundreds	Tens	Ones
			3	7

		3	7	0

In this way, the students may notice that the digits have shifted one place to the left. Pose several other problems where ten students make numbers with dot array parts and look at the combined product. For each example, separate the place values to see what contribution they make to the whole product, and write the number and it's ten times equivalent on the place value chart.

Further challenge the students by making a two-digit number and posing problems such as, "Imagine that one hundred students had 42 marbles/apples/dollars each. How many would that be in total?" Ask the students how this might be modeled. In these cases, each of the ten students will need to create each number ten times. This is a useful generalization that shows that ten times ten times of any number is one hundred times that number.

Transfer the focus to dividing by ten and by one hundred. Begin with a four-digit number like 3,800 (zero in the tens and ones places). Make this number with dot array pieces. Pose this problem: "I have 3,800 marbles and I am going to share them equally among all ten of you. How many marbles will you get each?" Ask the students to predict the result of the sharing, and then confirm it by modeling with the materials.

The result of dividing 3,800 by ten can be shown on a place value chart as:

Ten Thousands	Thousands	Hundreds	Tens	Ones
	3	8	0	0
		3	8	0

The symbolic effect of dividing by ten is to shift the digits of the dividend (3,800) one place to the right. Ask the students to predict what the result would be if they shared 3,800 into one hundred equal sets. Expect them to realize that the shares would be one-tenth of 380, which is 38. This may need to be acted out by cutting the 3 hundreds in 30 tens and the 8 tens into 80 ones so the tenth shares can be established. Use the place chart to connect 3,800 and the result of 3,800 ÷ 100 = 38. In this case, the symbolic effect is a two-place shift to the right.

Pose problems like these below, expecting the students to reason the answers using place value understanding. The students must be able to justify their answers by explaining what occurs with the quantities involved.

1. 100 boxes of 376 coins (100 x 376 = 37,600)
2. 960 skittles shared among 10 people (960 ÷ 10 = 96)
3. 30 sets of 40 pencils (30 x 40 = 1 200)
4. 4,300 movie tickets shared among 100 people (4,300 ÷ 100 = 43)
5. 20 sets of 56 marbles (20 x 56 = 1,120)
6. $5,000,000 shared among 1,000 people (5,000,000 ÷ 1,000 = $5,000)

FORMATIVE ASSESSMENT QUESTIONS

- What happens to the value of the digit in the ones place when the number is multiplied by 10?
- What happens to the value of the digit in the tens place when the number is divided by 10?
- What can you concluded about the value of a digit in the ones place compared to the value of that same digit in the tens place? What about the tens place and hundreds place? What about the hundreds place and thousands place?
- Which number is larger 960 or 96? How do you know? Why?

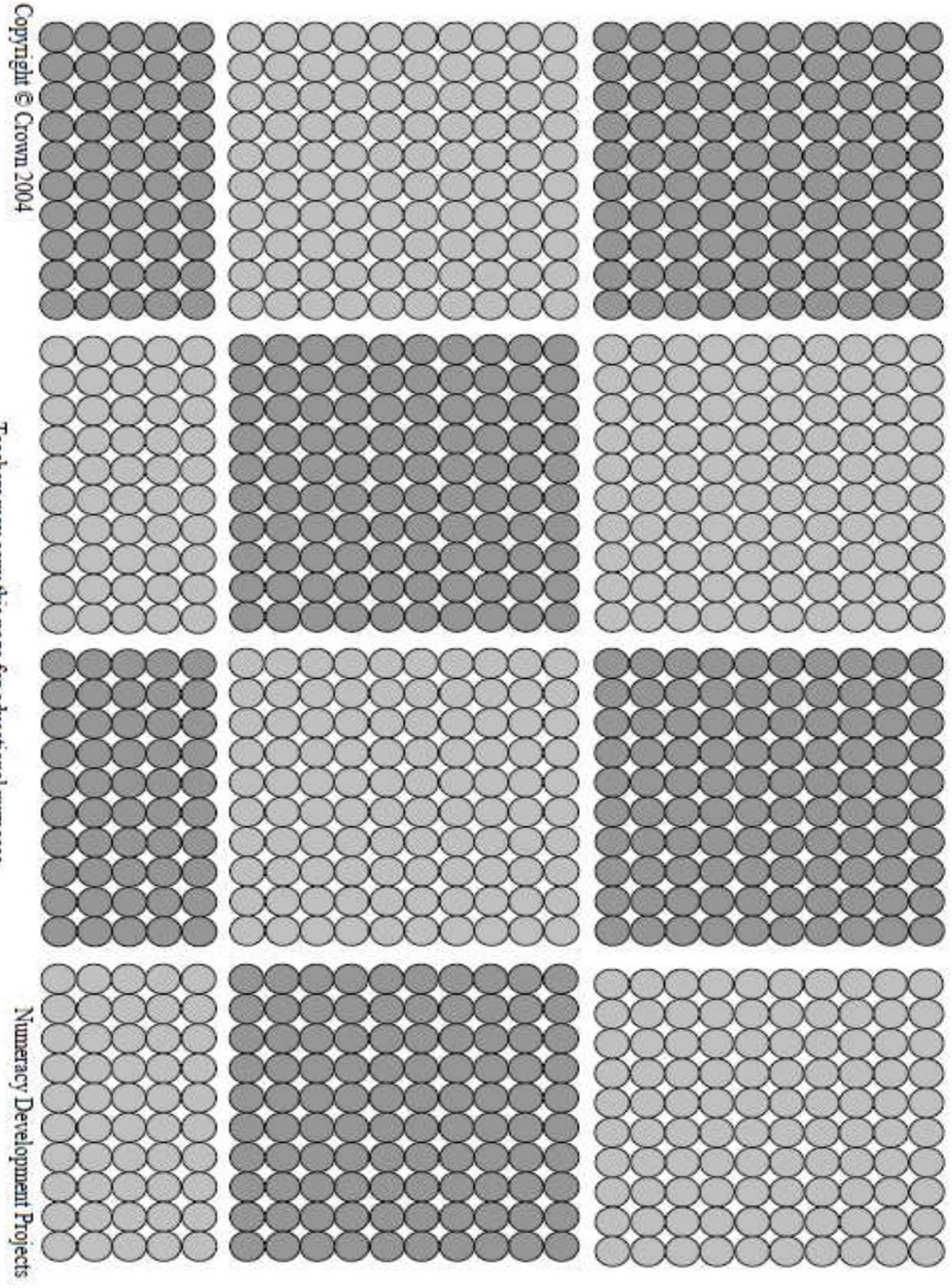
DIFFERENTIATION

Extension

- Have students explain what the value of a digit to the right of the ones place would be based on their conclusion about whole numbers.
- Have students record the number sentences associated with each problem.

Intervention

- Allow students to use base ten blocks to build numbers.



From The Numeracy Development Project, New Zealand. www.nzmaths.co.nz

Practice Task: Number Scramble

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
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5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students should have had prior experiences and/or instruction with ordering, writing numbers in expanded and standard form and comparing large numbers.

ESSENTIAL QUESTIONS

- How do digit values change as they are moved around in large numbers?
- What determines the value of a digit?

MATERIALS

- Scissors
- "Number Scramble" Recording Sheet
- Blank Place Value Chart

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students will manipulate the ten digits of the base ten-numeration system to complete various activities such as constructing large and small numbers and numbers with specific values in a given place, write numbers in expanded and standard form.

Comments

As students manipulate the numbers in this task, you will be able to see quickly which students have a good grasp of place value and the value of digits- of a number. For example, in steps 1 and 2, if students randomly place their numbers, they may need more practice to understand how the value of a number changes as its digits change.

Task Directions

Students will cut out number boxes (tiles) and use them to create numbers with the given requirements.

1. Make the largest whole number possible using 9 different tiles. Write your answer in standard form and expanded form.
2. Make the smallest whole number possible using 9 different tiles. Write your answer in standard form and expanded form.
3. Make a number worth more than two million, with a six in the ten-thousands place. Write the number in standard form and expanded form. Compare your number with your partner.
4. Make a number less than five million that has a two in the thousands' place. Write the number in standard form and expanded form. Compare your number with your partner.
5. Make a number that has only odd numbers in the thousands' period of the place value chart. Write the number in words.
6. Look carefully at your answers to Questions 1 and 2. Find one digit that is in **both** of your answers. How does the value of this digit change from the way you used it in Question 1 to the way you used it in Question 2? Use complete sentences to explain how and why the value of the digit did or did not change between the two answers.

FORMATIVE ASSESSMENT QUESTIONS

- Explain how you decided the order of the digits.
- How can you tell which number is the largest or smallest?
- How does the value of a digit change when it is moved to the left on the place value chart? To the right?
- How could a place value chart help you if you are confused about which order the numbers.

DIFFERENTIATION

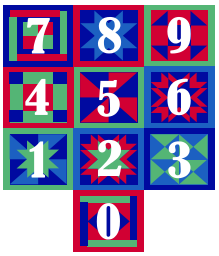
Extension

- Have students use all ten tiles to answer questions.
- Have students use tiles to create to develop two more additional questions to have their partners to solve.

Intervention

- Start students with building numbers in the hundreds, then the thousands, etc.
- Allow students to use a blank place value chart and write the numbers in the chart, showing the correct placement of the digits. This cueing device may assist students in comparing digits in the same place in order to determine value.
- Have students to use Base ten blocks to show their numbers.

Name _____ Date _____



Number Scramble

Task Directions: Cut out the number boxes at the bottom of the page by cutting on the black lines. Use the numbers to complete each task.

1. Make the largest whole number possible using 9 different tiles. Write your answer as directed below.

   Standard Form _____

   Expanded Form_____

2. Make the smallest whole number possible using 9 different tiles. Write your answer as directed below.

   Standard Form _____

   Expanded Form_____

3. Make a number larger than two million with a six in the ten-thousands place.

   What is your number? _____

   Expanded Form_____

4. Make a number smaller than five million with a two in the thousands place.

   What is your number? _____

   What is your partner's number? _____

   Expanded Form_____

5. Look carefully at your answers to Questions 1 and 2. Find one digit that is in BOTH of your answers. Write it here. _____

How does the value of this digit change from the way you used it in Question 1 to the way you used it in Question 2? On the back of this sheet, use complete sentences to explain how and why the value of the digit did or did not change between the two answers.

0	1	2	3	4	5	6	7	8	9

Practice Task: Ticket Master

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

BACKGROUND KNOWLEDGE

Students should have had prior experiences and/or instruction with ordering large numbers. This activity may be used as an assessment or as an independent follow-up activity for reinforcement or review

ESSENTIAL QUESTIONS

- How can we compare large numbers?
- What determines the value of a number?
- Why is it important for me to be able to compare numbers?

MATERIALS

- Tickets
- Paper bag
- "Ticket Master" Recording Sheet

GROUPING

Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this task, students order and compare 6-digit numbers found on preprinted ticket stubs. They will place them in ascending and/or descending order. Then they will compare two numbers using a greater than (>), less than (<), or equal to (=) symbol.

Comments

Part 1

Paper bags with tickets inside should be prepared ahead of time. You can purchase tickets at an office supply store or ask for a donated roll of tickets from activities that use them (raffles, bingo nights, school plays, etc). If purchasing or donations are not an option, you can use the master provided in this task to print tickets. Tickets should be the style that has a duplicate attached to each ticket. For this activity, ten tickets and their duplicates will be used. Detach and separate one set of ten tickets, but keep the duplicates attached to each other for students to use as an answer key. Place the ten separated tickets and one string of attached duplicate tickets inside a paper bag. You may want to laminate the tickets or print them on card stock for future use.

Part II

Students will need a bag of 20 detached tickets for Part II of this task. It may be advantageous to have separate plastic bags of 20 tickets for this game so that the detached tickets that match the string of attached tickets in Part 1 will not be mixed up.

Task Directions

Part I

Students will follow the directions below from the "Ticket Master" Recording Sheet.

- Open the bag of tickets and pour them out on your desk. You will find 10 detached tickets and one string of 10 tickets that has not been detached.
- Place the attached tickets to the side, face down.
- Take the detached tickets and arrange them in either descending or ascending order.
- Once you have completed this task, have a friend use the attached tickets to check your answers.

Part II

Play the game "Dare to Compare."

Players: 2 players
Materials: One bag of 20 detached tickets "Dare to Compare" student recording sheet
pencil

Directions:

1. Each player places a pile of 10 tickets face down in front of them.
2. For each round, both players turn the top ticket in their piles face up and lay them on the table next to each other.
3. The player with the larger number on the ticket must correctly read aloud the number.
4. Both players record an inequality or equality statement using the numbers on the tickets.
5. The player with the higher number gets to keep both tickets and place them in a separate pile with the tickets face up.
6. At the end of ten rounds, the player with the most tickets wins.

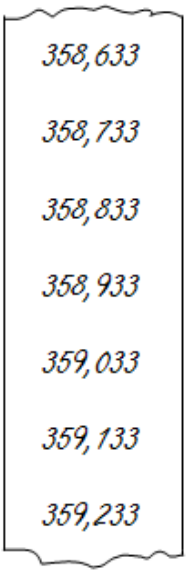
FORMATIVE ASSESSMENT QUESTIONS

- Explain your process for sorting your numbers?
- How can you tell which number is the largest or smallest?
- What do you do if two tickets have numbers with the same values?
- How could a place value chart help you order the numbers?
- What symbol would be appropriate to compare these two numbers? How do you know?

DIFFERENTIATION

Extension

- Create ticket strips (using the blank strip provided) that do not have sequential numbering. Have students practice putting in order-varied numbers, including numbers with fewer or more digits in them.

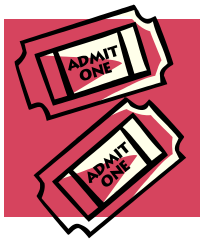


Intervention

- Have students use tickets with fewer digits in each number.
- Allow students to use a blank place value chart and write the numbers in the chart, showing the correct placement of the digits. This cueing device may assist students in comparing digits in the same place in order to determine value.

Name _____ Date _____

Ticket Master



Part I

- Open the bag of tickets and pour them out on your desk. You will find 10 detached tickets and one string of 10 tickets that has not been detached.
- Place the attached tickets to the side, face down.
- Take the detached tickets and arrange them in either descending or ascending order.
- Once you have completed this part of the task, have a friend use the attached tickets to check your answers.

