

Alaska Mathematics Standards Math Tasks Grade 2



Where Am I On The Number Line?

Content Standard

- 2.NBT.1.** Model and identify place value positions of three digit numbers.
Include:
- 100 can be thought of as a bundle of ten tens --called a "hundred".
 - The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).
- 2.NBT.2.** Count up to 1000, skip-count by 5s, 10s and 100s
- 2.NBT.3.** Read, write, order up to 1000 using base-ten numerals, number names and expanded form.

Mathematical Practices

- 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. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.
- 5. Use appropriate tools strategically.**
- 6. Attend to precision.**
- 7. Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.**
8. Look for and express regularity in repeated reasoning.

Task Description

In this task students will review counting up and counting back to get an answer. (Adapted from: <http://www.Mathwire.com>)

Materials:

- Spinners, one per pair of students
- 0–100 student number lines
- 0 –100 class number line made from adding machine tape or sentence strips
- Paper clips or clothes pins
- Empty number line set –One per student

****For spinners and number lines please see (pg. 24):**

<http://tinyurl.com/MathTasks-Grade2-Unit1>

Part I

Introduce the game with the whole class before assigning partners to play. Using adding machine tape or sentence strips, create a large 0-100 number line. Use this number line to introduce "Where Am I on the Number Line?" Students will begin with their clothespin on "50" and then spin the spinner. Each time the spinner is spun, a student will move a paper clip or clothespin forward or back the appropriate number of spaces either up or down the number line. Have students give a number sentence that matches their move. The students will take turns adding to or subtracting from their number until one player reaches or passes 100. This student is the winner. If they spin a number that is more than they can subtract they lose that turn.

When this happens make sure to discuss the fact that there ARE numbers on the other side of zero, negative numbers, but for now we are only working with/talking about the whole numbers.

Example: The player's clothespin is on 23 and he spins a -6. He will move the clothespin back and tell the class, "23 -6 = 17."

Student Directions

- Each player puts a paper clip or clothespin on **50**.
- Place a transparent spinner on the game spinner. (Use A and then B)
- Player A spins the spinner, adds or subtracts that number to **50** and places the paper clip on that answer.
- Player B spins the spinner and moves as above.
- Player A spins the spinner, adds or subtracts the number to where his/her paper clip is, then moves the paper clip to the new answer.
- Player B does the same.
- The game continues until one of the players **reaches or passes 100** on the number line. (Alternate version: Students could consider it a win when they reach/pass 0 or 100. The spinners are slightly weighted to favor passing 100. However, a student who has spun a lot of subtraction spins might get frustrated. S/he may remain engaged longer if reaching 0 also counted as a win. Further, one could easily adapt the spinner to balance it so either 0 **or** 100 is equally likely.)
- The first player to reach or pass 100 wins the game.

Part 2

Display a large number line and cover up most of the numbers. Select a mystery number and have a student place a marker where they think that number would lie on the number line. Check the location by uncovering the corresponding numbers. Distribute **folded** empty number lines and paper clips to each student. Have students place their empty number line facing up with the corresponding number line on the back. The paper clip can be placed on the fold and used as a slider/marker. Call out a mystery number and encourage students to locate the number on their empty number lines with the paper clip. Students can then flip the number line over to check their answers. Discuss the correct location with the class.

**Corresponding Van de Walle activities can be found on pages 142 and 143 in Teaching Student Centered Mathematics K-3. These number line activities should be incorporated into daily classroom routines to help students learn the relative magnitude of numbers.

- Activity 5.17 –"Who Am I?"
- Activity 5.18 –"Who Could They Be?"
- Activity 5.19 –"Close, Far, and in Between"

Part 3

Vary the games above by implementing skip counting by, 2's, 5's, and 10's into the number line activities. For example, after stating a number have students place a marker on the number that is 10 more. Continue counting by 10's until you reach the end of the number line. How do the numbers change? Do the students recognize a pattern?

Variation: As the unit progresses, change the number lines to show counts by 5's, 10's or 100's. Using dice, each roll of the dice has to be changed into the corresponding multiple of that number. Example: If a student rolls a 3 on a 10's number line that roll will represent 30.

Number Talk:

Strategy: Making 10

Making tens is an important focus in the primary grades. By now students should be able to break numbers apart quickly to make ten. The focus of this strategy is to be able to utilize fluency with ten to expedite adding. Being able to take numbers apart with ease, or fluency, is the key to using this strategy. This strategy encourages students to "make 10" as they add mentally. "The sequence of problems within a given number talk allows students to apply strategies from previous problems to subsequent problems."

For Example:

$$\begin{aligned}8 + 9 \\(7 + 1) + 9 \\7 + (1 + 9) \\7 + 10 = 17\end{aligned}$$

Or

$$\begin{aligned}8 + 9 \\8 + (2 + 7) \\(8 + 2) + 7 \\10 + 7 = 17\end{aligned}$$

By changing the 8 to a $7 + 1$ the student can restructure the problem to create a combination of 10 with $1 + 9$.

The student could also choose to make a 10 by breaking apart the 9 into $7 + 2$ and combining the 2 with the 8 to create 10.

Below is a Making Tens number talk to try with your students:

$$\begin{aligned}7 + 3 \\7 + 5 + 3 \\3 + 6 + 7\end{aligned}$$

Please refer to pgs. 125-128 in *Number Talks* by Sherry Parrish for more examples of number talks that will further develop this strategy.

Background Knowledge/Common Misconceptions:

(Information adapted from Mathematics Navigator: Misconceptions and Errors, America’s Choice) Some students may not move beyond thinking of the number 358 as 300 ones plus 50 ones plus 8 ones to the concept of 8 singles, 5 bundles of 10 singles or tens, and 3 bundles of 10 tens or hundreds. Use base-ten blocks to model the collecting of 10 ones (singles) to make a ten (a rod) or 10 tens to make a hundred (a flat). It is important that students connect a group of 10 *ones* with the word *ten* and a group of 10 tens with the word *hundred*.

1. When counting tens and ones (or hundreds, tens, and ones), the student misapplies the procedure for counting on and treats tens and ones (or hundreds, tens, and ones) as separate numbers. When asked to count collections of bundled tens and ones such as 32, student counts 10, 20, 30, 1, 2, instead of 10, 20, 30, 31, 32.
2. The student has alternative conception of multi-digit numbers and sees them as numbers independent of place value. Student reads the number 32 as “thirty-two” and can count out 32 objects to demonstrate the value of the number, but when asked to write the number in expanded form, she writes “3 + 2.” Student reads the number 32 as “thirty-two” and can count out 32 objects to demonstrate the value of the number, but when asked the value of the digits in the number, she responds that the values are “3” and “2.”
3. The student recognizes simple multi-digit numbers, such as thirty (30) or 400 (four hundred), but she does not understand that the position of a digit determines its value. Student mistakes the numeral 306 for thirty-six. Student writes 4008 when asked to record four hundred eight.
4. The student misapplies the rule for reading numbers from left to right. Student reads 81 as eighteen. The teen numbers often cause this difficulty.
5. The student orders numbers based on the value of the digits, instead of place value. $69 > 102$, because 6 and 9 are bigger than 1 and 2.

Formative Assessment Questions:

- If you are on the number _____, what number would you land on next if your spinner landed on _____?
- What number is 10 less than (10 more than, 5 less than,...)_____?
- What numbers are the next door neighbors of _____?

Differentiation:**Extension**

- Make a number line with only even or odd numbers so that students create a mental image of what the numeral's "neighbor" is on the number line.
- Have students evaluate the spinners in the Where Am I on the Number Line game. Ask students if it would be fair to say that passing either zero or 100 would be a fair way to play this game. (The spinners slightly favor 100.) Have students design a spinner that would make either score of 0 or 100 equally likely.

Intervention

- Reduce the number line to numerals less than 20 and use dice, either one or two depending on the level of the student. As the student becomes more proficient, the number line may be lengthened to include larger numbers.
- Use a spinner and/or number line with fewer numbers.

Vocabulary:

Less than
More than
Next Door Neighbors

References:

Parrish, Sherry. Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5. Sausalito: Math Solutions Publications, 2010

Alaska Mathematics Standards Math Tasks Grade 2



The Importance of Zero

Content Standard

- 2.NBT.1.** Model and identify place value positions of three digit numbers. Include:
- 100 can be thought of as a bundle of ten tens --called a "hundred".
 - The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).
- 2.NBT.3.** Read, write, order up to 1000 using base-ten numerals, number names and expanded form.

Mathematical Practices

- 1. Make sense of problems and persevere in solving them.**
- 2. Reason abstractly and quantitatively.**
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.
- Use appropriate tools strategically.
- 6. Attend to precision.**
- Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.
- 8. Look for and express regularity in repeated reasoning.**

Task Description

In this task students evaluate the importance of zero in building numbers in a base ten system. They represent numbers 3-digit numbers including 0 in multiple ways. (Task adapted from Gourmet Curriculum Press, Inc.)

Materials:

- 4 envelopes with flaps folded back, or library pockets, each labeled with the place value ones, tens, hundreds, and thousands (for each group)
- 4 sets of place value number index cards 0 –9 with numbers on the top of each strip (for each group)
- Set of stackable expanded notation arrow cards (for each group)
- Suggested Book: *A Place for Zero* by Angeline LoPresti (optional)

****Please see link below for expanded notation arrow cards and Math "Math Mambo" card for activity Part III (pg. 49):**

<http://tinyurl.com/MathTasks-Grade2-Unit1>

Part I

Before task is implemented, have four envelopes labeled thousands, hundreds, tens, and ones on the pockets. Prepare four sets of place value index cards 0-9 with the numbers written on top of each card. (Make sure number is visible above pocket.) Optional: Read "A Place for Zero."

1. Place a digit in the ones pocket. Have the students discuss what this number represents. (The number can be represented with base ten manipulatives as the number is discussed.)
2. Continue to add one to this digit until you reach 10. Ask: What happens if we add one to the number 9?
3. Repeat this process to discuss what happens after numbers like 19, 99, 109, 199. Etc.

4. With each situation, discuss what the "0" represents. Why is the "0" important? Also demonstrate what each digit is worth when it is placed in various pockets. Discuss that a 4 in the hundreds pocket is worth 400 while a 4 in the tens pocket is worth 40.
5. Create them with the stackable place value cards and write the expanded form of the numbers as you create them or discuss what happens if a "0" is used as a digit. (Ex. $207 = 200 + 7$.) What is the importance of zero?

Part II

Working in groups of four, students will create the base-ten number, number names, arrow cards, and expanded form. Each student in the group will do each job at least once. Use the attached "Math Mambo" card and assign each student a starting place. Then turn the card one place to the right and start over with a new number. Have students record their work within their math journals or on a piece of paper.

- The student assigned "choose the number" will create a three digit number using the 0-9 number cards. This number must include a 0 and will be used by all four students to fulfill their number form.
- The student assigned "Number in Words" will write the number name of the number. This student will write out the number in word form. This should be written both as "three hundred fifty-seven" and "three hundreds, five tens, seven ones."
- The third student will be assigned "expanded form." This student will create the number in an expanded form addition sentence.
- The fourth student builds the number with the arrow cards. Once every student has completed their job, the jobs rotate and the next student with the "base-ten number" job must move the 0 to a different place value position. Rotate these until each student has performed every job at least once, each time recording their work within their math journals or on a sheet of paper.

Number Talk:

Strategy: Making 10: Number Sentence

Making tens is an important focus in the primary grades. By now students should be able to break numbers apart quickly to make ten. The focus of this strategy is to be able to utilize fluency with ten to expedite adding. Being able to take numbers apart with ease, or fluency, is the key to using this strategy. This strategy encourages students to "make 10" as they add mentally. "The sequence of problems within a given number talk allows students to apply strategies from previous problems to subsequent problems."

For Example:

$8 + 9$ $(7 + 1) + 9$ $7 + (1 + 9)$ $7 + 10 = 17$	By changing the 8 to a $7 + 1$ the student can restructure the problem to create a combination of 10 with $1 + 9$.
Or $8 + 9$ $8 + (2 + 7)$ $(8 + 2) + 7$ $10 + 7 = 17$	The student could also choose to make a 10 by breaking apart the 9 into $7 + 2$ and combining the 2 with the 8 to create 10.

Below is a Making Tens number talk to try with your students:

$5 + 5$
$5 + 6 + 5$
$5 + 9 + 5$

Please refer to pgs. 125-128 in *Number Talks* by Sherry Parrish for more examples of number talks that will further develop this strategy.

Background Knowledge/Common Misconceptions:

(Information adapted from Mathematics Navigator: Misconceptions and Errors, America's Choice)

Some students may not move beyond thinking of the number 358 as 300 ones plus 50 ones plus 8 ones to the concept of 8 singles, 5 bundles of 10 singles or tens, and 3 bundles of 10 tens or hundreds. Use base-ten blocks to model the collecting of 10 ones (singles) to make a ten (a rod) or 10 tens to make a hundred (a flat). It is important that students connect a group of 10 *ones* with the word *ten* and a group of 10 tens with the word *hundred*.

1. When counting tens and ones (or hundreds, tens, and ones), the student misapplies the procedure for counting on and treats tens and ones (or hundreds, tens, and ones) as separate numbers. When asked to count collections of bundled tens and ones such as 32, student counts 10, 20, 30, 1, 2, instead of 10, 20, 30, 31, 32.
2. The student has alternative conception of multi-digit numbers and sees them as numbers independent of place value. Student reads the number 32 as "thirty-two" and can count out 32 objects to demonstrate the value of the number, but when asked to write the number in expanded form, she writes "3 + 2." Student reads the number 32 as "thirty-two" and can count out 32 objects to demonstrate the value of the number, but when asked the value of the digits in the number, she responds that the values are "3" and "2."
3. The student recognizes simple multi-digit numbers, such as thirty (30) or 400 (four hundred), but she does not understand that the position of a digit determines its value. Student mistakes the numeral 306 for thirty-six. Student writes 4008 when asked to record four hundred eight.
4. The student misapplies the rule for reading numbers from left to right. Student reads 81 as eighteen. The teen numbers often cause this difficulty.
5. The student orders numbers based on the value of the digits, instead of place value. $69 > 102$, because 6 and 9 are bigger than 1 and 2.

Formative Assessment Questions:

- What is the importance of zero?
- What is the difference between place and value?
- How can you show me this number in expanded form? In words? In standard form?

Corresponding activities can be found in *Teaching Student Centered Mathematics Grades K-3* by Van de Walle. (pg. 140)

- Activity 5.14 -"Say It/Press It"
- Activity 5.15 -"Show It/Press It"

Differentiation:

Extension

- Build 4 digit numbers

Intervention

- Say the number name for a number with either two or three digits.
- Allow students to use their own base ten models to show that number and press it on a calculator (or write it). Pay special attention to the teens and the case of zero tens.

Vocabulary:

Hundreds
Tens
Ones
Expanded Form
Word Form
Standard Form

References:

America's Choice. "Mathematics Navigator: Misconceptions and Errors" http://www.mypearsontraining.com/pdfs/mathnav/MathNav_ImpGuide.pdf Accessed 11/13/14

Parrish, Sherry. Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5. Sausalito: Math Solutions Publications, 2010

Van de Walle, John A., et al. Teaching Student Centered Mathematics: Developmentally Appropriate Instruction For Grades K-3. Pearson, 2013

Alaska Mathematics Standards Math Tasks Grade 2



Different Paths, Same Destination

Content Standard

2.OA.2. Fluently add and subtract using numbers up to 20 using mental strategies. Know from memory all sums of two one-digit numbers.

2.NBT.5. Fluently add and subtract using numbers up to 100.

Use:

- strategies based on place value
- properties of operations
- and/or the relationship between addition and subtraction.

Mathematical Practices

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. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.

8. Look for and express regularity in repeated reasoning.

Task Description

In this task the student will practice using benchmark numbers as he/she adds and subtracts 1s and 10s using a 99 chart.

Materials:

- 99 chart per student
- Class 99 Chart
- Paper/math journals
- Transparent counters or highlighters

****Please see link below for 99 charts (pg. 44):**

<http://tinyurl.com/MathTasks-Grade2-Unit2>

Part I

This task may provide teachers with the occasion to emphasize and model the importance of good listening skills. Explain to the children they will need to be especially good listeners in order to end up on the correct number.