Part II

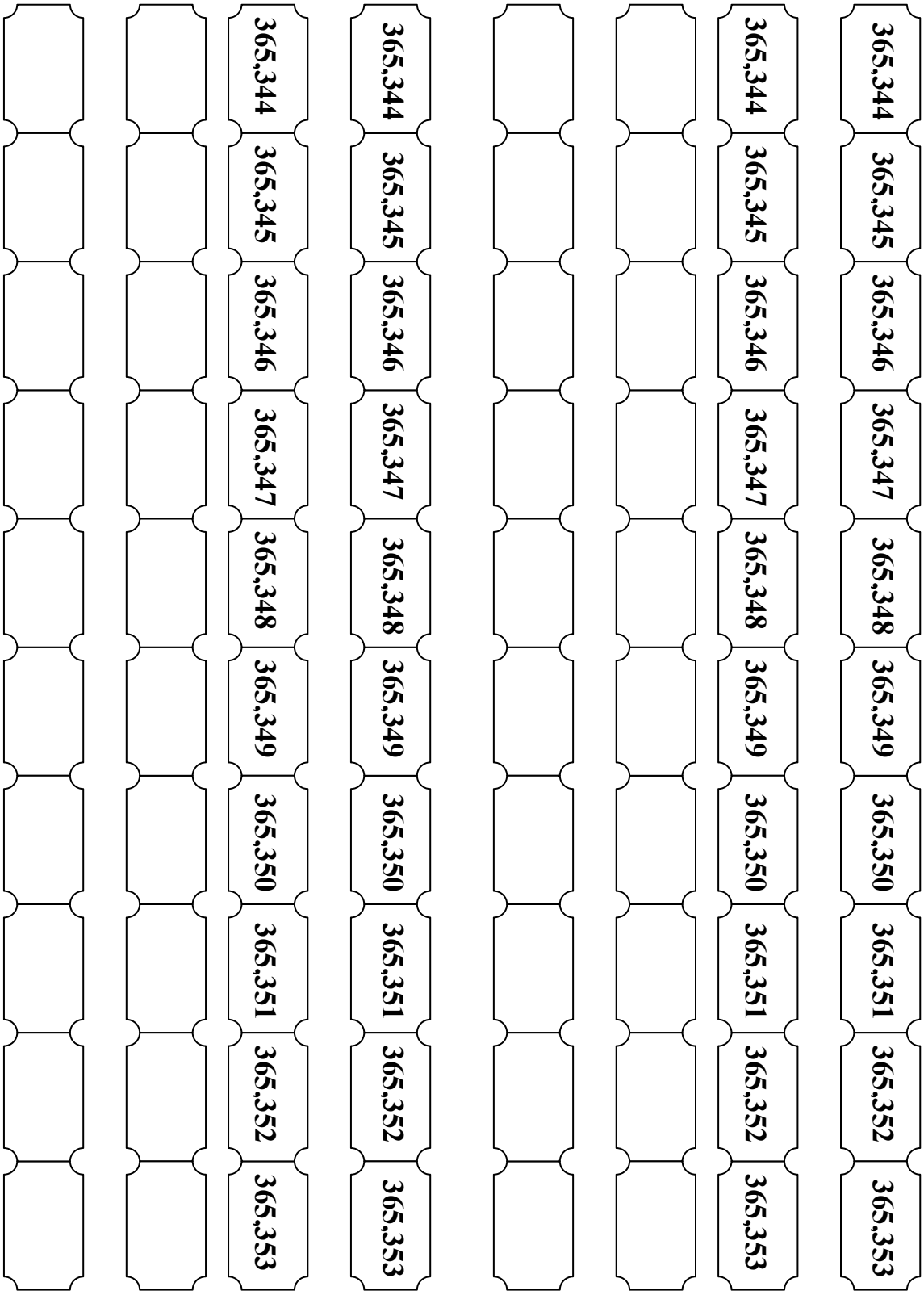
Play the game "Dare to Compare."
Players: 2 players
Materials: One bag of 20 detached tickets, "Dare to Compare" student recording sheet, and pencil

Directions:

1. Each player places a pile of 10 tickets face down in front of them.
2. For each round, both players turn the top ticket in their piles face up and lay them on the table next to each other.
3. The player with the larger number on the ticket must correctly read aloud the number.
4. Both players record an inequality or equality statement using the numbers on the tickets.
5. The player with the higher number gets to keep both tickets and place them in a separate pile with the tickets face up.
6. At the end of ten rounds, the player with the most tickets wins.

	My Ticket Number	**> < =**	**My Partner's Ticket Number**
Ex.	358,033	>	354,033
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Master Sheet for Tickets



Name _____ Date _____

Ticket Master

Part I

- Open the bag of tickets and pour them out on your desk. You will find 10 detached tickets and one string of 10 tickets that has not been detached.
- Place the attached tickets to the side, face down.
- Take the detached tickets and arrange them in either descending or ascending order.
- Once you have completed this part of the task, have a friend use the attached tickets to check your answers.

Part II

Play the game "Dare to Compare."
Players: 2 players
Materials: One bag of 20 detached tickets, "Dare to Compare" student recording sheet, and pencil

Directions:

7. Each player places a pile of 10 tickets face down in front of them.
8. For each round, both players turn the top ticket in their piles face up and lay them on the table next to each other.
9. The player with the larger number on the ticket must correctly read aloud the number.
10. Both players record an inequality or equality statement using the numbers on the tickets.
11. The player with the higher number gets to keep both tickets and place them in a separate pile with the tickets face up.
12. At the end of ten rounds, the player with the most tickets wins.

	My Ticket Number	**> < =**	**My Partner's Ticket Number**
Ex.	358,033	>	354,033
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Constructing Task: Nice Numbers

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.OA.3 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.
MCC4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.
MCC4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

According to Van De Walle, to round a number simply means to substitute a "nice" number that is close so that some computation can be done more easily. The close number can be any nice number and need not be a multiple of ten or one hundred. It should be whatever makes the computation or estimation easier or simplifies numbers sufficiently in a story, chart, or conversation. (*Van de Walle, Elementary and Middle School Mathematics, 2010*)

ESSENTIAL QUESTIONS

- What is a sensible answer to a real problem?
- What information is needed in order to round whole number to any place?
- How can I ensure my answer is reasonable?
- How can rounding help me compute numbers?

MATERIALS

- Nice Numbers recording sheet
- Empty number lines
- Blank number lines labeled in different ways

GROUPING

Partner or small group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments: For addition and subtraction problems involving only two terms, one strategy is to round only one of the two numbers. For example, you can round only the subtracted number as in 2367-1678 becomes 2367-1700. Rounding to "nice" numbers depends on what the estimator considers "nice". The point is that are no rigid rules. Choices depend on the relationships held by the estimator, on how quickly the estimate is needed, and how accurate an estimate needs to be.

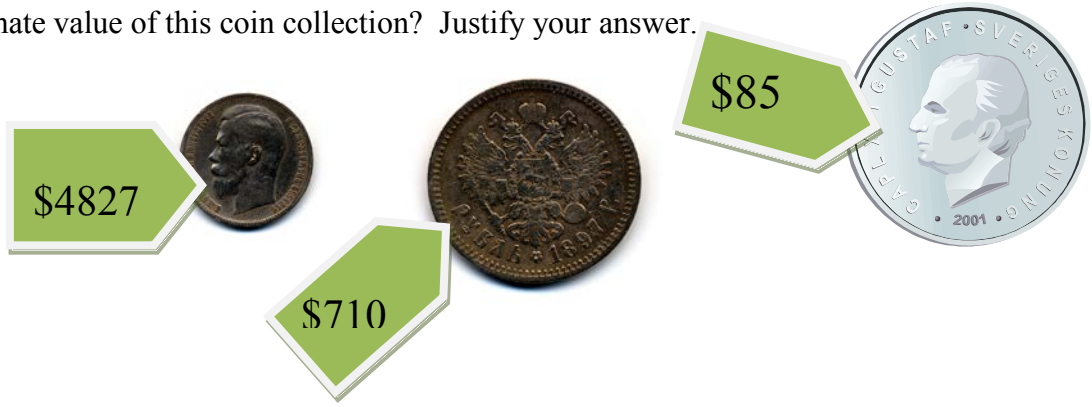
For multiplication, a good rounding strategy is to round one factor up and the other down, even if that is not the closest round number. For example, 86 x 28, 86 is between 80 and 90, but 28 is very close to 30. If one were to round 86 down to 80 and 28 to 30, the estimate would only be 8 off the actual product of 2408. However, if one were to round 86 to 90 and 28 to 30, the estimate would be nearly 300 off the actual product.

When rounding in division, the key is to find two nice numbers, rather than round to the nearest benchmark. For example, 3370 ÷ 6 can be estimated by rounding to the close nice number, 3000, resulting in an estimate of 500. Rounding to the nearest hundred results in a dividend of 3300, which does not make the division easier to do mentally.

Task directions:

Students will follow the directions below from the "Nice Numbers" recording sheet.

What is the approximate value of this coin collection? Justify your answer.



The most popular boy band is coming to town for a concert. The concert tickets cost $39.95. A group of 13 friends want to attend the concert together. About how much will the group pay for tickets?

Robert and his family traveled from Atlanta, Georgia to Washington D.C. to visit the Martin Luther King Monument. They traveled a total 648 miles. It took them a total of 12 hours to get to Washington, D.C. If they traveled the same speed the entire distance, about how many miles per hour did they drive?

FORMATIVE ASSESSMENT QUESTIONS

- What is the problem asking you?
- Does your answer make sense? How do you know?
- How does rounding help you in this context?
- Did you get the same answer for 44÷7 each time you encountered it? Why or why not?

DIFFERENTIATION

Extension

- Discuss whether these answers are definitely wrong or not: 2,365 + 7,694 = 10,059; 1,788 – 891= 497

Intervention

- Adjust the numbers in Maureen's problem to include three-digit numbers.
- Provide students with a number line with a range of numbers noted.

Name _____ Date_____

Nice Numbers

Directions

What is the approximate value of this coin collection? Justify your answer.

The most popular boy band is coming to town for a concert. The concert tickets cost $39.95. a group of 13 friends want to attend the concert together. About how much will the group pay for tickets?

Robert and his family traveled from Atlanta, Georgia to Washington D.C. to visit the Martin Luther King Monument. They traveled a total 648 miles. It took them a total of 12 hours to get to Washington, D.C. If they traveled the same speed the entire distance, about how many miles per hour did they drive?

Constructing Task: Estimation as a Check

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.OA.3 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.
MCC4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.
MCC4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

In order for students to be able to round accurately, "rounding should be flexible and well understood conceptually" (Van de Walle, 246). In order for students to conceptually understand rounding, they must be engaged in contexts to allow them to make sense of this concept. This task provides several contexts in which students will have to determine the best estimation for the situation. With these estimations, students will use the most familiar form of estimation, rounding (Van de Walle, 241).

When students use the standard written forms or use a calculator, it is essential that they demonstrate good number sense in rejecting answers that are obviously wrong.

ESSENTIAL QUESTIONS

- What is a sensible answer to a real problem?
- What information is needed in order to round whole number to any place?
- How can I ensure my answer is reasonable?
- What effect does a remainder have on my rounded answer?

MATERIALS

- Estimation as a Check recording sheet
- Empty number lines

GROUPING

Partner or small group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments: Before students attempt this task, they should have had opportunities to work with various contexts which required rounding to determine a reasonable answer. Students should be comfortable using place value concepts within their explanation of a rounded answer. Through context problems, students should have concluded a reasonable rounded answer is based on the context of the situation and not rules or procedures for rounding.

Task directions:

Students will follow the directions below from the "Estimation as a Check" recording sheet.

Problem: To work out 4,567 + 4,890, Maureen uses her calculator or pencil and paper. Her answer is 8,457. Is Maureen's answer correct? Show how you know.

FORMATIVE ASSESSMENT QUESTIONS

- What is the problem asking you?
- Does your answer make sense? How do you know?
- How does rounding help you in this context?
- Did you get the same answer for 44÷7 each time you encounter it? Why or why not?

DIFFERENTIATION

Extension

- Discuss whether these answers are definitely wrong or not: 2,365 + 7,694 = 10,059; 1,788 – 891= 497

Intervention

- Adjust the numbers in Maureen's problem to include three-digit numbers.
- Provide students with a number line with a range of numbers noted.

Name _____ Date_____

Estimation as a Check

Directions

Problem: To work out 4,567 + 4,890, Maureen uses her calculator or pencil and paper.
Her answer is 8,457. Is Maureen's answer correct? Show how you know your answer is correct.

CONSTRUCTING TASK: Making Sense of the Algorithm

Adapted from: A Written Form of Subtraction, nzmaths, Adding, Subtraction , and Place Value

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

For students who are good at multi-digit addition and subtraction, learning a standard written subtraction is straightforward, provided they understand the core idea that the particular decomposition needed in a given subtraction depends on what is subtracted.

ESSENTIAL QUESTIONS

- What strategies can I use to help me make sense of a written algorithm?

MATERIALS

- Play money if needed
- Base-ten blocks
- Making Sense of the Algorithm recording sheet

GROUPING

Individual or partner

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments:
This task allows students to make sense of the standard algorithm for subtraction. It is important you allow them to grapple with the strategies used by Jane. Through this grappling, students make sense of what Jane did to solve each problem. Through classroom discussion, student understanding will be shared and developed. Therefore, it is not necessary to work them through the methods presented in Jane's work.

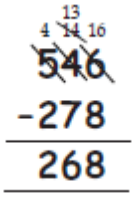
After engaging in this task, students should know that it is mathematically possible to subtract a larger number from a smaller number but that their work with whole numbers does not allow this as the difference would result in a negative number.

Task directions:

Students will follow the directions below from the "Making Sense of the Algorithm" recording sheet.

Problems:
1. "To work out 856 – 138, Jane rearranges 856 as 800 + 40 + 16. Why does she do this?" Explain, using play money, if necessary. (In the decomposition method of subtraction, there are sufficient hundreds and tens to solve the problem, but there are insufficient ones.) "So find 856 – 138."
2. "To work out 856 – 162, Jane rearranges 856 as 700 + 150 + 6. Why does she do this?" Explain, using play money, if necessary. (In the decomposition method of subtraction, there are sufficient hundreds and ones to solve the problem, but there are insufficient tens.) "So find 856 – 162."
3. "To work out 856 – 168, Jane rearranges 856 as 700 + 140 + 16. Why does she do this?" Explain, using play money, if necessary. "So find 856 – 168."
4. "To work out 856 – 123, Jane does not have to rearrange 856 at all. Why not?" Explain, using play money, if necessary. "So find 856 – 123."