Gather students in the meeting area. Display the class the 99 chart. Give each student a 99 chart. Select a starting number. Have students place a transparent counter on it or highlight it. Give students directions one at a time using the terms add 10, subtract 10, add 1, subtract 1, 10 more, 10 less, 1 more, and 1 less. After each clue, give students the opportunity to count up using their chart, if they need to and then have students move their transparent counter to the new number. Model this with the class, using only 3 or 4 directions. When the last direction has been given, ask students what number their transparent counter is on.

Sample direction set:

- Place your counter on 16.
- Add 10. (students should move their counter to 26)
- Subtract 1. (students should move their counter to 25)
- Move ahead 10 more. (students should move their counter to 35)
- What number is the counter covering? (35)

Repeat this activity several times as a class making sure to vary directions to include subtracting, moving back 1 or 10, 10 more, 10 less etc. Once students are comfortable with following the given directions, proceed to part II of the task.

Part II

Tell the students the game directions have now changed. Explain to the students that you need their help to create the directions to get to the number 45 from the number 14. Use the large class 99 chart to model the directions offered by students. Ask students to suggest directions. Possible scenario may include "Add 10 to 14." Now where are we? (24) "Add another group of ten." Where are we now? (34) Add 10 once more. (44) We are almost there, what should I add now? (1 more) "Where did we end?" (45)

Students directions will vary, ask students to share. Encourage conversations about the difference in addition strategies presented. It is important to discuss how adding and subtracting 10 is more efficient. This also allows students to practice using 10 as a benchmark number. Helping students to see that adding 12 done faster by adding 10 and then 2 more. Working with groups of 10 in this task gives students more practice with understanding benchmarks of 10.

Continue activity with several classroom examples until students appear comfortable with creating directions. Include examples with numbers that have a larger starting point than ending point, so that subtraction is involved.

Allow students to work with a partner to create their own set of directions for a specific number. The teacher will provide the ending point, but will allow students to select their own starting point. For instance, 27 may be the end point the teacher designates. One set of partners may choose to start at 48 and another at 7; however they will all end at 27. Allow time for several partners to share their different pathways to 27. Using their 99 chart and their math journals, have students record their directions to 27. Make comments about various ways to get to the number 27, encouraging students to use benchmark numbers to navigate the numbers.

Part III

Allow students to select any number they choose as their final destination. Then instruct the students to create 3 different paths to the same destination (same number). Also instruct students to include subtraction in at least one of the paths.

Number Talk:

This task will provide a good opportunity to engage students in a number talk about why 10 is used as a benchmark number. For example, ask your students to solve the following equations: $15 + 10$ $15 + 11$ $32 + 10$ $32 + 11$ $54 + 10$ $54 + 11$

Ask students to share how they used 10 to help them solve the equations quickly. (For more information, refer to *Number Talks, grades K-5* by Sherry Parrish.)

Background Knowledge/Common Misconceptions:

Students may overgeneralize the idea that answers to addition problems must be greater. Adding 0 to any number results in a sum that is equal to that number. Provide word problems involving 0 and have students model using drawings with an empty space for 0. Students are usually proficient when they focus on a strategy relevant to particular facts. When these facts are mixed with others, students may revert to counting as a strategy and ignore the efficient strategies they learned. Provide a list of facts from two or more strategies and ask students to name a strategy that would work for that fact. Students should be expected to explain why they chose that strategy then show how to use it.

Students may think that the 4 in 46 represents 4, not 40. Students need many experiences representing two-and three-digit numbers with manipulatives that group (base ten blocks) and those that do NOT group, such as counters, etc.

When adding two-digit numbers, some students might start with the digits in the ones place and record the entire sum. Then they add the digits in the tens place and record this sum. Assess students' understanding of a ten and provide more experiences modeling addition with grouped and pre-grouped base-ten materials as mentioned above. When subtracting two-digit numbers, students might start with the digits in the ones place and subtract the smaller digit from the greater digit. Then they move to the tens and the hundreds places and subtract the smaller digits from the greater digits. Assess students' understanding of a ten and provide more experiences modeling subtraction with grouped and pre-grouped base-ten materials.

Formative Assessment Questions:

- What happens to a number when we add ten to it? When we subtract ten from it?
- Are you counting by ones when you add on a ten? Why?
- What does it mean to "skip count" by ten? Why would we want to do this?
- How do you think adding or subtracting by twenty would relate to adding and subtracting by ten?

Differentiation:

Extension

- Play the "I Have, Who Has?" games. Examples and direction cards are available at <http://math.about.com/od/mathlessonplans/ss/ihave.htm>
These games can be printed on cardstock and laminated for extended use.
- Encourage students to use 2 or more subtractions of 1s or 10s in their paths.

Intervention

- Teacher can select numbers which would allow students to focus on using directions, "I am 1 or 10 less than____, I am 1 or 10 more than____. What is the number?"
"This could be done with a sentence frame for students.

Vocabulary:

Counter
Add Subtract
More
Less

References:

Parrish, Sherry. Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5. Sausalito: Math Solutions Publications, 2010

Alaska Mathematics Standards Math Tasks Grade 2



Our Number Riddles

Content Standard

2.OA.1. Use addition and subtraction strategies to estimate, then solve one- and two-step word problems (using numbers up to 100) involving situations of adding to, taking from, putting together, taking apart and comparing, with unknowns in all positions (e.g., by using objects, drawings and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem.

2.OA.2. Fluently add and subtract using numbers up to 20 using mental strategies. Know from memory all sums of two one-digit numbers.

2.NBT.5. Fluently add and subtract using numbers up to 100.

Use:

- strategies based on place value
- properties of operations
- and/or the relationship between addition and subtraction.

Mathematical Practices

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. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.

8. Look for and express regularity in repeated reasoning.

Task Description

In this task the students will write and solve clues describing numbers.

Materials:

- 99 chart per partner set for reference
- Sticky notes
- "Number Riddles" student task sheet
- "Make Your Own Number Riddles" student task sheet

****Please see link below for 99 chart and student task sheets (pg. 52):**

<http://tinyurl.com/MathTasks-Grade2-Unit2>

Part I

Provide a copy of the 99 chart for each student. You need to think of a two-digit number less than 20 (example – 18), but do not tell the class what it is. Instead, write it on a Post-it note that cannot be seen by the students. Then have students record their guess of what number is written on the post it note. Have students place their sticky note on their palm and come stand in a circle in the meeting area. Begin saying clues about your number, one at a time. "My number is an even 2 digit number." Students who have an even number on their sticky note will raise their hands. Anyone without their hand raised sits down in the circle. You should verify student responses and ask questions if needed. The students with even numbers should remain standing. Continue with the next clue, such as "My number is a 2 digit number." Students who have a two digit number should remain standing and raise their hand. You will then verify their number and others will sit down. You will then give additional clues as needed, "My number is ten more than 8." or "My number has an 8 in the ones place." Students who have 8 in the ones place will remain standing and you will verify that a student has chosen 18 as their number.

(Again, this is a good opportunity to strengthen listening skills among your students.)

Continue with various examples to develop student's fluency with this game. As students become more comfortable with the game, provide more challenging clues. Some other examples of number riddles are:

- My number is even/odd.
- My number is a ___digit number.
- My number is 10 less than _____.
- My number is 10 more than _____.
- My number is 1 less than _____.
- My number is 1 more than _____.
- My number is 5 more than _____.
- My number is 5 less than _____.
- My number is 2 less than_____.
- My number is 2 more than_____.

More challenging examples of clues are:

- If you subtract 3 from my number, you get _____.
- If you start at 0 and count by 5's, you will say my number.
- My number has 2 digits, one is even and one is odd.
- My number is the sum of 10 and 12.
- If you add the digits in my number you get_____.
- If you subtract the digits in my number you get_____.
- My number is 10 more than 40 and ten less than 60.
- I am the value of 6 nickels and 3 pennies.

Part II

Students work with a partner to complete the "Number Riddles" task sheet. After ample time to complete the task sheet, gather students together and share answers from sheet. Then allow partners to share the riddle they created as part of the task sheet.

Part III

Students work with a partner to complete "Make Your Own Number Riddles" task sheet. After ample time to complete the task sheet, each set of partners will team up with another set of partners and take turns solving each other's riddle.

Part IV

Special Comment-This part of the task is for individual practice.

Ask the children to work individually to choose a number and write at least 3 clues about the number they chose. The students should write their secret number on the back of their work and the clues on the front.