Now establish a standard written form for subtraction. A good way to do this is to explain why 546 – 278 requires 546 to be renamed 4 hundreds + 13 tens and 16 ones and link this to the problem below.



FORMATIVE ASSESSMENT QUESTIONS

- When you write the numbers in expanded form, what do you discover?
- What happens when one number has more or less tens than the other?
- Why do you think Jane rearranged the numbers before subtracting?

DIFFERENTIATION

Extension

- In each of these subtractions, explain how to split up 953 to solve the problem, then find the answers: 953 – 234; 953 – 184; 953 – 594; 953 – 284; 953 – 388 ...

Intervention

- Have students model Jane's methods using play money or base ten blocks.

Name _____ Date_____

Making Sense of the Algorithm

Directions

Problems:

1. "To work out 856 – 138, Jane rearranges 856 as 800 + 40 + 16. Why does she do this?" Explain, using play money or base ten blocks, if necessary.

2. "To work out 856 – 162, Jane rearranges 856 as 700 + 150 + 6. Why does she do this?" Explain, using play money or base ten blocks, if necessary.

3. "To work out 856 – 168, Jane rearranges 856 as 700 + 140 + 16. Why does she do this?" Explain, using play money or base ten blocks, if necessary.

4. "To work out 856 – 123, Jane does not have to rearrange 856 at all. Why not?" Explain, using play money or base ten blocks, if necessary.

Now establish a standard written form for subtraction. A good way to do this is to explain why 546 – 278 requires 546 to be renamed 4 hundreds + 13 tens and 16 ones and link this to the problem below.

$$\begin{array}{r} {\scriptstyle 4\ \ 13\ \ 16} \\ \cancel{5}\cancel{4}\cancel{6} \\ -278 \\ \hline 268 \end{array}$$

Constructing Task: Reality Checking

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NBT.4 Fluently add and subtract multi-digit whole numbers using the standard algorithm.
MCC4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.
MCC4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

When students begin using the standard algorithm their explanation may be quite lengthy. After much practice with using place value to justify their steps, they will develop fluency with the algorithm. Students should be able to explain why the algorithm works. Often students mix up when to 'carry' and when to 'borrow'. Also students often do not notice the need of borrowing and just take the smaller digit from the larger one. Emphasize place value and the meaning of each of the digits.

ESSENTIAL QUESTIONS

- How can I combine hundreds, tens and ones in two or more numbers efficiently?
- What strategies help me add and subtract multi-digit numbers?
- How does the value of digits in a number help me compare two numbers?
- How can I round to help me find a reasonable answer to a problem?
- How does understanding place value help me explain my method for rounding a number to any place?

MATERIALS

- Hundreds chart or number line
- Reality Checking recording sheet

GROUPING

Individual or partner

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments: This task provides a real world connection for students to apply the addition and subtraction strategies which help them explain the standard algorithm. Students will engage in the balancing of a mock checking account register. Students will add whole number deposits and subtract whole number withdrawals using addition and subtraction strategies such as, place value or the standard algorithm. Students will be required to explain how their understanding of place value helped add and subtract the given amounts.

Within their explanations, students should use language noting the number of hundreds, tens and ones combined and/or separated in order to determine the final balance in the register. Students will also be required to compare the amounts in the banking statement and the register for accurate balancing of the checking account.

A context problem is included to encourage students to think about the reasonableness of their answers. Students will round the determined amount based on the context, it will be important to keep students grounded in the context. Encourage them to round based on the context and not apply a procedure for rounding.

Task directions:

Students will follow the directions below from the "Reality Checking" recording sheet.

Part 1:

1. First finish subtracting the checks and adding the deposit in the check register.
2. First check off each check and deposit that are in the **check register** and checking statement from Reality Bank. This will tell you which checks and deposits cleared the bank. The check goes underneath the column that has the check in your register.
3. Write down the checks that are i**n the check register and not in the bank statement**. Add up all of these checks. This tells you what checks you wrote but are still outstanding from the bank.
4. Subtract this sum from your **ending balance** on your statement.
5. Add to this balance (line 4) any **deposits** that weren't checked off. The answer that you get here should match the last balance from your check register.

Part 2:

After balancing her check register above, Marsha realized she did not include a check she received for her birthday from her grandmother. She remembers depositing the check in the bank on March 29th close to closing time. However, she cannot remember the exact amount of the check. She believes it is between $125 and $130 dollars. About how much will her ending balance be when she includes the amount of her birthday check?

Part 3:

After taking a financial course to help her manage her money, Marsha decided to create a monthly budget. She used her March checking register to determine how much money she spent on food, bills like car payment, phone bill, and spending at her favorite stores. Help Marsha determine in which of the three areas she spends the most money and in which she spends the least. Use what

you know about place value to explain which area uses most of her money and which area uses the least of her money.

FORMATIVE ASSESSMENT QUESTIONS

- Can you explain how you are subtracting the withdrawals from the balance? Explain how you are adding the deposits to the balance.
- What is the beginning balance in Marsha's register? What is the ending balance? Which is greater, the beginning balance or the end balance?
- How can you determine Marsha's new end balance after including the birthday check?

DIFFERENTIATION

Extension

- Have students create a monthly budget for Marsha based on her March spending.

Intervention

- Have students use the hundreds chart or number line to aid in rounding the amount of the birthday check and new ending balance.
- Provide students with more entries for the register to require limited addition and subtraction opportunities.
- Have base-ten blocks available to help students formulate their thoughts about using place value to help add and subtract the deposits and withdrawals.

Name _____ Date_____

Reality Checking

Directions

Checking Statement
Reality Bank
March 1 - 30

Beginning Balance: $1234.00

Deposits $1800.00

Withdrawals $2095.00

Ending Balance: $939.00

Date	Check #	Amount	Balance
2- Mar	231	$300.00	934.00
2-Mar	Deposit	$890.00	1824.00
4-Mar	223	$45.00	1779.00
5-Mar	221	$35.00	1744.00
6-Mar	228	$450.00	1294.00
7-Mar	229	$56.00	1238.00
8-Mar	Deposit	$910.00	2148.00
10-Mar	239	$430.00	1718.00
13-Mar	225	$50.00	1668.00
15-Mar	226	$46.00	1622.00
19-Mar	237	$52.00	1570.00
23-Mar	222	$85.00	1485.00
25-Mar	232	$96.00	1389.00
28-Mar	236	$125.00	1264.00
28-Mar	224	$325.00	939.00

Check No.	Date	Description of Transaction	(-) Amount of Payment or Withdrawal		√ O T	(+ -) other	(-) Amount of Deposit or Interest		Balance 1234.00	
221	2/15	Mr. Jones	35	00					1199	00
222	2/15	Mrs. Wilkinson	85	00					1114	00
223	2/16	Phone	45	00					1069	00
224	2/18	Car Payment	325	00					744	00
225	2/18	Insurance	50	00					694	00
226	2/20	Dr. Norris	46	00					648	00
227	2/21	Groceries	24	00					624	00
Dep	2/24	Paycheck					890	00	1514	00
228	2/26	Rent	450	00						
229	2/26	Groceries	56	00						
230	2/28	Wal-Mart	10	00						
231	2/28	K-mart	300	00						
232	2/28	Dining	96	00						
233	2/28	Cable	23	00						
234	2/28	Pizza	9	00						
235	3/1	Water	23	00						
Dep	3/1	Paycheck					910	00		
236	3/1	Books	125	00						
237	3/2	Dining	52	00						
238	3/2	Groceries	83	00						
239	3/2	Visa	430	00						

Dep	3/5	Paycheck					1123	00		

Part 1:
First finish subtracting the checks and adding the deposit in the check register.

1. First put a check mark by each check and deposit that are in the **check register** and checking statement from Reality Bank. This will tell you which checks and deposits cleared the bank. The check mark goes underneath the column that has the check in your register.
2. Write down the checks that are **in the check register and not in the bank statement**. Add up all of these checks. This tells you what checks you wrote but are still outstanding from the bank.

_____ _____

_____ _____

_____ _____

_____ Total: _____

3. Subtract this sum from your **ending balance** on your statement.

_____-_____=_____

4. Add to this balance (line 4) any **deposits** that weren't checked off. The answer that you get here should match the last balance from your check register.

_____+_____=_____

5. Explain how you balanced the equation in problem #5. Use what you know about place value to help you explain how you added the two amounts to make it equal the ending balance in the checking statement.

Part 2:
After balancing her check register above, Marsha realized she did not include a check she received for her birthday from her grandmother. She remembers depositing the check in the bank on March 29th close to closing time. However, she cannot remember the exact amount of the check. She believes it is between $125 and $130 dollars. About how much will her ending balance be when she includes the amount of her birthday check?

Part 3:
After taking a financial course to help her manage her money, Marsha decided to create a monthly budget. She used her March checking register to determine how much money she spent on food, bills like car payment and phone bill and spending on at her favorite stores. Help Marsha

determine which of the three areas she spends the most money and which she spends the least. Use what you know about place value to explain which area uses most of her money and which area uses the least of her money.

Constructing Task: At the Circus

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.OA.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.
MCC 4.OA.3 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.
MCC4.NBT.5 Multiply a whole number of up to four digits by one –digit whole number, and multiply two tow digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular, arrays, an /or area models.

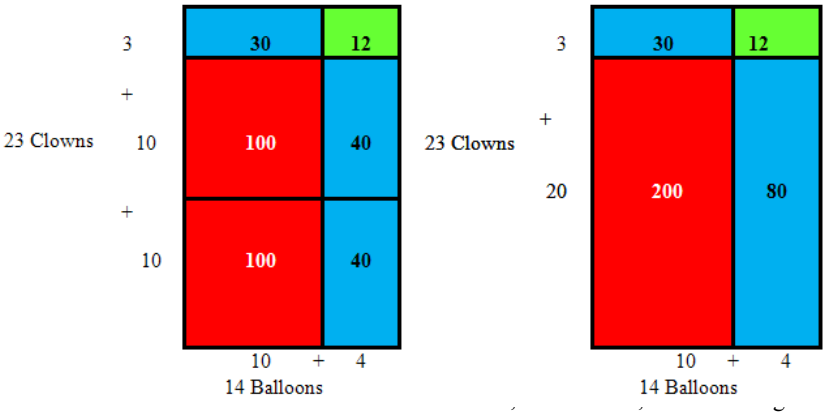
STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

Students should understand how to use grid paper and partial products area models to determine multiplication products with numbers larger than 10. Use this task or another one similar to it to help students make the transition from depending on manipulatives for determining products of larger numbers to being able to determine these products through self-made diagrams.

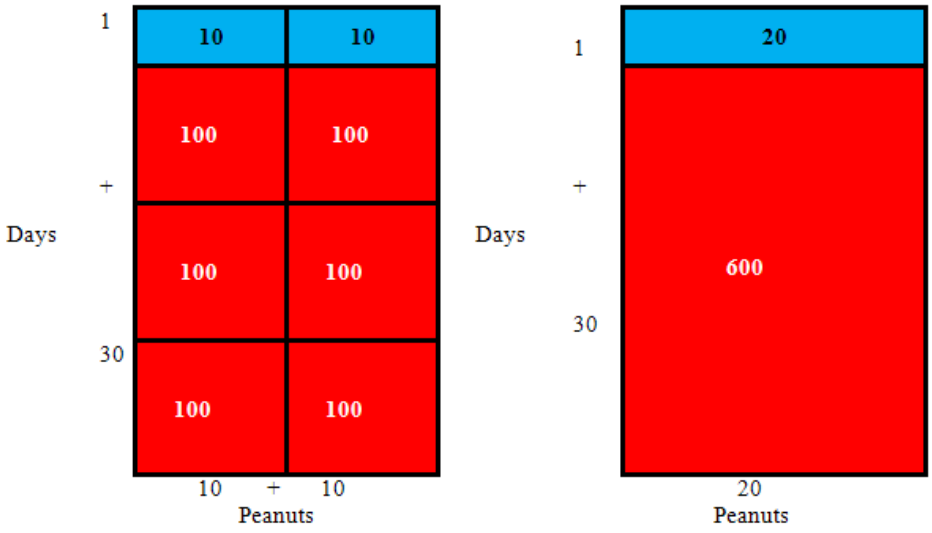
Based on their understanding of base ten blocks, students should draw a model similar to either of these for the clown and balloons problem:



MAT 'omputation

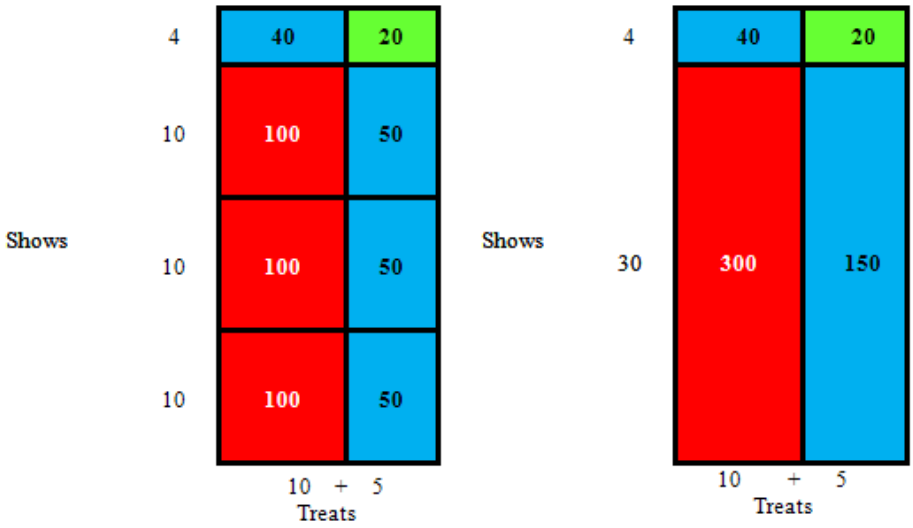
To get the final answer the students can add the areas:
100 + 100 + 30 + 40 + 40 + 12 = 322 or 200 + 80 + 30 + 12 = 322. There will be 322 balloons.