Once the students have written their clues, select a few students to share his/her clues and see if the class can determine his/her number. The child that correctly determines the number gets to share their clues next. Listen for the use of benchmark numbers such as 10 as students are reading their clues.

Number Talk:**Strategy: Breaking Each Number into Its Place Value**

The ultimate goal of number talks is for students to compute accurately, efficiently, and flexibly.

Once students begin to understand place value, this is one of the first strategies they utilize. Each addend is broken into expanded form and like place value amounts are combined. When combining quantities, children typically work left to right because it maintains a magnitude of numbers.

$$24 + 38$$
$$(20 + 4) + (30 + 8)$$

$$20 + 30 = 50$$

$$4 + 8 = 12$$

$$50 + 12 = 62$$

Each addend is broken into its place value.

Tens are combined.

Ones are combined.

Totals are added from the previous sums.

Below is a place value number talk for you to try with your students. The following number talks are composed of smaller two-digit numbers that do not require regrouping:

$$10 + 10$$

$$10 + 11$$

$$12 + 13$$

$$14 + 15$$

$$12 + 17$$

$$15 + 14$$

$$13 + 16$$

$$11 + 17$$

For more number talks using this strategy please see *Number Talks* by Sherry Parrish.

Background Knowledge/Common Misconceptions:

Students may overgeneralize the idea that answers to addition problems must be greater. Adding 0 to any number results in a sum that is equal to that number. Provide word problems involving 0 and have students model using drawings with an empty space for 0. Students are usually proficient when they focus on a strategy relevant to particular facts. When these facts are mixed with others, students may revert to counting as a strategy and ignore the efficient strategies they learned. Provide a list of facts from two or more strategies and ask students to name a strategy that would work for that fact. Students should be expected to explain why they chose that strategy then show how to use it.

Students may think that the 4 in 46 represents 4, not 40. Students need many experiences representing two- and three-digit numbers with manipulatives that group (base ten blocks) and those that do NOT group, such as counters, etc.

When adding two-digit numbers, some students might start with the digits in the ones place and record the entire sum. Then they add the digits in the tens place and record this sum. Assess students' understanding of a ten and provide more experiences modeling addition with grouped and pre-grouped base-ten materials as mentioned above. When subtracting two-digit numbers, students might start with the digits in the ones place and subtract the smaller digit from the greater digit. Then they move to the tens and the hundreds places and subtract the smaller digits from the greater digits. Assess students' understanding of a ten and provide more experiences modeling subtraction with grouped and pre-grouped base-ten materials.

Formative Assessment Questions:

- How did you decide what clues to write in your riddle?
- Where did you include skip counting in your clues?
- Is there a clue that talked about the money value of your number? If so how did you figure out the amount? How did you count it?
- Did you include a clue about your number being even or odd?
- How do you know if a number is even or odd?

Differentiation:**Extension**

- Challenge students to create numbers riddles for numbers larger than 100.
- Challenge students to use mental strategies to solve the riddles, without the use of the 99 chart.

Intervention

- Limit the numbers students work with to less than 20.
- Provide 99 chart, manipulatives and number line for students.

Vocabulary:

Riddle
Skip Counting
Odd
Even
Less Than
More Than

References:

Parrish, Sherry. Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5. Sausalito: Math Solutions Publications, 2010

Alaska Mathematics Standards Math Tasks Grade 2



Snails And Lizards

Content Standard

- 2.MD.1.** Measure the length of an object by selecting and using standard tools such as rulers, yardsticks, meter sticks, and measuring tapes.
- 2.MD.2.** Measure the length of an object twice using different length units for the two measurements. Describe how the two measurements relate to the size of the unit chosen.
- 2.MD.3.** Estimate, measure and draw lengths using whole units of inches, feet, yards, centimeters and meters.
- 2.MD.4.** Measure to compare lengths of two objects, expressing the difference in terms of a standard length unit.

Mathematical Practices

- 1. Make sense of problems and persevere in solving them.**
- Reason abstractly and quantitatively.
- 3. Construct viable arguments and critique the reasoning of others.**
- Model with mathematics. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.
- 5. Use appropriate tools strategically.**
- 6. Attend to precision.**
- Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.
- Look for and express regularity in repeated reasoning.

Task Description

In this task, students reason about using standard units. They measure items in inches, feet, and yards.

Materials:

- *Twelve Snails to One Lizard* by Susan Hightower or similar book
- Class set of twelve-inch rulers
- 6-8 yard sticks
- Ribbon for making snakes, iguanas, and snails(it is recommended to not use yarn as it stretches and can complicate the lesson as the students measure items)

****Please see link below for snakes and lizards recording sheet (pg. 42):**

<http://tinyurl.com/MathTasks-Grade2-Unit3>

Part I

Read *Twelve Snails to One Lizard* by Susan Hightower or similar book to the class. Have the children measure items such as the ones in the story using a nonstandard type of measurement unit like the student's feet. For example, have everyone measure the length of the classroom using their feet (or review from prior tasks where this was discussed). Ask questions such as "Did all of you get the same measurement? Why or why not? Can you explain why this happened? Is there a way to measure our classroom and not get so many different answers? Is there a tool we can use besides our own feet?" At this point, you would want to refer back to the previous task, My Big Foot. Discuss the story and identify the problem and solution.

Part II

Students measure the distance across the room and record their measurements. They will hopefully ask which measurement to use for this distance. Invite student discussion on the appropriate unit (foot and yard) to use and why. Help to guide the discussion of why inch would not be the best unit for this measurement. After measurements are completed, groups will share their findings. Let students discuss/argue rationale for foot and yard as better choices for measurement of the classroom.

Part III

Use ribbon to make snakes that are exactly thirty six inches long (one yard), iguanas that are twelve inches long (1 foot) and snails that are exactly one inch long. Teacher should make yard sticks available or have a measuring table where students could use pre-marked place on table to measure and cut their ribbon. The group will create one of each animal and explain the relationship of the three. This may be done through a journaling activity or chart that the group creates. The teacher should be sure to provide conversations about the standard measurement vocabulary of inch, foot and yard.

Please note: Encourage the groups to show how many snails it takes to equal one snake to avoid inaccurate measurements.

Students should answer questions (using math journal) such as:

- Which is the shortest unit of measurement? Longest?
- How many snails does it take to equal the length of an iguana? How many iguanas does it take to equal the length of a snake?

Part IV

(This portion should be done on the next day to allow the student to fully comprehend the unit comparisons)

As a class, generate a list of items that the students think are one inch, one foot and one yard in length. Then give each student a twelve inch ruler and divide class into groups of three students. Students should locate an item that is approximately one inch long, an item that is one foot long and an item that is one yard long. (All three students must work together to measure a yard by putting their three twelve inch rulers together). Then have students find items that are shorter and/or longer than one inch, one foot, and one yard. Bring students back together and discuss the items they located in these measurements. Facilitate discussion on comparisons of the items and their measurements.

Part V

Students should choose one item that is longer than their snake or 1 yard. Measure the object and record the measurements. The measurements should be done to nearest whole unit. At this point students are not using fractional notation so they should only be using whole units, however, this does not mean that discussion of fractional parts should be prohibited. Descriptions should include at least 2 ways to record the measurement. For example: yards and inches, feet and inches, or all inches.

Number Talk:

Even though this task involves measurement, it is still important to practice number talks daily. There is an example of a number talk appropriate for 2nd grade below. However, feel free to choose or create a number talk that is relevant and/or needed for the students in your classroom.

Strategy: Breaking Numbers into Place Value

This number talk consists of three sequential problems. The sequence of problems allows students to apply strategies from previous problems to subsequent problems. Once students begin to understand place value, this is one of the first strategies they utilize. Each addend is broken into expanded form and like place value amounts are combined.

Example:

$24 + 38$	Each addend is broken into its place value.
$(20 + 4) + (30 + 8)$	
$20 + 30 = 50$	Tens are combined.
$4 + 8 = 12$	Ones are combined.
$50 + 12 = 62$	Totals are added from the previous sums.

The following number talk is composed of smaller two-digit numbers that does not require re-grouping:

$20 + 20$
$23 + 25$
$24 + 21$
$22 + 26$

For more number talks using this strategy please see *Number Talks* by Sherry Parrish.