Below are two possible solutions for the Jumbo the elephant problem:



To get the final answer students can add the areas:
100 + 100 + 100 + 100 + 100 + 100 + 10 + 10 = 620 or 600 + 20 = 620.
Jumbo's trainer needs to carry 620 peanuts with him.

Below are two possible solutions for dancing bear family problem:



To get the final answer the students can add the areas:
100 + 100 + 100 + 50 + 50 + 50 + 40 + 20 = 510 or 300 + 150 + 40 + 20 = 510.
The dancing bear family will receive 510 treats from the trainer during 15 shows.

ESSENTIAL QUESTIONS

- How will diagrams help us determine and show the products of two-digit numbers?

MATERIALS

- Colored pencils, markers, or crayons
- Centimeter Grid Paper
- "At the Circus" recording sheet

GROUPING

Partner or Individual Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

In this task, students will make diagrams to discover and demonstrate the answers to 2-digit to 4-digit multiplication story problems.

Comments

This task provides opportunities for students to work with arrays in real world situations as they work with larger numbers. The recording sheet also asks students to develop a story problem of their own.

The idea of moving beyond building arrays with base-ten blocks to drawing rectangles on paper or grid paper is critical. At this point students must begin to visualize the multiplication process without the blocks. As students begin to work, they may realize that modeling problems such as these can require a large number of base-ten blocks. Ask them to think of ways to do the same problem without having to utilize base-ten blocks.

Task Directions

Students will follow the directions below from the "At the Circus" recording sheet.

Solve the following problems. Show your thinking using words, pictures, and/or numbers.

1. There are 110 clowns at the circus. Each clown is carrying 14 balloons. How many balloons are there altogether?
2. The dancing bear family loves when their trainer gives them little treats to reward them for a good performance. If the trainer gives the dancing bear family 34 treats each show, how many treats will the trainer need for 220 shows?
3. Jumbo the elephant loves peanuts. His trainer gives him 20 peanuts every day. If they are going to be traveling for 134 days, how many peanuts should the trainer take with him?
4. Create your own circus problem and solution to share with the class.

FORMATIVE ASSESSMENT QUESTIONS

- How did you decide what size your diagrams should be?
- What are the dimensions of the array? How do you know?

- Describe what each dimension in your array represents.
- What groups are being counted in your word problem? How do you know?
- How many times is each group in your word problem being counted? How do you know?
- How are you using colors to keep your data organized?
- How can colors help you identify the number of groups and the number of times each group is counted?

DIFFERENTIATION

Extension

- Ask students to try to solve a multiplication problem using a different method. (Students could try some of the strategies used to solve the problems on the "School Store" task.) Encourage students to apply another student's strategy to solve a given problem.

Intervention

- All students will not be ready at the same time to discontinue use of the base-ten manipulatives. The teacher will need to be conscientious about monitoring each student's level of understanding to know when the student will be ready to transition to diagrams without manipulative support. If students experience frustration or uncertainty during this process, the manipulatives should be kept available for use as reinforcement or as a way to check the diagram.

Name _____ Date _____

At the Circus

Solve the following problems. Show your thinking using words, pictures and/or numbers.

1. There are 23 clowns at the circus. Each clown is carrying 110 balloons. How many balloons are there altogether?	2. The dancing bear family loves when their trainer gives them little treats to reward them for a good performance. If the trainer gives the dancing bear family 34 treats each show, how many treats will the trainer need for 220 shows?
3. Jumbo the elephant loves peanuts. His trainer gives him 20 peanuts every day. If they are going to be traveling for 134 days, how many peanuts should the trainer take with him?	4. Create your own circus problem and solution to share with the class.

Constructing Task: School Store

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.OA.1 Interpret a multiplication equation as a comparison, e.g., interpret35 = 5 × 7 as a statement that 35 is 5times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
MCC4.OA.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.
MCC 4.OA.3 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.
MCC4.NBT.5 Multiply a whole number of up to four digits by one–digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular, arrays, and /or area models.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

BACKGROUND KNOWLEDGE

	Unknown Product	**Group Size Unknown ("How many in each group?" Division**	**Number of Groups Unknown ("How many groups?" Division)**
	3 x 6 =?	**3 x ? = 18 , and 18 ÷ 3 = ?**	**? x 6 = 18 , and 18 ÷ 6 = ?**
Equal Groups	There are 3 bags with 6 plums in each bag. How many plums are there in all? *Measurement example*. You need 3 lengths of string, each 6 inches long. How much string will you need altogether?	If 18 plums are shared equally into 3 bags, then how many plums will be in each bag? *Measurement example*. You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be?	If 18 plums are to be packed 6 to a bag, then how many bags are needed? *Measurement example*. You have 18 inches of string, which you will cut into pieces that are 6 inches long. How many pieces of string will you have?
Arrays Area	There are 3 bags with 6 plums in each bag. How many plums are there in all?	If 18 plums are shared equally into 3 bags, then how many plums will be in each bag?	If 18 plums are to be packed 6 to a bag, then how many bags are needed?

	Measurement example. You need 3 lengths of string, each 6 inches long. How much string will you need altogether?	*Measurement example*. You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be?	*Measurement example*. You have 18 inches of string, which you will cut into pieces that are 6 inches long. How many pieces of string will you have?
Compare	A blue hat costs $6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost? *Measurement example*. A rubber band is 6 cm long. How long will the rubber band be when it is stretched to be 3 times as long?	A red hat costs $18 and that is 3 times as much as a blue hat costs. How much does a blue hat cost? *Measurement example*. A rubber band is stretched to be 18 cm long and that is 3 times as long as it was at first. How long was the rubber band at first?	A red hat costs $18 and a blue hat costs $6. How many times as much does the red hat cost as the blue hat? *Measurement example*. A rubber band was 6 cm long at first. Now it is stretched to be 18 cm long. How many times as long is the rubber band now as it was at first?
General	a x b =?	a x ? = p , and p ÷ a = ?	? x b = p , and p ÷ b = ?

ESSENTIAL QUESTIONS

- How can I effectively explain my mathematical thinking and reasoning to others?
- What patterns do I notice when I am multiplying whole numbers that can help me multiply more efficiently?
- What real life situations require the use of multiplication?
- How can I use the situation in a story problem to determine the best operation to use?

MATERIALS

- "School Store" recording sheet

GROUPING

Partner or Individual Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students explore their understanding of multiplication and how it applies to multiplying 1-digit and 2 digit numbers by up to 4-digit whole numbers.

Comments

This is an opportunity for students to use what they know about multiplication to find the product of 1-digit and 2-digits by up to 4-digit whole numbers. This task should be completed **before** students have any experiences with the standard algorithm for multiplying two digit numbers.

There should be no instruction on how to multiply 1 to 2 digit by up to 4-digit before giving students this problem. An example of how students may solve this type of problem is provided below.

As students work on this problem, talk with the students about their thinking and how they know their answers are correct. Also, it is important for students to share their thinking with their classmates

Task Directions

Students will follow the directions below from the "School Store" recording sheet.

Use what you know about multiplication to solve the following problems.

1. Jeni sells 125 pencils each day at the school store. How many pencils will she sell after 14 days?
2. Marquis runs the school store. He noticed they sold around 521 pens every day. If he wants to order as few pens as possible to get through 4 weeks of school, how many pens should he order?
3. There are 1,647 students at Eagle Creek Elementary School. Sixty-eight students shopped at the Eagle's Nest school store each day. How many students shopped at the school store after 45 days?

Below is one possible way students can solve the problems for this task.

This standard calls for students to translate comparative situations into equations with an unknown and solve.

Students need many opportunities to solve contextual problems.

Examples:

Unknown Product: A blue scarf costs $3. A red scarf costs 6 times as much. How much does the red scarf cost? (3 x 6 = p).

Group Size Unknown: A book costs $18. That is 3 times more than a DVD. How much does a DVD cost? (18 ÷ p = 3 or 3 x p = 18).

Number of Groups Unknown: A red scarf costs $18. A blue scarf costs $6. How many times as much does the red scarf cost compared to the blue scarf? (18 ÷ 6 = p or 6 x p = 18).

When distinguishing multiplicative comparison from additive comparison, students should note that Additive comparisons focus on the difference between two quantities (e.g., Deb has 3 apples and Karen has 5 apples. How many more apples does Karen have?). A simple way to remember this is, "How many more?"

Multiplicative comparisons focus on comparing two quantities by showing that one quantity is a specified number of times larger or smaller than the other (e.g., Deb ran 3 miles. Karen ran 5 times as many miles as Deb. How many miles did Karen run?). A simple way to remember this is "How many times as much?" or "How many times as many?"

FORMATIVE ASSESSMENT QUESTIONS

- How are you thinking about this problem?
- How do you know your answer is correct?
- What strategies are you using to solve this problem?
- What properties of multiplication have you used to solve this problem?

DIFFERENTIATION

Extension

- Have students show as many different representations as they can and develop additional strategies as needed.
- Have students practice each of the strategies with numbers in the hundreds and thousands. Numbers larger than this can usually be handled with the use of the calculator, which should also be introduced once students have mastered the basic algorithm.

Intervention

- Have students solve the problem by inserting smaller numbers into the problem, then having them to choose two of the strategies to solve the problems

Name_____ Date_____

School Store

Use what you know about multiplication to solve the following problems. Jeni sells 125 pencils each day at the school store. How many pencils will she sell after 14 days?

1. Marquis runs the school store. He noticed they sold around 521 pens every day. If he wants to order as few pens as possible to get through 3 weeks of school, how many pens should he order?

2. There are 1,647 students at Eagle Creek Elementary School. Sixty-eight students shopped at the Eagle's Nest school store each day. How many students shopped at the school store after 45 days?

Constructing Task: Sensible Rounding

STANDARDS OF MATHEMATICAL CONTENT

MCC4.OA.3 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.
MCC4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.

STANDARDS OF MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

BACKGROUND KNOWLEDGE

A problem like 44 ÷ 7 produces a calculator answer of 6.285714286 and the traditional division algorithm will produce 6r2. For any practical purposes, this number must be rounded. Yet there is no one rule for doing this. This is because the context always suggests the method of rounding. The students need to display very good number sense and understanding of real problems to round calculator answers sensibly.

ESSENTIAL QUESTIONS

- What is a sensible answer to a real problem?
- What information is needed in order to round whole number to any place?
- How can I ensure my answer is reasonable?
- What effect does a remainder have on my rounded answer?

MATERIALS

- Sensible Rounding recording sheet
- calculator

GROUPING

Partner or small group

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments:

For students to be able to round accurately, "rounding should be flexible and well understood conceptually" (Van de Walle, 246). In order for students to conceptually understand rounding, they must be engaged in context to allow them to make sense of this concept. This task provides several contexts in which students will have to determine the best estimation for the situation. With these estimations, students will use the most familiar form of estimation, rounding (Van de Walle, 241).

Task directions:

Students will follow the directions below from the "Sensible Rounding" recording sheet.

Use an empty number line to work through the following problems. Discuss the answers carefully with your partner or group.

"Jane has 44 liters of milk to share among seven families. How much does she measure out for each family?" (In traditional rounding "rules" students would round this amount to 7 liters. However, this context proves this rounded amount would be inaccurate because there is not enough milk for each family to receive 7 liters.)

"The market gardener sends 44 tons of potatoes to eight supermarkets. How much does he send to each?" The market gardener would need x amount of tons of potatoes in order for each supermarket to receive 6 tons of potatoes. What amount does x represent? How do you know? (Students will determine each supermarket will receive about 5 tons of potatoes with 4 tons left over for the gardeners. Students can use the remainder to help determine the value for x, or they can use the relationship of 6x8 to help them identify 48 as the value of x.)

"The service station sells seven large pizzas for $44. About how much does a pizza cost?" Assume the service station charges to the nearest $1.

"John shares 44 Tootsie Pops among seven children. How many does each child get?" (You cannot cut up Tootsie Pops, so 6r6 Tootsie pops ≈ 6 Tootsie pops. Have students discuss how many would be left over and who would get the extra Tootsie pops.)

"Joel has 44 cookies to share among seven people. He needs to get rid of all the cookies. How many cookies does each person receive?"(Here 6r6 is very inappropriate as an answer because he must get rid of all the cookies. Everyone receives six cookies. There are two whole cookies left over so probably these should be cut. Students need to decide if this amount can be considered 6 cookies or 7 cookies.)

FORMATIVE ASSESSMENT QUESTIONS

- What is the problem asking you?
- Does your answer make sense? How do you know?
- How does rounding help you in this context?
- Did you get the same answer for 44÷7 each time you encounter it? Why or why not?

DIFFERENTIATION

Extension

- For each of these division problems, create word problems that are solved by the division yet the rounding rules change with the context. 2,225 ÷ 17; 4,567 ÷ 29; 7,888 ÷ 11 ...
- Have students use a calculator to divide and discuss how the results given by the calculator are not sensible answers. Students must explain a more sensible answer based on the context.

Intervention

- Allow students to use manipulatives to simulate the division contexts and discuss a sensible rounded answer.

Name _____ Date_____

Sensible Rounding

Directions

Use an empty number line to work through the following problems. Discuss the answers carefully with your partner or group.

"Jane has 44 liters of milk to share among seven families. How much does she give to each family?"

"The market gardener sends 44 tons of potatoes to eight supermarkets. How much does he send to each?" The market gardener would need x amount of tons of potatoes in order for each supermarket to receive 6 tons of potatoes. What amount does x represent? How do you know?

"The service station sells seven large pizzas for $44. About how much does a pizza cost?" Assume the service station charges to the nearest $1.

"John shares 44 Tootsie Pops among seven children. How many does each child get?"

"Joel has 44 cookies to share among seven people. All cookies must be shared. How many cookies does each person receive?"

Constructing Task: Compatible Numbers to Estimate

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NBT.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
MCC4.OA.3 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.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

BACKGROUND KNOWLEDGE

Compatible numbers are easy to use and are chosen to simplify the calculation of an estimate. Students should understand that sensibly chosen compatible numbers are not right or wrong, though some may yield better estimates than others. For example, the quotient 407 ÷ 5 may usefully be estimated using the compatible numbers 400 ÷ 5, 420 ÷ 6, 350 ÷ 7, 400 ÷ 4, or any of several other pairs. The first two, however, yield estimates closer to the actual quotient than the others do.

ESSENTIAL QUESTIONS

- How can I mentally compute a division problem?
- What are compatible numbers and how do they aid in dividing whole numbers?

MATERIALS

- "Compatible Numbers" recording sheet

GROUPING

Individual or partner

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Comments

Ask students how they could estimate the number of small prizes each of Mr. Wong's 9 students would receive if he had exactly 893 prizes to give away. If no one mentions compatible numbers, remind the class that they can estimate the answer to a problem by replacing the numbers in the problem with numbers that are easier to calculate with. Such easier numbers are called compatible numbers. You might show these two examples of compatible numbers:

- To estimate 3,456 ÷ 7, students might recognize 3,456 is close to 3,500 and choose compatible numbers 3,500 and 7. So, 3,456 ÷ 7 is about 3,500 ÷ 7, or 500.

Task Directions

Students will follow the directions below from the "Compatible Numbers" recording sheet.

1. Mr. Wong has between 300 and 1,000 small prizes to divide evenly among his 9 students over the course of the school year. He will give away as many prizes as possible. Estimate the number of small prizes each of Mr. Wong's 9 students would receive if he had exactly 893 prizes to give away.
2. At Hatfield Elementary School, there are 504 students in 7 classes. Each class has the same number of students. What is a good estimate of the number of students in each class? Explain your reasoning.
3. Marcel worked 9 hours and earned $232. What is a good estimate of the amount that he earned each hour? Explain your reasoning.

FORMATIVE ASSESSMENT QUESTIONS

- What compatible numbers are you using?
- How did these compatible numbers make solve the problem easier?
- Do you think that is a reasonable estimate? Why?

DIFFERENTIATION

Extension

- Have students solve the following problem with an estimate which fits the context. Mr. Wong has between 300 and 1,000 small prizes to divide evenly among his 9 students over the course of the school year.. He will give away as many prizes as possible. What is the greatest number of prizes that could be left over? Is it possible for each student to get 200 prizes?

Intervention

- Have students link basic division facts to identifying compatible numbers. You can begin with 35 ÷ 7, then 350 ÷ 7. Make explicit the connection of the compatibility between 35 and 7 and how it can be applied to 350 and 7.

Name _____ Date _____

Compatible Numbers

Use compatible numbers to help you estimate the answers for the following problems.

1. Mr. Wong has between 300 and 1,000 small prizes to divide evenly among his 9 students over the course of the school year. He will give away as many prizes as possible. Estimate the number of small prizes each of Mr. Wong's 9 students would receive if he had exactly 893 prizes to give away.

2. At Hatfield Elementary School, there are 504 students in 7 classes. Each class has the same number of students. What is a good estimate of the number of students in each class? Explain your reasoning.

3. Marcel worked 9 hours and earned $232. What is a good estimate of the amount that he earned each hour? Explain your reasoning.

Scaffolding Task: Brain Only!

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NBT.5 Multiply a whole number of up to four digits by one –digit whole number, and multiply two tow digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular, arrays, and /or area models.
MCC4.NBT.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
MCC4.OA.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

BACKGROUND KNOWLEDGE

In fourth grade, students build on their third grade work with division within 100. Students need opportunities to develop their understandings by using problems in and out of context. Example: A 4th grade teacher bought 4 new pencil boxes. She has 260 pencils. She wants to put the pencils in the boxes so that each box has the same number of pencils. How many pencils will there be in each box?

Using Base 10 Blocks: Students build 260 with base 10 blocks and distribute them into 4 equal groups. Some students may need to trade the 2 hundreds for tens but others may easily recognize that 200 divided by 4 is 50.

Using Place Value: $260 \div 4 = (200 \div 4) + (60 \div 4)$

Using Multiplication: $4 \times 50 = 200$, $4 \times 10 = 40$, $4 \times 5 = 20$; $50 + 10 + 5 = 65$; so $260 \div 4 = 65$
Some students may need to use manipulatives and other strategies to model their thinking until they begin to "see" the patterns and understand what is happening. The teacher should not point these relationships out for the students. Instead, they should guide the thinking of the students through questions and allow students to discuss their thinking with peers; the teacher should act as a facilitator.

Example:
There are 592 students participating in Field Day. They are put into teams of 8 for the competition. How many students are on each team?

Student 1	**Student 2**	**Student 3**
592 divided by 8 There are 70 8's in 560 592 - 560 = 32 There are 4 8's in 32 70 + 4 = 74	592 divided by 8 I know that 10 8's is 80 If I take out 50 8's that is 400 592 - 400 = 192 I can take out 20 more 8's which is 160 192 - 160 = 32 8 goes into 32 4 times I have none left I took out 50, then 20 more, then 4 more That's 74	Student 3 I want to get to 592 8 x 25 = 200 8 x 25 = 200 8 x 25 = 200 200 + 200 + 200 = 600 600 - 8 = 592 I had 75 groups of 8 and took one away, so there are 74 teams

ESSENTIAL QUESTIONS

- How are multiplication and division related to each other?
- What are some simple methods for solving multiplication and division problems?
- What patterns of multiplication and division can assist us in problem solving?

MATERIALS

- "Brain Only!" recording sheet

GROUPING

Small Group or Partner Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

In this task, students analyze multiplication and division expressions to find patterns and make connections among division and multiplication problems...

Comments

It is critical for students to understand the relationship that exists between multiplication and division as well as the strong relationship between the dividend, divisor, and quotient. This task is designed to allow students to further explore these relationships.

Task Directions

Students will follow the directions below from the "Brain Only!" recording sheet.

It's true! You can really use one problem to solve related problems just by using your brain!

Use this problem to answer the following ones with your brain.

$$1240 \div 4 = 310$$

1. Be able to explain the relationship of each problem to the one above.

$$1240 \div 8 = q$$

$$620 \div d = 155$$

$$155 \times 4 = p$$

$$620 \div 2 = q$$

$$310 \times 8 = p$$

$$620 \div d = 310$$

2. Make up at least 3 more problems that are related to these.

_____ _____ _____

3. Swap with your partner and see if you can use only your brain to solve their related problems.

4. Be able to explain the relationship of each of your partner's problems, too.

FORMATIVE ASSESSMENT QUESTIONS

- What patterns do you notice in the sets of numbers?
- How is each multiplication or division expression related to the others?
- What shortcuts do you think you can learn from analyzing these expressions?
- Can you think of other related multiplication or division problems?

DIFFERENTIATION

Extension

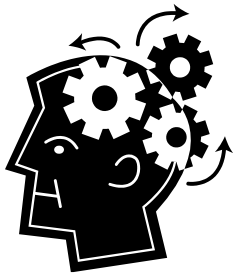
- Ask students if they think these ideas extend to larger numbers. Encourage them to use four and five digit numbers in the problems they create for the final step. Have them explain their thinking when choosing the numbers they did and provide evidence that the pattern continues even when the numbers become much larger.

Intervention

- The times table chart is an excellent visual cueing device that can be used to help students discover patterns in multiplication and division. Do not neglect to use this excellent teaching tool frequently for students who have not developed the ability to see connections and relationships between numbers easily.

Name _____ Date _____

Brain Only!



It's true! You can really use one problem to solve related problems just by using your brain!

Use this problem to answer the following ones with your brain.

$$1240 \div 4 = 310$$

5. Be able to explain the relationship of each problem to the one above.

$$1240 \div 8 = q$$

$$620 \div d = 155$$

$$155 \times 4 = p$$

$$620 \div 2 = q$$

$$310 \times 8 = p$$

$$620 \div d = 310$$

6. Make up at least 3 more problems that are related to these.

_____ _____ _____

7. Swap with your partner and see if you can use only your brain to solve their related problems.

8. Be able to explain the relationship of each of your partner's problems, too.

Constructing Task: What is 2,500 ÷ 300?

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.NBT.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
MCC4.OA.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.
MCC 4.OA.3 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.
MCC 4.OA.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

BACKGROUND KNOWLEDGE

When students simply memorize the rule to simplify division involving the numbers ending with zeroes by eliminating the same number of 0s from both numbers, they often produce an incorrect answer as shown in this problem. They do not realize that 2,500 ÷ 300 and 25 ÷ 3 are equivalent expressions. When we solve 2,500 ÷ 300, we can think about using hundreds as a unit. Thus, when we use 25 ÷ 3 to solve 2,500 ÷ 300, we are indeed asking, "How many groups of 3 hundreds can we make with 25 hundreds?" Thus, the remainder must also be interpreted with the unit of the dividend and the divisor; that is, there is 1 hundred leftover. The remainder for 2500 ÷ 300 must be 100.

	Unknown Product	Group Size Unknown ("How many in each group?" Division	Number of Groups Unknown ("How many groups?" Division)
	3 x 6 = ?	**3 x ? = 18 , and 18 ÷ 3 = ?**	**? x 6 = 18 , and 18 ÷ 6 = ?**
Equal Groups	There are 3 bags with 6 plums in each bag. How many plums are there in all? *Measurement example*. You need 3 lengths of string, each 6 inches long. How much string will you need altogether?	If 18 plums are shared equally into 3 bags, then how many plums will be in each bag? *Measurement example*. You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be?	If 18 plums are to be packed 6 to a bag, then how many bags are needed? *Measurement example*. You have 18 inches of string, which you will cut into pieces that are 6 inches long. How many pieces of string will you have?
Arrays Area	There are 3 bags with 6 plums in each bag. How many plums are there in all? *Measurement example*. You need 3 lengths of string, each 6 inches long. How much string will you need altogether?	If 18 plums are shared equally into 3 bags, then how many plums will be in each bag? *Measurement example*. You have 18 inches of string, which you will cut into 3 equal pieces. How long will each piece of string be?	If 18 plums are to be packed 6 to a bag, then how many bags are needed? *Measurement example*. You have 18 inches of string, which you will cut into pieces that are 6 inches long. How many pieces of string will you have?
Compare	A blue hat costs $6. A red hat costs 3 times as much as the blue hat. How much does the red hat cost? *Measurement example*. A rubber band is 6 cm long. How long will the rubber band be when it is stretched to be 3 times as long?	A red hat costs $18 and that is 3 times as much as a blue hat costs. How much does a blue hat cost? *Measurement example*. A rubber band is stretched to be 18 cm long and that is 3 times as long as it was at first. How long was the rubber band at first?	A red hat costs $18 and a blue hat costs $6. How many times as much does the red hat cost as the blue hat? *Measurement example*. A rubber band was 6 cm long at first. Now it is stretched to be 18 cm long. How many times as long is the rubber band now as it was at first?
General	a x b = ?	a x ? = p , and p ÷ a = ?	? x b = p , and p ÷ b = ?

ESSENTIAL QUESTIONS

- How can we find evidence to support our conclusions?
- What happens in division when there are zeroes in both the divisor and the dividend?
- How are remainders and divisors related?
- What is the meaning of a remainder in a division problem?

MATERIALS

- "What is 2,500 ÷ 300?" recording sheet

GROUPING

Partner or Individual Task

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Part 1

Students explore why dividing by zero is undefined.

Task Directions

Start this task with a whole group discussion regarding division and zero. Remind students about the relationship between multiplication and division and the product when one of the factors is zero. Then pose the following problem.

> What happens when you divide by zero?
> Use multiplication to justify your answer.
> Were you surprised by your findings? Why or why not?

Regardless what approach the students elect to take with this task, when justifying using multiplication, they should notice that something strange happens.

For instance, if they choose to divide using a dividend of 12, they may discover something similar to the following:

$12 \div 12 = 1$	$12 = 12 \times 1$
$12 \div 6 = 2$	$12 = 6 \times 2$
$12 \div 4 = 3$	$12 = 4 \times 3$
$12 \div 3 = 4$	$12 = 3 \times 4$
$12 \div 2 = 6$	$12 = 2 \times 6$
$12 \div 1 = 12$	$12 = 1 \times 12$
$12 \div 0 = ?$	$12 = 0 \times ?$

If students choose to use a fact family they will have similar results.

If	$2 \times 4 = 8$,	then	$8 \div 4 = 2$
If	$4 \times 2 = 8$,	then	$8 \div 2 = 4$

Following the same pattern:

If	$0 \times 8 = 0$,	then	$0 \div 8 = 0$
If	$8 \times 0 = 0$,	but	$0 \div 0 \neq 8$

After students have had time to explore division with zero and share their findings explain that because any number multiplied by zero is zero, the last situation in both examples is impossible. **Therefore, division by zero is not possible and we call it "undefined".**

Some students may have noticed that occasionally when using a computer or calculator, they are given an error message. Frequently that is caused by situations such as dividing by zero. Now that they understand why this may happen, they may enjoy playing with a computer or calculator to verify this message.

History also has interesting situations that have occurred due to division by zero. The USS Yorktown had a divide by zero error on September 21, 1997. This caused the ship's propulsion system to fail.

Part II

Students determine whether a child's work is mathematically sound and give evidence for their conclusions.

Task Directions

Students will follow the directions below from the "What is 2,500 ÷ 300?" recording sheet.

Steven says the answer to 2500 ÷ 300 is 8, with a remainder of 1. He said, "My reason is because you can just cross out two 0s in both numbers to make it 25 ÷ 3. The answer to 25 ÷ 3 is 8, with a remainder of 1." Is he correct? Why or why not?

FORMATIVE ASSESSMENT QUESTIONS

- What is the value of the one left over? How do you know?
- What is the number expression you are solving?
- Is it helpful to cancel out zeroes if you have them in both the dividend and divisor? Why or why not?
- What effect does a set of zeroes in the divisor and dividend have on the quotient? On the remainder?

DIFFERENTIATION

Extension

- Using a problem such as 208 divided by 30, have students explain and give evidence for ignoring the zeroes or using them as a shortcut to solving this division problem. Require an explanation that uses multiple representations to explain their conclusions.

Intervention

- Have students to use smaller numbers 50 divided by 10, have student to model or illustrate the problem and explain their thought process in solving the problem.

Name _____ Date _____

What is 2,500 ÷ 300?

Steven says the answer to 2500 ÷ 300 is 8, with a remainder of 1. He said, "My reason is because you can just cross out two 0s in both numbers to make it 25 ÷ 3. The answer to 25 ÷ 3 is 8, with a remainder of 1." Is he correct? Why or why not?