Background Knowledge/Common Misconceptions:

Students should have experience measuring the length of the same object using different tools (ruler with inches, ruler with centimeters, a yardstick, or meter stick). This will help students learn which tool is more appropriate for measuring a given object. They describe the relationship between the size of the measurement unit and the number of units needed to measure something. For instance, a student might say, "The longer the unit, the fewer I need."

Estimation helps develop familiarity with the specific unit of measure being used. To measure the length of a shoe, knowledge of an inch or a centimeter is important so that one can approximate the length in inches or centimeters. Students should begin practicing estimation with items which are familiar to them (length of desk, pencil, favorite book, etc.).

Some useful benchmarks for measurement are:

- First joint to the tip of a thumb is about an inch
- Length from your elbow to your wrist is about a foot
- If your arm is held out perpendicular to your body, the length from your nose to the tip of your fingers is about a yard

Formative Assessment Questions:

- How did you determine which instrument (inch cube, ruler, yard stick) to use to measure?
- What are things you would measure in inches, feet, and yards?

Differentiation:**Extension**

- Have students measure other items and make comparisons. Write about the comparisons in their math journal using comparison symbols $>$, $<$, $=$.

Intervention

- Provide students with a piece of adding machine tape that is one inch, one foot, and one yard, so they can visually see the difference in each unit of measurement. Then have them use the inch piece to determine how many inches it takes to make a foot. Do the same for how many feet are in a yard. By using adding machine tape, students can see the measurements more clearly. They may choose to mark it on the paper in different colors or cut the paper.

Vocabulary:

Measure

Inch

Feet

Yard

Length

Problem

Solution

References:

Parrish, Sherry. Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5. Sausalito: Math Solutions Publications, 2010

Alaska Mathematics Standards Math Tasks Grade 2



Kangaroo Jumps

Content Standard

2.MD.1. Measure the length of an object by selecting and using standard tools such as rulers, yardsticks, meter sticks, and measuring tapes.

2.MD.5. Solve addition and subtraction word problems using numbers up to 100 involving length that are given in the same units (e.g., by using drawings of rulers). Write an equation with a symbol for the unknown to represent the problem.

2.MD.9. Collect, record, interpret, represent, and describe data in a table, graph or line plot.

2.MD.10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put together, take-apart and compare problems using information presented in a bar graph.

Mathematical Practices

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. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.

8. Look for and express regularity in repeated reasoning.

Task Description

In this task, students measure their jumps and create a class line plot of their measurements.

Materials:

- Rulers with inches and feet, centimeters and meter
- Student task sheet
- A book on kangaroos (optional)

****Please see link below for Kangaroo Jumps student task sheet (pg. 55):**

<http://tinyurl.com/MathTasks-Grade2-Unit3>

Part I

Read a book about kangaroos (or another jumping animal) to the students. Afterwards, explain to them, "Today we will do some jumping like the kangaroo!" Have someone demonstrate a kangaroo jump. Explain to the students they are going to measure their jumps from a standing position five times. Place the students in groups of four. Ask children to record their information on the task sheet chart. They will need to decide on the unit of measurement (centimeters, inches, feet, or meter) and fill that in on the task sheet. Students will come up with the rules for the jumping. (Do they start with toes on the starting line? Are they going to measure to the heel or the toes of the foot once they have landed? Will there be a practice jump or will the first jump count?) The distance jumped can be marked with a piece of chalk or tape. Children will record their information on the task sheet. Students should estimate jump distance before measuring the distance.

Students might start out using a unit of measurement and then decide they want to change their unit. They might come to ask you, as the teacher, if this is ok. You can use this at your closing of the lesson letting that group share why they asked that and what they changed to for the task. You can allow them to change the unit BUT they need to be questioned about how they will record that data on the graph. (Watch them discuss this as you might see them convert the measurements or start all over). Either choice is another great thing to discuss at closing.

It is imperative that you allow this mathematical discussion to take place between them as a group and you simply listen and watch. **As indicated by the Mathematical Practice Standards, this type of mathematical discourse should be the goal of every task.**

Students order their jumps from longest to shortest on the back of the task sheet. After students have completed their chart, lead them in a discussion about how measuring in various units is different, which is more practical for this experiment, why they think this way, and how many inches are in a foot, centimeters are in a meter?

Part II

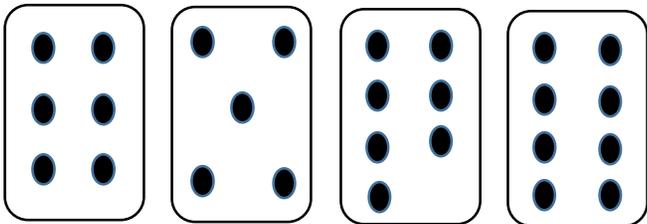
Students will work together in their group to create a line plot to display the information from their jumps. After groups have created their graphs demonstrating their data for their jumps, they should create 3-5 questions that can be answered using the line plot. The teacher may ask students to trade graphs with another group and answer questions created. Students' graphs and questions should be presented to the class. Guide students in discussion about comparisons between graphs.

Number Talk:

Even though this task involves measurement, it is still important to practice number talks daily. There is an example of a number talk appropriate for 2nd grade below. However, feel free to choose or create a number talk that is relevant and/or needed for the students in your classroom.

Strategy: I Wish I Had 10

Flash a dot card or ten frame showing 9 or less and say, "I wish I had 10". Students respond with the part that is needed to make ten. The game can focus on a single whole, or the "wish I had" number can change each time.



Variation: teacher flashes card and students write the complement of ten on individual whiteboards with dry erase markers.

Here are some great questions to use with this number talk game:

- *Who would like to share their **thinking**?*
- *Who did it another way?*
- *How many people solved it the same way?*
- *Does anyone have any questions for ____?*
- *How did you figure that out?*
- *What was the first thing your eyes saw, or your brain did?*

Background Knowledge/Common Misconceptions:

(Information quoted from Van de Walle and Lovin, *Teaching Student-Centered Mathematics: Grades K-3*, pg. 322)

Students should begin to understand that a ruler is a representation of a consistent row of units. Students should have experience measuring the length of the same object using different tools (ruler with inches, ruler with centimeters, a yardstick, or meter stick). This will help students learn which tool is more appropriate for measuring a given object. They describe the relationship between the size of the measurement unit and the number of units needed to measure something. For instance, a student might say, "The longer the unit, the fewer I need." Multiple opportunities to explore provide the foundation for relating metric units to customary units, as well as relating within customary (inches to feet to yards) and within metric (centimeters to meters). The more students work with a specific unit of measure, the better they become at choosing the appropriate tool when measuring.

Estimation helps develop familiarity with the specific unit of measure being used. To measure the length of a shoe, knowledge of an inch or a centimeter is important so that one can approximate the length in inches or centimeters. Students should begin practicing estimation with items which are familiar to them (length of desk, pencil, favorite book, etc.). For additional information on measurement see chapter 8 in *Teaching Student Centered Mathematics* by John A. Van de Walle.

One way to organize the data collected within this task is to use a bar graph or a line plot. Bar graphs are widely used and many students find them easy to read. One type of graph that students may have less exposure to is a line plot graph.

"*Line plots* are useful *counts* of things along a numeric scale. To make a line plot, a number line is drawn and an X is made above the corresponding value on the line for every corresponding data element. One advantage of a line plot is that every piece of data is shown on the graph. It is also a very easy type of graph for students to make. It is essentially a bar graph with a potential bar for every possible value. A simple example is shown in *Teaching Student Centered Mathematics, K-3* (Figure 11.6., pg. 322) by Van de Walle.

Formative Assessment Question:

- How do I know if an estimate is close to the actual measurement?
- Why do we need to be able to estimate a measurement or value?
- How do you organize the data from your jumps?
- How do you use a line plot? What can you tell using your line plot?

Differentiation:**Extension**

- Challenge students to add up all the jumps together to see how far the group jumped. Challenge them to tell how many inches it would be all together and how many feet it would be.
- As a group, create two line plots, one of the longest jump everyone did and another one of the shortest jump everyone did.
- Write questions that can be answered by the data in your line plot.

Intervention

- Students can lay rulers in a line to measure the jumps if they are having a difficult time measuring lengths that are longer than one foot.
- Students can also use measuring tapes to help them measure distances longer than a foot.