Constructing Task: My Son is Naughty

Adapted from: My Son is Naughty, nzmaths

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.OA.4 Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

BACKGROUND KNOWLEDGE

This standard requires students to demonstrate understanding of factors and multiples of whole numbers. Students should understand the process of finding factor pairs so they can do this for any number 1-100,
Example: Factor pairs for 96: 1 and 96, 2 and 48, 3 and 32, 4 and 24, 6 and 16, 8 and 12.
Multiples can be thought of as the result of skip counting by each of the factors. When skip counting, students should be able to identify the number of factors counted e.g., 5, 10, 15, 20 (there are 4 fives in 20).
Example:
Factors of 24: 1, 2, 3, 4, 6, 8,12, 24
Multiples: 1, 2, 3, 4, 5…24
2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24
3, 6, 9, 12, 15, 18, 21, 24
4, 8, 12, 16, 20, 24
8, 16, 24
12, 24
24
To determine if a number between 1-100 is a multiple of a given one-digit number, some helpful hints include the following:
• all even numbers are multiples of 2
• all even numbers that can be halved twice (with a whole number result) are multiples of 4
• all numbers ending in 0 or 5 are multiples of 5

ESSENTIAL QUESTIONS

- What are factors?
- How do I determine the factors of a number?

MATERIALS

- My Son is Naughty recording sheet

GROUPING

Partners

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Here we have a problem (read problem below) that looks impossible to solve at first glance. Ray was certainly right to say that the '36 and 13' part is insufficient information to solve the problem. But surely knowing the additional information that Jack's smallest son is very naughty can't help at all? Where is the extra mathematical information there that enables Ray to solve the problem? It's worth writing down *exactly* what key pieces of information you actually have. The trick is in first finding out as much as you can from the '36 and 13' piece of information. Once you have done that what more do you need to know?

This is an example of a problem where seemingly irrelevant information enables the solution to be found. It is a rare kind of problem at school level. But we often get problems in life where apparently useless information turns out to be a key factor in its solution.

Solution
There are three key pieces of information here. These are:

- the product of the ages is 36;
- the sum of the ages is 13;
- the youngest of Jack's sons is very naughty.

Let's work with the three pieces of information separately.
Suppose that the children are A, B and C. What can we tell about them from the fact that the product of their ages is 36? What three numbers multiplied together give you 36? Or another way, how can you decompose 36 into three factors?
Perhaps the best way to do this is to work systematically as we have done in the table below. Start with 36, 1, and 1 and work downwards in the sense that the highest factor gets smaller.
But the second key idea is that the sum of the ages of the children is 13. How can we use this fact? In terms of the factors of 36, this just means that the sum of the factors is 13.

In the table we have listed the sums of all of the factors.

A's age	B's age	C's age	Sum of their ages
36	1	1	38
18	2	1	21
12	3	1	16
9	4	1	14
9	*2*	*2*	*13*
6	*6*	*1*	*13*
6	3	2	11
4	3	3	10

From the table we can see that there are two lots of ages (factors of 36) that add up to 13. These are 9, 2, 2 and 6, 6, 1.

It's not surprising that there are two answers. If there was only one, Ray would have been able to solve the problem without any further clues. But what possible help can it be to know that Jack's youngest son is very naughty?

The point here is that Jack has a youngest son! He doesn't have two youngest sons that are the same age. So 9, 2, 2 can't be the answer. The answer has to be 6, 6, 1, where there is a youngest son whose age is 1.

Ray correctly identified the ages of Jack's sons as 6 years, 6 years and 1 year.

Task Directions

Students will follow the directions below from the "My Son is Naughty" recording sheet.

Jack and Ray were at the football game. Ray's team was winning so Jack decided to give Ray a hard time. So Jack said, "Did you know that today is my three sons' birthday?" "How old are they?" Ray inquired. "I'll give you a hint. The product of their ages is 36 and the sum of their ages is 13," Jack replied. "That's no help," said Ray. So Jack weakened and gave him another clue. "O.K. My youngest son is very naughty." "Nothing to it," exclaimed Ray and he told Jack the correct ages of his sons.

How did Ray figure out the correct answer and what are Jack's sons' ages?

FORMATIVE ASSESSMENT QUESTIONS

- What is the problem asking you to find out?
- What are the important ideas in this problem?
- Can you summarize the problem in your own words?
- What strategies might you be able to use?
- Do you think it is useful to make a table? If so, how?
- What do you understand from the statement "All my three children are celebrating their birthday today"?
- Do you think the last hint is very important? In what way?
- How many possible answers are there that satisfy the first two hints?

- Have you considered all the cases?
- Have you checked your solutions? Does it look reasonable?
- Are there any other solutions?

DIFFERENTIATION

Extension

- Make up a similar problem to this one. Do this first by seeing if you can find numbers other than 36 and 13 that will work the same way. Then reword the problem using these new numbers.

Intervention

- Provide students with a table similar to the one above to fill in the information.

Name _____ Date _____

My Son is Naughty

Jack and Ray were at the football game. Ray's team was winning so Jack decided to give Ray a hard time. So Jack said "Did you know that today is my three sons' birthday?" "How old are they?" Ray inquired. "I'll give you a hint. The product of their ages is 36 and the sum of their ages is 13," Jack replied. "That's no help," said Ray. So Jack weakened and gave him another clue. "O.K. My youngest son is very naughty." "Nothing to it," exclaimed Ray and he told Jack the correct ages of his sons.

How did Ray figure out the correct answer and what are Jack's sons' ages?

Practice Task: The Factor Game

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.OA.4 Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite

STANDARDS FOR MATHEMATICAL PRACTICE:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

BACKGROUND KNOWLEDGE

This standard requires students to demonstrate understanding of factors and multiples of whole numbers. Students should understand the process of finding factor pairs so they can do this for any number 1-100,
Example: Factor pairs for 96: 1 and 96, 2 and 48, 3 and 32, 4 and 24, 6 and 16, 8 and 12.
Multiples can be thought of as the result of skip counting by each of the factors. When skip counting, students should be able to identify the number of factors counted e.g., 5, 10, 15, 20 (there are 4 fives in 20).
Example:
Factors of 24: 1, 2, 3, 4, 6, 8,12, 24
Multiples: 1, 2, 3, 4, 5…24
2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24
3, 6, 9, 12, 15, 18, 21, 24
4, 8, 12, 16, 20, 24
8, 16, 24
12, 24
24
To determine if a number between1-100 is a multiple of a given one-digit number, some helpful hints include the following:
• all even numbers are multiples of 2
• all even numbers that can be halved twice (with a whole number result) are multiples of 4
• all numbers ending in 0 or 5 are multiples of 5

ESSENTIAL QUESTIONS

- What are factors?
- How do I determine the factors of a number?

MATERIALS

- Crayons
- Game board

GROUPING

Partners

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

One way to introduce this task is to model the first one or two steps on the overhead. Discuss the patterns students see. Write these on the board or chart paper as students share them.
Each group will complete a game board, however students need to answer questions separately. Let students share their observations. Record these on a chart or the board.

Task Directions
You and your partner will have a different colored crayon or colored pencil. The first move is granted to the person wearing the lightest colored shirt.
STEP 1: Partner A will use their color and color any number 1-99.
STEP 2: Partner B will then color in all the factors for the number that Partner A just colored in.
STEP 3: Once Partner B has colored in all factors, Partner B will color in any number 1-99, just like Partner A did in the beginning of the game.
STEP 4: Now it is Partner A's turn to color in all the factors for the number that Partner B filled in. Continue the steps until the entire number chart is colored in.
STEP 5: Go back to your number chart and count how many prime numbers you have. You earn 2 points for each prime number you colored in.
STEP 6: Answer the questions on the back of this page.

****IMPORTANT: If a number is already colored in, you cannot color that box and you lose that number.**

FORMATIVE ASSESSMENT QUESTIONS

- **How do you know you have found all of the factors?**
- **What representations did you use to find the factors of ____?**
- **Did you notice any patterns in the factors you found?**
- **What strategies did you use to choose a number?**

DIFFERENTIATION

Extension

- Students in need of an extension could extend the number chart to 150 or 200.
- Students in need of an extension could create restrictions for the game to make it more challenging, such as "no even numbers can be chosen for the first two turns."

Intervention

- Students work in a small group setting with teacher and only use numbers 1-50 on the game board.

THE FACTOR GAME

0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
10	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
20	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**
30	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**
40	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**
50	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**
60	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**
70	**71**	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**
80	**81**	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**
90	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**

Name_____ Date_____

1. List all of your composite numbers. _____

   _____

   _____

   _____

2. List all of your prime numbers. _____

   _____

   _____

   _____

3. If a number is divisible by 2,3,5 is it a composite number? How do you know?

   _____

   _____

   _____

   _____

4. Long ago, people observed the sun rising and setting over and over at about equal intervals. They decided to use the amount of time between two sunrises as the length of a day. They divided the day into 24 hours. Use what you know about factors to answer these questions:

   a. Why is 24 a more convenient choice than 23 or 25? _____

      _____

      _____

   b. If you were to select a number different from 24 to represent the hours in a day, what number would you choose? Why? _____

      _____

      _____

      _____

Scaffolding Task: Investigating Prime and Composite Numbers

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.OA.4 Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

BACKGROUND KNOWLEDGE

This standard requires students to demonstrate understanding of factors and multiples of whole numbers. This standard also refers to prime and composite numbers. Prime numbers have exactly two factors, the number one and their own number. For example, the number 17 has the factors of 1 and 17. Composite numbers have more than two factors. For example, 8 has the factors 1, 2, 4, and 8. A common misconception is that the number 1 is prime, when in fact; it is neither prime nor composite. Another common misconception is that all prime numbers are odd numbers. This is not true, since the number 2 has only 2 factors, 1 and 2, and is also an even number.

Prime vs. Composite:

A prime number is a number greater than 1 that has only 2 factors, 1 and itself. Composite numbers have more than 2 factors. Students investigate whether numbers are prime or composite by building rectangles (arrays) with the given area and finding which numbers have more than two rectangles (e.g. 7 can be made into only 2 rectangles, 1 x 7 and 7 x 1, therefore it is a prime number) or by finding factors of the number.

ESSENTIAL QUESTIONS

- How do I identify prime numbers?
- How do I identify composite numbers?
- What is the difference between a prime and a composite number?

MATERIALS

- Counters or color tiles

GROUPING

Partners

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students will discover the difference between prime and composite numbers through the making of arrays using color tiles or counters.

Task Directions
Have students create a T-chart and label one side only two ways and the other more than two ways. Instruct students to answer the following questions and fill in the T-chart with the answers to the questions.
How many ways can you make 2? Use your counters.
How many ways can you make 8? Use your counters.
How many ways can you make 9? Use your counters.
How many ways can you make 11? Use your counters.
How many ways can you make 24? Use your counters.
How many ways can you make 41? Use your counters.
How many ways can you make 15? Use your counters.
How many ways can you make 13? Use your counters.

Have a discussion with students about their observations of the number of arrays made for each number. Introduce the vocabulary words prime and composite.

Have students complete the activity with the following comparisons.
Use your counters to determine if 21 is prime or composite. Explain your answer.
Use your counters to determine if 14 is prime or composite. Explain your answer.
Use your counters to determine if 7 is prime or composite. Explain your answer.
Use your counters to determine if 4 is prime or composite. Explain your answer.

FORMATIVE ASSESSMENT QUESTIONS

- Are those all the ways you can make that number?
- What kind of number has only two ways it can be made?
- What kind of number has more than two ways it can be made?
- How do you know this number is prime? Composite?

DIFFERENTIATION

Extension
- Have students investigate using the counters to determine if 1 is prime or composite.

Intervention
- Provide students with a list of numbers which are prime and a list of numbers which are composite. Have students prove the numbers are on the correct list by making arrays to determine the number of ways each number can be made.

Practice Task: Prime vs. Composite

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.OA.4 Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite

STANDARDS FOR MATHEMATICAL PRACTICE

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5. Use appropriate tools strategically.
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BACKGROUND KNOWLEDGE

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ESSENTIAL QUESTIONS

- How do I identify prime numbers?
- How do I identify composite numbers?
- What is the difference between a prime and a composite number?

MATERIALS

- Prime vs. Composite recording sheet

GROUPING

Individual

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Students will follow the directions below from the "Prime vs. Composite" recording sheet.

List the factors and draw lines to connect factor pairs. Write P for prime, C for composite, or N for neither.

What is the only even prime number? Use a diagram to explain how you know the number is prime.

How can you determine if a number is prime, composite, or neither by looking at the factors of the number? Explain your answer.

FORMATIVE ASSESSMENT QUESTIONS

- What are factors?
- How do you know you have found all the factors of that number?
- What kind of number has only two factors?
- What kind of number has more than two factors?
- How do you know this number is prime? Composite?
- What kind of diagram will you use to show the only even prime number?

DIFFERENTIATION

Extension

- Have students investigate using the counters to determine if 1 is prime or composite.

Intervention

- Provide students with a list of numbers which are prime and a list of numbers which are composite. Have students prove the numbers are on the correct list by making arrays to determine the number of ways each number can be made.

Name _____ Date _____

Prime vs. Composite

List the factors and draw lines to connect factor pairs. Write P for prime, C for composite, or N for neither.

Number	Factors	P, C, or N
1. 8		
2. 19		
3. 30		
4. 1		
5. 42		
6. 29		

7. What is the only even prime number? Use a diagram to explain how you know the number is prime.

8. How can you determine if a number is prime, composite, or neither by looking at the factors of the number? Explain your answer.

Scaffolding Task: Finding Multiples

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.OA.4 Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite

STANDARDS FOR MATHEMATICAL PRACTICE:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

BACKGROUND KNOWLEDGE

This standard requires students to demonstrate understanding of factors and multiples of whole numbers. Students should understand the process of finding factor pairs so they can do this for any number 1-100,
Example: Factor pairs for 96: 1 and 96, 2 and 48, 3 and 32, 4 and 24, 6 and 16, 8 and 12.
Multiples can be thought of as the result of skip counting by each of the factors. When skip counting, students should be able to identify the number of factors counted e.g., 5, 10, 15, 20 (there are 4 fives in 20).
Example:
Factors of 24: 1, 2, 3, 4, 6, 8,12, 24
Multiples: 1, 2, 3, 4, 5…24
2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24
3, 6, 9, 12, 15, 18, 21, 24
4, 8, 12, 16, 20, 24
8, 16, 24
12, 24
24
To determine if a number between1-100 is a multiple of a given one-digit number, some helpful hints include the following:
• all even numbers are multiples of 2
• all even numbers that can be halved twice (with a whole number result) are multiples of 4
• all numbers ending in 0 or 5 are multiples of 5

ESSENTIAL QUESTIONS

- What are multiples?

- How is skip counting related to identifying multiples?

MATERIALS

- Crayons
- Hundred chart

GROUPING

Individual

TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION

Look at the patterns that skip-counting sequence numbers make on a hundreds chart, e.g., the sequence of threes makes a diagonal pattern like this:

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Ask the students to predict other numbers in the threes sequence. Ask questions such as, "Will 41 be in the pattern? How do you know?" Point to numbers in the sequence (30 or less) and ask, "How many threes are in that number?" Ask the students to say or write the matching multiplication number sentence, e.g., "Seven times three is twenty-one" or 7 x 3 = 21.

Task Directions
Have students investigate the patterns for 2, 4, 5, and 6 using their hundred chart. Each sequence can be represented with a different color crayon.

FORMATIVE ASSESSMENT QUESTIONS

- What do you notice about this sequence?
- How many ____ are in that number?
- What number sentence represents this sequence?

DIFFERENTIATION

Extension

- Have students investigate the patterns for 7, 8, and 9 using their hundred chart. Each sequence can be represented with a different color crayon.

Intervention

- Students can practice the counting sequences in pairs with a calculator. If they enter + 3 and press the equals sign repeatedly, this will generate the sequence 3, 6, 9, 12, … as the calculator adds three repeatedly.

Hundreds Chart

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Constructing Task: Number Riddles

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.OA.4 Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

STANDARDS FOR MATHEMATICAL PRACTICE:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

BACKGROUND KNOWLEDGE

This standard requires students to demonstrate understanding of factors and multiples of whole numbers. Students should understand the process of finding factor pairs so they can do this for any number 1-100,
Example: Factor pairs for 96: 1 and 96, 2 and 48, 3 and 32, 4 and 24, 6 and 16, 8 and 12.
Multiples can be thought of as the result of skip counting by each of the factors. When skip counting, students should be able to identify the number of factors counted e.g., 5, 10, 15, 20 (there are 4 fives in 20).
Example:
Factors of 24: 1, 2, 3, 4, 6, 8,12, 24
Multiples: 1, 2, 3, 4, 5…24
2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24
3, 6, 9, 12, 15, 18, 21, 24
4, 8, 12, 16, 20, 24
8, 16, 24
12, 24
24
To determine if a number between1-100 is a multiple of a given one-digit number, some helpful hints include the following:
• all even numbers are multiples of 2
• all even numbers that can be halved twice (with a whole number result) are multiples of 4
• all numbers ending in 0 or 5 are multiples of 5

ESSENTIAL QUESTIONS

- How can we use clues and reasoning to find an unknown number?

MATERIALS

- "Number Riddles" Recording Sheet

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Students use logic, specifically deductive reasoning, to solve number riddles. This task gives students an opportunity synthesize their skills with multiples, factors, place value, and numeric expressions.

Comments

This task provides students with an opportunity to consolidate their understanding of factors and multiples, prime and composite numbers, place value, and problem solving. In order for students to be successful with this task, they should have an understanding of the elements required to solve the problem on the task sheet.

Solutions given below:

Riddle #1 463	Riddle #2 43	Riddle #3 7632
Riddle #4 485	Riddle #5 193	Riddle #6 347
Riddle #7 813	Riddle #8 1205	

Task Directions

Students work individually or in pairs to solve the number riddles provided on the "Number Riddles" task sheet.

FORMATIVE ASSESSMENT QUESTIONS

- How can you find the factors of a number? Multiples of a number?
- How do you know if a number is even? Odd?
- What operation do you use if you are finding a sum? Difference?

DIFFERENTIATION

Extension

- Have students write their own riddles on separate index cards. These can be collected and used as warm-ups, centers, problem solving activities, etc.
- These types of riddles can be used as warm-up problems to reinforce critical thinking and mathematical vocabulary. They can be adapted to include a variety of mathematical concepts.

Intervention

- Have students use the "Number Riddles" Recording Sheet as a tic-tac-toe task where students need to solve three riddles in a row, column, or diagonal.

Name _____ Date _____

Number Riddles Recording Sheet

Use the clues to solve these number riddles.

Riddle #1 – I am a 3-digit whole number between 400 and 650. My hundreds digit is divisible by 2 but not 3. My tens digit is a multiple of 3. My ones digit is ½ of my tens digit. All of my digits are different. The sum of my digits is 13. What number am I?	**Riddle #2 –** I'm a 2-digit whole number between 30 and 80. My tens digit is one more than my ones digit. I am a prime number. What number am I?	**Riddle #3 –** I am a four-digit whole number greater than 6000. My thousands digit is prime. My ones digit is the only even prime number. I am divisible by 4. My tens digit is ½ my hundreds digit. All of my digits are different. What number am I?
Riddle #4 – I'm an odd number between 250 and 700. I am divisible by 5. My tens digit is 3 more than my ones digit. The sum of my digits is 17. What number am I?	**Riddle #5 –** I am between 150 and 375. All of my digits are odd. My tens digit is 3 times my ones digit. My hundreds digit is my smallest digit. None of my digits is the same. What number am I?	**Riddle #6 –** I am a three-digit whole number between 300 and 500. My ones digit is the largest single digit prime number. My tens digit is even. The sum of my digits is 14. What number am I?
Riddle #7 – I am a 3-digit odd number greater than 800. My tens digit is 2 less than my ones digit. I am divisible by 3 but not 5. The sum of my digits is 12. What number am I?	**Riddle #8 –** I am a four-digit whole number. I am divisible by 5 but not 10. My thousands digit is neither prime nor composite. My hundreds digit is 2 more than my tens digit. The sum of my digits is 8. What number am I?	<u>Challenge</u> Create two riddles of your own. Include the answer to your riddle on the back of the paper.

Constructing Task: Earth Day Project

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.OA.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

STANDARDS FOR MATHEMATICAL PRACTICE:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

BACKGROUND KNOWLEDGE

Students should have had prior experiences working with and extending patterns. Also, students should be able to graph points easily. After points are graphed, ask students if it is appropriate to connect the points. (In this situation it is not appropriate because students collect cans just once a day and they do not (typically) collect a fraction of a can. However, students may want to line up the points along the edge of a ruler or sheet of paper to make predictions using the graph.

ESSENTIAL QUESTIONS

- How can we determine the relationships between numbers?
- How can we use patterns to solve problems?
- How can we describe a pattern?

MATERIALS

- "Earth Day Project" student recording sheet, 3 pages
- Blocks to use to build the pattern (for those students who wish to use them)

GROUPING

Individual/Partner Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this activity, students consider a real-world situation involving a set of data. Using the data, students determine the pattern formed by the numbers in the data set. Then they extend the pattern and use the pattern to make predictions.

Comments

This activity may be used as an assessment, as a learning task, or as an independent follow-up activity for reinforcement or review, depending on the instruction that occurred prior to this task.

For Teacher information only:

Teachers should give some thought to this pattern before presenting this problem to their students. Start by looking at the relationship of the numbers in the two columns. Teachers should try to express this relationship in words. See the examples below.
Some students may think about the pattern in this way:

Day 1 shows a column of 4 and 1 more.
Day 2 shows 2 columns of 4 and 1 more.
Day 3 shows 3 columns of 4 and 1 more
Day 4 will show 4 columns of 4 and 1 more.

Therefore the pattern is generated by 4× ☐ + 1, where ☐ represents the number of the day. While it is not expected that students will be able to generalize this pattern to an expression (except possibly as an extension for some students), asking students to talk about what they see changing/growing in the pattern is important to help them develop an awareness of the structure of a pattern.

Keep in mind some students may see the pattern differently. For example, it is possible for students to describe it as follows:

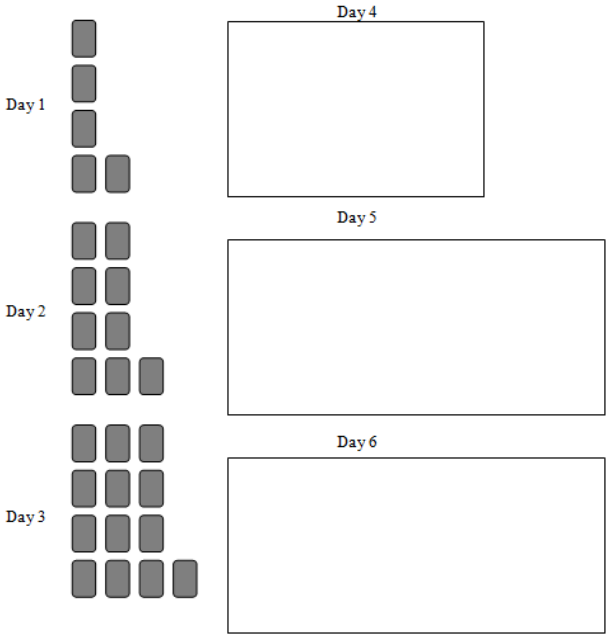
Day 1shows a 2 × 4 rectangle with 3 missing.
Day 2 shows a 3 × 4 rectangle with 3 missing.
Day 3 shows a 4 × 4 rectangle with 3 missing.
Day 4 will show a 5 × 4 rectangle with 3 missing.

Of course, this can be written as (☐ + 1) × 4 – 3, with the ☐ representing the number of the day. Using the distributive property gives you 4 × ☐ + 4 – 3, which is the same as 4 × ☐ + 1. Asking students about their thinking is a good way to understand how students see the relationship of the numbers in the two columns.

Task Directions

Students will follow the directions below from the "Earth Day Project" student recording sheet.

> Fourth graders in Ms. Smith's class have decided to start a recycling project for Earth Day. They put a bin in the cafeteria to collect used aluminum cans. At the end of each school day, they take the bin back to their classroom and count the cans collected for the day. Ms. Smith's class is keeping notes about how many cans are being collected. It seems that the number of cans collected each day follows a pattern. If the pattern continues, sketch the number of cans collected on days 4-6 in the boxes below.



The students recorded the number of cans they collected each day in the t-table below. When they collect one hundred cans, the students can turn them in to the recycling center and earn money to be used for an upcoming field trip. If the pattern continues how many days will it take to collect at least 100 cans?

1. Use what you know about the cans collected in the first five days to make a prediction about how many days it will take to collect at least 100 cans. Show your work and explain in words why you predicted the number of days that you chose.
2. Continue the pattern in the t-table. Fill in the missing values.
3. Explain how you found the missing values in the t-table.
4. How many days will it take the class to collect enough cans for the field trip. Show all work and explain your thinking.
5. On the graph paper below, label the horizontal axis "Number of Days," label the vertical axis "Number of Cans." Label the horizontal axis 1-25 by 1s; label the vertical axis 1-100 by 5s. Make sure you start at zero. Plot the number of cans collected each day for days 1 - 5. If the pattern continues, use the graph to predict the number of cans the students will collect on the 25th day.

Day	Cans
1	5
2	9
3	13
4	17
5	21
6	____
7	____
8	____
9	____
10	____
•	
•	
•	
20	____
•	
•	
•	
100	____

FORMATIVE ASSESSMENT QUESTIONS

- What is changing each day in the pattern?
- How many cans will be collected on day 4? How do you know? How will the pattern look?
- How did you complete the chart? How do you know you are correct?
- What do you notice about the numbers in each column? What do you notice about how the numbers in each row are related?
- How did you find the number of cans collected on day 20? On day 100? How do you know your answers are correct?
- How do you plot points on a coordinate plane?

DIFFERENTIATION

Extension

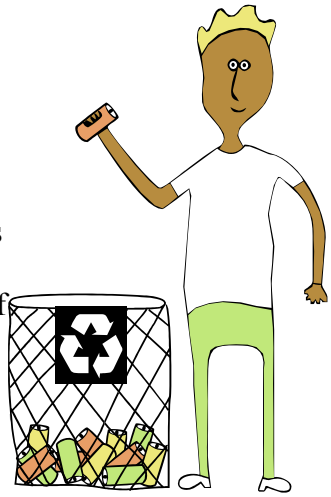
- Asks students to write in words what is happening in the pattern (i.e. each day the number of cans increases by 4; the number of cans each day can be found by multiplying the day number by 4 and adding 1 or the expression $4 \times \square + 1$ where $\square$ is the day number.). Also, ask students to make other predictions based on the graph and check their predictions using the expression $4 \times \square + 1$.

Intervention

- Some students will benefit by using manipulatives to help them demonstrate the problem with concrete objects prior to drawing a model or attempting to extend the pattern.

Name_____ Date _____

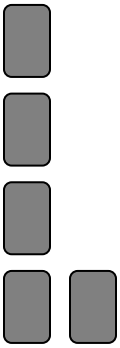
Earth Day Project



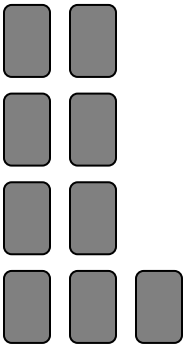
Fourth graders in Ms. Smith's class have decided to start a recycling project for Earth Day. They put a bin in the cafeteria to collect used aluminum cans. At the end of each school day, they take the bin back to their classroom and count the cans collected for the day. Ms. Smith's class is keeping notes about how many cans are being collected.

It seems that the number of cans collected each day follows a pattern. If the pattern continues, sketch the number of cans collected on days 4-6 in the boxes below.

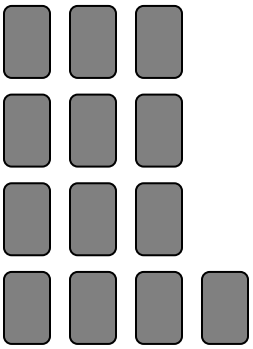
Day 1



Day 2



Day 3



Day 4

Day 5

Day 6

The students recorded the number of cans they collected each day in the t-table below. When they collect one hundred cans, the students can turn them in to the recycling center and earn money to be used for an upcoming field trip. If the pattern continues how many days will it take to collect at least 100 cans?