Vocabulary:

Measure

Centimeter

Inches

Feet

Meter

Estimate

Line plot

Longest

Shortest

References:

Parrish, Sherry. Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5. Sausalito: Math Solutions Publications, 2010

Van de Walle, John A., and Lou Ann H. Lovin. Teaching Student-Centered Mathematics: Grades K-3, Volume 1. Pearson, 2006

Alaska Mathematics Standards Math Tasks Grade 2



Desktop Basketball – Money Version

Content Standard

2.NBT.6. Add up to four two-digit numbers using strategies based on place value and properties of operations.

2.NBT.8. Mentally add 10 or 100 to a given number 100-900 and mentally subtract 10 or 100 from a given number.

2.MD.8. Solve word problems involving dollar bills and coins using the \$ and ¢ symbols appropriately.

2.MD.10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put together, take-apart and compare problems using information presented in a bar graph.

Mathematical Practices

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. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.

8. Look for and express regularity in repeated reasoning.

Task Description

In this task the students will use mental math strategies while adding or subtracting money in a game of basketball.

Materials:

- Plastic cup
- Paper wad for a "basketball"
- Paper and pencil for recording information and drawing a graph

Comment: Prior to the activity, each pair of students should have a plastic cup taped to one edge of a desk/table, a ¼ sheet of paper to wad up for a "basketball", and paper/pencil for recording and drawing a graph of the data.

Part I (Review of Game from 1st grade)

Tape the cup to the edge of the desk. Students will take turns gently tossing the crumpled paper into the cup taped to the desk. Allow each student ten tosses before switching players. The student who is not tossing the basketball will be the scorekeeper and will use tally marks to record baskets made. They can create their own chart to keep track of the tallies. After each child has had a chance to make ten tosses, the students will use their table of basketball toss tally marks to create a graph. Since they have had many experiences with graphs prior to this experience, **students can choose the type of graph they want to make (picture graph or bar graph).**

Upon completion of their individual graphs, have students compare their results. If a student is working independently, then the activity could be repeated twice. The student would then have two different sets of tally marks to graph and compare.

Ask students to pose a question which can be answered using the data from their graph. Then have them swap graphs and questions with a neighbor to see if they can answer each other's questions based on the information provided in their graph.

Question examples:

- What type of game data is represented in this graph?
- How many baskets did you make?
- How many baskets did you miss?
- How many throws in all did you shoot?
- Do you think you will have the same results if you do it again? Why?
- How will this experience help you to predict what might happen if you were to do this experiment again?

Part II (four rounds-in each round the pieces of paper have a different value)

Now each student will have ten pieces of paper to throw and each piece will be worth a particular amount (see rounds 1-4 below). For each round, students need to keep a running **MENTAL** total of how much they earned and how much they lost. They "earn" money by making the basket, they "lose money" by missing the basket. They will announce what they mentally calculated to be their total earned and lost when their round is up, and their partner will check. If they are correct, they double their score. If they are incorrect, they lose half their score. The winner is the partner with the most money at the end of each round.

Round One-

Each piece of paper is worth 10 cents

Round Two-

Each piece of paper is worth 50 cents

Round three-

Each piece of paper is worth 10 dollars

****Round Four- (This round should only be played when students are ready, because the total may exceed 1,000. Consider your students' ability before playing this round. Adapt the number if necessary.)**

Each piece of paper is worth 100 dollars

Number Talk:

Strategy: Doubles/Near Doubles

At this point it would be an opportunity to discuss "doubling" and "halves" of numbers. Using a Rekenrek Arithmetic Rack, display the same number of beads on the top and bottom. As students make the connection with doubles, it will naturally lend itself to discussion about halves. (Refer to Catherine Twomey Fosnot and Willem Uittenbogaard, *Minilessons for Early Addition and Subtraction: A Yearlong Resource*, 2007, pgs. 34 & 35.)

As each number talk is shown on a rekenrek, ask students, "How many beads do you see? How do you see them?"

A. 3 on top
3 on bottom

B. 4 on top
3 on bottom

C. 3 on top
2 on bottom

A. 4 on top
4 on bottom

B. 5 on top
4 on bottom

C. 4 on top
3 on bottom

A. 5 on top
5 on bottom

B. 6 on top
5 on bottom

C. 5 on top
4 on bottom

For more examples of Double/Near Doubles Number Talks please see *Number Talks* by Sherry Parrish (pgs. 108-110)).

Background Knowledge/Common Misconceptions:

Part one of this task calls for students to work with categorical data by organizing, representing and interpreting data. Students collect their data by using tallies or another way of keeping track. Students organize their data by totaling each category in a chart or table. A similar task was done in 1st grade, however this time students will be attributing a money value to the paper slips they are tossing in Part two.

Students need to build on their flexible strategies for adding within 20 in first grade to fluently add and subtract within 100 in second grade. Students gain computational fluency, using efficient and accurate methods for computing, as they come to understand the role and meaning of arithmetic operations in number systems. An efficient strategy is one that can be done mentally and quickly. Frequent use of games like this provides the necessary experience students need in order to develop efficient mental processes, which lead to fluency and understanding the relationship between quantity and value. Since students have not been introduced to decimals, problems should either have only dollars or only cents.

Formative Assessment Questions:

- How did you keep track of the total baskets made when you first played the game?
- What type of graph did you decide to make?
- Why is it important to keep a record of some kind when you are doing an experiment?
- Were you able to answer your partner's graph question? Were they able to answer yours? How could you change your question or graph so that they are more useful?
- How much money did you make in each round when we changed the game?
- How would the amount change if you earned a quarter for each shot? How about 50 cents for each shot?
- How many baskets do you need to make to earn \$5?
- If you earned a dollar for each shot made, but lost 50 cents for each shot missed, what would your total be?
- Let's say you are at a carnival playing this game. It costs \$1.00 to take ten shots. For each shot you make, you will get back 25 cents. Think about how you did in the game in class. Based on this, would you play the game at the carnival? Why or why not?

Differentiation:**Extension**

- Increase the number of tosses to twenty and have the students create their own graph of tosses made and tosses missed. Have students compare this to their first graph of ten tosses. Do they notice any significant differences? Ask students what they think would happen if they made thirty tosses. Forty tosses. How would their graph change?

- Write different coin amounts OR dollar amounts on each of the ten slips of paper.

After the ten tosses students add up the total earned and the total lost. Compare and find the difference between the two amounts.

Intervention

- Give students a pre-made bar graph or pictograph on which they may color in the appropriate number of blocks or pictures for each successful basket.

Vocabulary:

Graph

Data

Quarter (25 cents)

Record

Scorekeeper

Tally mark

References:

Fosnot, Catherine Twomey, and Willem Uttenbogaard. Minilessons for Early Addition and Subtraction: A Yearlong Resource (Contexts for Learning Mathematics). Portsmouth: FirstHand, 2008

Parrish, Sherry. Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5. Sausalito: Math Solutions Publications, 2010

Alaska Mathematics Standards Math Tasks Grade 2



Multi-digit Addition Strategies

Content Standard

2.OA.1.

Use addition and subtraction strategies to estimate, then solve one-and two-step word problems (using numbers up to 100) involving situations of adding to, taking from, putting together, taking apart and comparing, with unknowns in all positions (e.g., by using objects, drawings and equations). Record and explain using equation symbols and a symbol for the unknown number to represent the problem.

2.OA.2. Fluently add and subtract using numbers up to 20 using mental strategies. Know from memory all sums of two one-digit numbers.

2.NBT.5. Fluently add and subtract using numbers up to 100.

Mathematical Practices

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. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.

8. Look for and express regularity in repeated reasoning.

Task Description

In this task the students will apply their developed problem solving strategies as they use and share solutions for addition number stories.

Materials:

- Various manipulatives (counters, base-ten blocks, unifix cubes)
- Chart paper for class recording sheets

****Please see link below for Part IV story problem reproducible (pg. 86):**

<http://tinyurl.com/MathTasks-Grade2-Unit4>

Part I

Introduce task with this story problem:

Mrs. Jones and Mrs. Smith are going to plan a popsicle party for their classes. Mrs. Jones has 28 students in her class and Mrs. Smith has 25 students in her class. They plan on getting one popsicle for each student in their classes. How many popsicles do Mrs. Jones and Mrs. Smith need to buy?

Have several students retell the story problem to you and discuss what is happening in the problem to ensure their understanding.