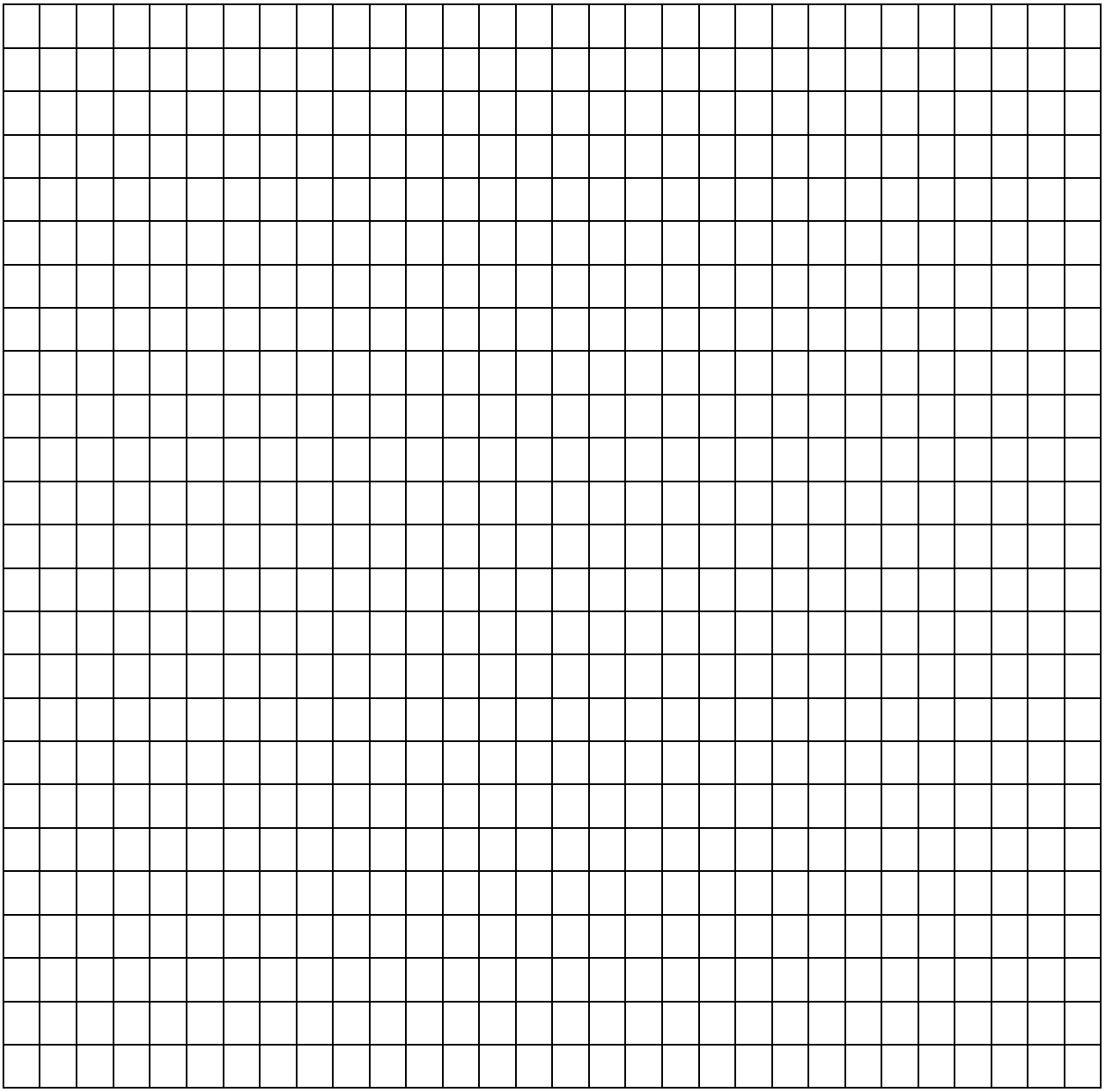
1. Use what you know about the cans collected in the first five days to make a prediction about how many days it will take to collect at least 100 cans. Show your work and explain in words why you predicted the number of days that you chose.

2. Continue the pattern in the t-table. Fill in the missing values.
3. Explain how you found the missing values in the t-table.

4. How many days will it take the class to collect enough cans for the field trip? Show all work and explain your thinking.

Day	Cans
1	5
2	9
3	13
4	17
5	21
6	____
7	____
8	____
9	____
10	____
• • •	
20	____
• • •	
100	____

5. On the graph paper below, label the horizontal axis "Number of Days," label the vertical axis "Number of Cans." Label the horizontal axis 1-25 by 1s; label the vertical axis 1-100 by 5s. Make sure you start at zero. Create a bar graph of the number of cans collected each day for days 1 - 5. If the pattern continues, use the graph to predict the number of cans the students will collect on the 25^{th} day.



Unit 1 Culminating Tasks

PERFORMANCE TASK: It's in the Numbers!

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STANDARDS FOR MATHEMATICAL CONTENT

MCC4.OA.3 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
MCC4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
MCC4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.

STANDARDS FOR MATHEMATICAL PRACTICE:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

BACKGROUND KNOWLEDGE

Students should have a thorough knowledge by this time of how to compare and order whole numbers. Students must be able to articulate how they know the sizes of digits in a given number and how to equate any number with its word form and/or expanded form. Students should know how to round to the nearest whole, ten, hundred, and thousand

ESSENTIAL QUESTIONS

- What kinds of things are large numbers used to measure?
- How can we tell which number among many large numbers is the largest or smallest
- How do people use data to make decisions in their lives?
- How does numerical data inform us when choosing a place to live?

MATERIALS

- "It's in the Numbers! Directions" Student Sheet
- "It's in the Numbers! Data Collection" Recording Sheet
- "It's in the Numbers! Questions" Recording Sheet

- Research materials
- Computers with Internet access
- Notebook paper

GROUPING

Individual Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

In this culminating task, students will collect data related to U.S. regional demographics, including population, precipitation, and area and use these data to draw conclusions about why people might choose to live there.

Comments

This task is intended to serve as a summative assessment. A sample rubric has been provided to support the use of this task as a culminating performance assessment. Students should be given a copy of the rubric as part of the teacher introduction to the assessment so they are aware of the rigor and quality of work that is expected. This task is appropriate to use in a variety of ways, including:

- Peer Review
- Display for parent night
- Portfolio

Task Directions

Students will follow the directions below from the "It's in the Numbers!" Recording Sheet.

> Your job is to work on a committee to compare life in different regions of the United States. People will use your information when deciding in which part of the country they want to live.

FORMATIVE ASSESSMENT QUESTIONS

- What is the best way to organize your research?
- When comparing numbers how can you check to be sure that the comparisons are correct?
- What strategy for rounding works best for you? Can you demonstrate and explain it to me or another classmate?
- Explain how you know the value of multi-digit number.
- What do the numbers in your chart tell you about a particular region?

DIFFERENTIATION

Extension

- Activities such as these lend themselves to extended exploration of analyzing data using whole to compare further U.S. demographics and/or countries all over the world. An additional website is offered for the purpose of extending student understanding: http://money.cnn.com/magazines/moneymag/bplive/2007/

Intervention

- Help students organize the task and break it into smaller steps.
- Limit the number of student choices in terms of states or research resources to help them use their time wisely.
- Limit the number of regions (not less than three) so students will be able to round and compare sufficient data while avoiding getting bogged down in the research process.

Name _____ Date _____

It's in the Numbers!

Directions

Your job is to work on a committee to compare life in different regions of the United States. People will use your information when deciding in which part of the country they want to live.

Step 1:

- Choose one state from each of the seven geographic regions of the country. Examples of possible states in each region are listed. Use the resources provided to decide which state you will research.
- The geographic regions are:
  - New England: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island
  - Mid-Atlantic: Delaware, Maryland, New Jersey, New York, Pennsylvania
  - Southeast: Florida, Georgia, North Carolina, South Carolina, Alabama
  - Midwest: Illinois, Iowa, Indiana, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin
  - Rocky Mountain: Colorado, Idaho, Montana, Nevada, Utah, Wyoming
  - Southwest: Arizona, California, New Mexico, Texas
  - Northwest: Alaska, Oregon, Washington

Step 2:

- Using appropriate resources, record the information required to complete your data chart.
- Resources such as the Internet, Atlases, Almanacs, and Encyclopedias provide excellent current data.
- Suggested websites for Internet research include:
  - http://www.census.gov/schools/facts/
  - http://www.ers.usda.gov/statefacts/
  - http://www.statemaster.com/index.php
  - http://lwf.ncdc.noaa.gov/oa/climate/online/ccd/nrmlprcp.html
  - http://www.allcountries.org/uscensus/411_normal_monthly_and_annual_precipitation_selected.html

Step 3:

- Answer the questions provided using the data charts on your own notebook paper. Explain your answers thoroughly using complete sentences and correct math vocabulary.

Name _____ Date_____

Region	State	Population	Population rounded to nearest _____	Precipitation in inches	Precipitation in inches rounded to nearest whole number	Size in square miles	Size rounded to nearest square mile
New England							
Mid-Atlantic							
Southeast							
Midwest							
Rocky Mountain							
Southwest							
Northwest							

Name _____ Date _____

It's in the Numbers!

Questions

1. If someone wanted to live in a region with a large population, which region would you recommend to them and why?

_____

_____

_____

2. If someone wanted to live in a region that didn't rain much, which region would you recommend to them and why?

_____

_____

_____

3. If someone wanted to live in a region that had lots of space in which to move around without a lot of people, which region would you recommend to them and why?

_____

_____

_____

4. Which two regions seem most like each other? How do you know?

_____

_____

_____

5. Write <u>all</u> of the exact data (not rounded data) for one state in expanded form and word form.

_____

_____

_____

6. In which region would you prefer to live? Explain why, using the data you collected.

_____

_____

_____

_____

_____

4th Grade Math Unit 1 Performance Assessment RUBRIC

Standard ↓	Exceeding	Meeting	Not Yet Meeting
MCC4.OA.3 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	Student explanation gives thorough description of numbers involved, the relative size of those numbers in relation to other, and how the number might impact a person's decision to live in that region.	Student explanation in regards to precipitation demonstrates an understanding of the relative size of various numbers.	Student response shows an inability to accurately equate standard form with either word name or expanded form or both.
MCC4.NBT.2 Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	Student response shows all correct word and/or expanded form for whole numbers	Student responses have minor errors in word and/or expanded form for whole numbers.	Student response has errors in word and/or expanded form for whole numbers.
MCC4.NBT.3 Use place value understanding to round multi-digit whole numbers to any place.	A student response shows all numbers are rounded to the nearest whole number correctly.	Student responses have minor errors in rounding whole numbers.	Student response has errors in whole number rounding and expands forms.

Performance Task: School Newspaper

STANDARDS FOR MATHEMATICAL CONTENT

MCC4.OA.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
MCC4.OA.2 Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.
MCC4.OA.3 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.
MCC4.OA.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.
MCC4.NBT.5 Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
MCC4.NBT.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

STANDARDS FOR MATHEMATICAL PRACTICE:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

ESSENTIAL QUESTIONS

- How do multiplication, division, and estimation help us solve real world problems?
- How can we organize our work when solving a multi-step word problem?
- How can a remainder affect the answer in a division problem?

MATERIALS

"School Newspaper" recording sheet

GROUPING

Partner or Individual Task

TASK DESCRIPTION, DEVELOPMENT AND DISCUSSION

Comments

Multiplication, division, and rounding are essential elements of this task. You may wish to use the actual number of students within your school to make this task more meaningful for your class. Also, you may need to adjust the other numbers within the task to ensure the essential elements of the task are addressed.

While this task is intended to serve as a summative assessment, it also may be used for teaching and learning. It is important that all elements of the task be addressed throughout the learning process so that students understand what is expected of them. This task is appropriate to use in a variety of ways, including:

- Peer Review
- Display
- Portfolio

Task Directions

Students will follow the directions below from the "School Newspaper" recording sheet.

- Your class has agreed to publish a 26 page school-wide newspaper for each of the 1,740 students. Both sides of the paper will be printed to help save money. A package of 50 sheets of special newsprint paper costs $1.00.
- Find the cost of publishing the newspaper if you can make the copies at school for no additional cost other than purchasing the paper. Explain how you know.
- The students in your class do not have the money to pay for this much paper and your teacher does not have it in her budget. To solve this problem, it was agreed to ask local businesses to purchase advertisements to place in the newspaper. The prices that your class decided to charge are:

o Full-page $50
o Half-page $25
o Fourth-page $15

- What is the fewest number of advertisement pages that you will need in order to pay for the paper and not make more than $15 over your expenses? How do you know?
- What is the largest number of pages that you will need to pay for the paper without going more than $15 over what you need to spend? Explain your thinking.
- Show a combination of all three sizes that would pay for the paper without using more pages than the largest number of pages needed to pay for the paper.

FORMATIVE ASSESSMENT QUESTIONS

- Can you describe your strategy for solving this problem?
- Explain how you know your answer is correct
- Is there any mental math you are using? Explain.
- How are you organizing the information in the problem to help you solve it?

- How do the remainders in this problem affect the answers?

DIFFERENTIATION

Extension

- How many extra copies of the newspaper could you make using the paper that you purchased? How do you know?
- If the school decided to charge $20 for the use of the copy machine, how would this change your answers?
- Instead of selling advertisements, your class decided to sell the newspapers to students. If they will be sold at a cost of $0.25, you are not sure that every student will buy one. Even though you are printing enough newspapers for every student, will you make enough money to cover the cost of the paper if only 500 students purchase one? Explain your thinking.
- If each of the teachers in your school also wanted a copy of the newspaper, show how that would change your results.
- What would you need to charge for the advertisements if you wanted them to use no more than 2 pages? Tell why.
- If the school will not allow you to use the copy machine and you have to use a local printer, how would this affect the costs?

Intervention

- Have students work in small groups or with a partner.
- Adjust the number of copies needed for the newspapers.

Name _____ Date _____

School Newspaper

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  o Full-page $50
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- What is the fewest number of advertisement pages that you will need in order to pay for the paper and not make more than $15 over your expenses? (You may use a fraction of a page for advertising.) How do you know?

- What is the largest number of pages that you will need to pay for the paper without going more than $15 over what you need to spend? (You may use a fraction of a page for advertising.) Explain your thinking.

- Show a combination of all three sizes that would pay for the paper without using more pages than the largest number of pages needed to pay for the paper.