Part II

Split students into pairs and give each student a half sheet of chart paper to use in solving the problem. Also, have various manipulatives available for students to use as they work to solve the problem. Walk around and observe students as they are problem solving. Ask questions such as:

- What are you trying to find out?
- How many students are in Mrs. Jones's class?
- How many students are in Mrs. Smith's class?
- Can you explain the strategies you are using to solve this problem?
- Are there other ways you could solve the problem?
- Is there a way you can check your answer?

As you are walking around, find students who are using a variety of strategies.

Part III

Let several students share their different strategies and answers to the problems. Allow the students to call on their peers to ask questions or make comments about their strategy and the answer that was found. After students have shared various strategies, spend some additional time discussing the different strategies students have used. Some students may have broken the numbers into smaller pieces to simplify the addition problem.

For example: in $28 + 25$ you can begin by pulling out the tens and add $20 + 20 = 40$. You then have $8 + 5$. You can then break up the 5 into 3 and 2. Next, add $8 + 2$ to get 10. You will then have 3 more to add. $20 + 20 + 10 + 3 = 53$.

Other students may have used benchmark numbers to help add.

For example $28 + 25$ could have been solved by keeping the 28 and taking 2 from 25. You can have 30 and 23. You can then add $30 + 23$ to get 53.

Another Strategy may be to add 5 to 25 to make a group of 30 then add 20 to 30 by grouping 20 more, equally 50 then add 3.

This may sound convoluted to adults, but students who have strong number sense will tend to think in this way. When we teach just the algorithm, or teach the algorithm too early, we discourage the students from using a more natural strategy. When they are allowed to develop strategies that make sense to them, they are developing better number sense of addition and subtraction!

Create a list of the various strategies students used when solving addition problems (anchor chart). Some students may have also mention the traditional algorithm for addition with regrouping. It is more beneficial to encourage students to utilize the various other strategies at this time; then move towards the algorithm when they can demonstrate true number sense.

Comments: If no student describes using the number line or number chart as a strategy, then this is a good time to bring up this tool for combining amounts. Students should be able to use the number line or number chart as a tool for adding numbers. For example, students could find 28 on the number line or number chart, and count on 25 or vice versa. Use of models in this way elicits a natural discussion about the commutative property of addition.

Part IV

Give students this problem:

Amy had a collection of 46 stamps. Her brother Chris had a stamp collection with 35 stamps. If they combine their stamps, how many stamps will they have?

Allow students to attempt to solve this problem on their own. As students work, walk around asking questions about the students' strategy use. Look to see if students are using the strategies mentioned above. Students should be prepared to write and share their thinking with the class. After students have completed solving the problem, allow students to take turns sharing their strategy with people at their table or other small groups of students. The task should be closed with the teacher selecting students to highlight various strategies used in the classroom and again referring to the number line or number chart if it is not one of the strategies presented by students.

Number Talk:**Strategy: Adding Up in Chunks**

This strategy is similar to the Breaking Each Number into Its Place Value strategy except the focus is on keeping one addend whole and adding the second number in easy-to-use chunks. The strategy is slightly more efficient than the Breaking Each Number into Its Place Value strategy, since you are not breaking apart every number.

Example:

A. $45 + 28$
 $45 + (20 + 8)$
 $45 + 20 = 65$
 $65 + 8 = 73$

In Example A, 45 is kept whole while 28 is broken into its place value and added in parts to the 45.

B. $45 + 28$
 $(40 + 5) + 28$
 $40 + 28 = 68$
 $68 + 5 = 73$

Example B demonstrates that either number can be kept whole. This time the 28 is kept intact while 45 is broken into combinations that make the problem easier to solve.

Here is an Adding Up in Chunks number talk to try with you students (this number talk focuses on adding multiples of ten to any number):

$7 + 10$
 $7 + 20$
 $7 + 30$
 $7 + 40$

For more number talks using this strategy please see *Number Talks* by Sherry Parrish.

Background Knowledge/Common Misconceptions:

Students should have had prior experiences and/or instruction with addition and subtraction of two-digit numbers without regrouping. Students should also have experience solving various story problems with the use of manipulatives. Students can use place value blocks, number charts, create drawings of place value blocks, or number lines to support their work.

Some students may draw a picture, solve the problem with manipulatives, or use benchmark numbers. All of these strategies demonstrate a solid foundation of number sense. If you notice students using the traditional algorithm for regrouping, it is imperative that you ask them to explain their reasoning for using this method. The idea that numbers can be “carried” is not a natural progression when numbers are combined. Algorithms are a short cut method that makes recording numbers more convenient and efficient. Students need to explore many different strategies for combining numbers before they can understand the idea of an amount being “carried” from one place value position to another. Moving to the standard algorithm too early will often prevent students from continuing to make sense of the numbers that work within a given situation.

Formative Assessment Questions:

- Describe how you solved the problem.
- Do you think you could solve the problem another way?
- How is your strategy for solving the problem the same as your neighbor's? How is it different?
- How do you think we should record our work so that someone else could understand what we did?

Differentiation:**Extension**

- Give students this problem to supplement problem 1: If popsicles come in boxes of 12, how many boxes do Mrs. Jones and Mrs. Smith need to get for their classes of 32 students? If each student gets one popsicle, how many popsicles will be left over?
- Give students this problem to supplement problem 2: Amy and Chris join their stamps together in a scrap book. If the stamp book can hold up to 100 stamps, will there be enough room for both Chris' and Amy's stamps? How do you know? How many more stamps could Chris and Amy place into the scrap book before it reaches its maximum capacity?
- Write a problem involving either the stamps or the popsicles, and ask a partner to solve it. What strategy was used?

Intervention

- Some students may need to work on the second problem with partner groups. They may not be ready to utilize the addition strategies independently in this lesson. They may also need to use manipulatives to physically act out the problem.
- Some students may not be able to communicate their strategy in written form. Those students could be pulled to solve the second problem individually in an interview setting, so they may explain their process as they go.

Vocabulary:

Strategy/Strategies

Stamp collection

References:

Parrish, Sherry. Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5. Sausalito: Math Solutions Publications, 2010

Alaska Mathematics Standards Math Tasks Grade 2



Perfect 500!

Content Standard

2.NBT.6. Add up to four two-digit numbers using strategies based on place value and properties of operations.

2.NBT.7. Add and subtract using numbers up to 1000.

Use:

- concrete models or drawings and strategies based on place value
- properties of operations
- and/or relationship between addition and subtraction.

Relate the strategy to a written method and explain the reasoning used.

Demonstrate in adding or subtracting three-digit numbers, hundreds and hundreds are added or subtracted, tens and tens are added or subtracted, ones and ones are added or subtracted and sometimes it is necessary to compose a ten from ten ones or a hundred from ten tens.

2.NBT.8. Mentally add 10 or 100 to a given number 100-900 and mentally subtract 10 or 100 from a given number.

2.NBT.9. Explain or illustrate the processes of addition or subtraction and their relationship using place value and the properties of operations.

Mathematical Practices

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. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.

8. Look for and express regularity in repeated reasoning.

Task Description

In this task the students will use number cards and addition strategies to create and add multiple two-digit numbers.

Materials:

- Deck of playing cards,(2 copies of the cards provided for a deck of 40 cards)
- "Perfect 500" Directions Sheet
- "Perfect 500" Student Recording Sheet

****Please see link below for playing cards, directions sheet and recording sheet (pg. 97):**

<http://tinyurl.com/MathTasks-Grade2-Unit4>

This game allows students to look for combinations of numbers that equal 100.

Task Directions

The goal of the game is to have a sum as close to but not over 500 at the end of five rounds. To begin, each student is dealt 5 cards. The player uses four of the cards to make 2 two-digit numbers, saving the unused card for the next round. Each player will arrange the cards so that the sum of their 2 two-digit numbers are as close as possible to 100. Students record their addition problem on the recording sheet, keeping a running total as they play. For the second round, each player gets four cards to which they add the unused card from the first round. The students will repeat the same process as the first round, saving one card for the next round. After the end of five rounds, each player will total their sums of the five rounds. The student, who is closest to 500 without going over, after five rounds, is the winner.

Number Talk:

Strategy: Compensation

The goal of compensation is to manipulate the numbers into easier, friendlier numbers to add. When compensating, students will remove a specific amount from one addend and give that exact amount to the other addend to make friendlier numbers. Taking from one addend and giving the same quantity to the other addend to maintain the total sum is a big mathematical idea in addition.

For Example:

A. $\begin{array}{r} 8 + 6 \\ -1 + 1 \\ \hline 7 + 7 = 14 \end{array}$	Example A demonstrates first grader's Compensation strategy for making a double.
B. $\begin{array}{r} 18 + 23 \\ +2 - 2 \\ \hline 20 + 21 = 41 \end{array}$	In Example B, the student changes 18 to the friendly number of 20. Notice how 2 was subtracted from the 23 and then added to the 18.
C. $\begin{array}{r} 36 + 9 \\ -1 + 1 \\ \hline 35 + 10 = 45 \end{array}$	Example C demonstrates that Compensation can be used to make an easy 10. Choosing which number to adjust is an important student decision that is linked to the student's thinking about efficiency.

Below is a Compensation number talk to try with your students (this number talk focuses on using compensation as a strategy for basic facts and combinations to 25 by removing 1 from one addend and adding it to the other addend):

$3 + 9$	$16 + 4$
$9 + 5$	$19 + 4$
$7 + 9$	$6 + 19$
$9 + 6$	$19 + 3$

For more number talks using this strategy please refer to *Number Talks* by Sherry Parrish.

Background Knowledge/Common Misconceptions:

At this point, students should have foundational addition skills clearly in place. Additionally, students should have strategies for larger numbers they are comfortable and efficient with, which include counting up, counting back, making pairs that make ten, making pairs that make 100, and adjusting and compensating strategies. Students may find this game challenging and it should not be introduced too early in the school year. When introducing this game, you may choose to use one of the variations of the game from the list below.

- Play just one round, the students with the sum closest to 100 wins.
- Play just one round as a class. Put the digits on the board and let students create the sum that is closest to 100.
- Discuss the relationship between pairs of 10 and pairs of 100. (i.e. $4 + 6 = 10$, so $40 + 60 = 100$)

Formative Assessment Questions:

- What is one way to quickly find the answer? Can you think of another way?
- How do you know you will not go over 500?
- How do you decide which numbers to use? How do you choose which cards to use?

Differentiation:**Extension**

- Students can play "Perfect 5,000" during which each player draws 7 cards and uses 6 to make 2 three-digit numbers whose sum is close to 1,000. After 5 rounds, the player with the sum closest to 5,000, without going over, is the winner.

Intervention

- Plan for students with like abilities to play in partners.
- Students can play "Perfect 100" during which each player draws 4 cards and adds the numbers on three cards to find a sum as close as possible to 20. After 5 rounds, the player with the sum closest to 100, without going over, is the winner.

Vocabulary:

Two-digit number

Sum

References:

Parrish, Sherry. Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5. Sausalito: Math Solutions Publications, 2010

Alaska Mathematics Standards Math Tasks Grade 2



Greedy Shapes

Content Standard

2.G.1. Identify and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces compared visually, not by measuring. Identify triangles, quadrilaterals, pentagons, hexagons and cubes.

Mathematical Practices

- 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. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.
5. Use appropriate tools strategically.
- 6. Attend to precision.**
7. Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.
8. Look for and express regularity in repeated reasoning.

Task Description

In this task, students explore attributes of a triangle and start to reason with other shapes and learn more about polygons.

Materials:

- *The Greedy Triangle* by Marilyn Burns or similar book
- Geoboards
- Rubber bands
- (optional) Virtual Manipulative Geoboard: <http://nlvm.usu.edu/en/nav/vlibrary.html>
- Describing Plane Shapes Class Chart
- Describing Plane Shapes Student Chart
- "What's my rule" task sheet

****Please see link below for describing plane shapes sheet and "what's my rule" task sheet (pg. 34):**

<http://tinyurl.com/MathTasks-Grade2-Unit5>

Part I

Read students the book, *The Greedy Triangle* by Marilyn Burns. Before reading, discuss the terms side, angle, and vertex. Draw a triangle on the board and have students determine the number of sides and vertices. As you read the book, have the students predict the shape which the greedy triangle will become next. Ask questions as you read, such as:

- How many sides did the shape have to begin with?(3) How did you figure that out?(Counted them, or recognized the shape as a triangle and I know triangles have three sides)

- How many vertices did the shape have to begin with? How are these different from sides?
- How many sides did the shape have when it became a (quadrilateral, a pentagon, etc.)?

Part II

Introduce the term quadrilateral to the students. This word is an important term for the students to use and understand. Use a word web to deconstruct the meaning of the word polygon. Break apart the word using prior knowledge of shapes.

Tell students that they will now use geo-boards to recreate the story of *The Greedy Triangle*. Each student should have his or her own geoboard. However, students can sit in partner groups as they create shapes. This will encourage dialogue about the geometry and allow students to comment on each other's work.

Variation

Toothpicks or pretzels sticks could be used to create the shape instead of using the geoboard.

Begin reading the book again, however, this time stop at each shape and allow the students to create that shape on their geo-boards using rubber bands. (Students who can create the shapes quickly may explore creating various sizes and irregular examples of the shapes)

While students are working, ask questions like:

- How many sides does your shape have now?
- What shape have you made? How do you know it is that shape?
- What characteristics of a shape help us figure out/determine the name of the shape?
- How did your shape change?
- What are differences between a (triangle) and a (quadrilateral)?
- Can you make that shape smaller? Larger?
- What would happen if you made that side longer? Would it still be a (triangle?)

Once all students have created the shape, allow a partner group to come to the board. Have one student demonstrate how to make the shape using the over-head or possibly a virtual geoboard: <http://nlvm.usu.edu/en/nav/vlibrary.html>. Discuss with students the meaning of the word "regular polygon"; that the shape is a regular polygon if all the sides are equal. However, show the students that you can make the figure an irregular polygon by grasping one or more of the vertices and extending the sides. Ask the students, "What do we call this three sided shape that does not have all sides the same length? (*a triangle*) Why do we still call it a triangle? (*because it still has three sides*)." Make sure that students understand and can explain that making sides longer or shorter does not change the name of the shape (*triangle, quadrilateral, pentagon, etc.*) because the number of sides and vertices is still the same. It is very important for students to understand and articulate that knowing the number of sides and vertices of a shape is how we determine/decide the name of the shape. Allow the other student in the partner group to record the number of sides and vertices by the shape name on the class chart. Allow all the students in the class to record the number of sides, vertices, and several of their favorite examples of each shape on their student chart. Continue with the book, stopping at each shape and repeating the process as above.

Note

When students are creating quadrilaterals, encourage them to create various kinds of quadrilaterals (parallelograms, squares, rectangles, and trapezoids).

Part III

Organize students into small groups. Distribute the sets of cut-out figures, one set per group and the recording sheet. "What's My Rule?" task sheet cards should be distributed. Then review the rules of the game. One participant in each group is the sorter. The sorter writes down a "secret rule" to classify the set of figures into two groups and uses that rule to slowly sort the pieces as the other players observe. At any point in the game, the players can call "stop" and guess the rule. After the correct rule identification, the player who figured out the rule becomes the sorter. The correct identification from the sorter is worth five points. A correct answer, but not the written one, is worth one point. As a variation, each incorrect guess results in a two-point penalty. The winner is the first one to accumulate ten points. You

may also use this set of shapes, which provides more variety, thus expanding the possible conversations about shapes and their attributes-**BLM 20-26**:
http://www.ablongman.com/vandewalleseries/volume_1.html

As students are sorting the cards and making decisions about the sort, the teacher should be listening for student's descriptions of the shapes.

Number Talk:

Even though this task involves geometry standards, it is still important to practice number talks daily. There is an example of a number talk appropriate for 2nd grade below. However, feel free to choose or create a number talk that is relevant and/or needed for the students in your classroom.

Strategy: Making Landmark or Friendly Numbers

Landmark or friendly numbers are numbers that are easy to use in mental computation. Fives, multiples of ten, as well as monetary amounts such as twenty-five and fifty are examples of numbers that fall into this category. Students may adjust one or all addends by adding or subtracting amounts to make a friendly number.

For example:

$\begin{array}{r} 23 + 48 \\ + 2 \\ \hline 23 + 50 = 73 \\ - 2 \\ \hline 71 \end{array}$	In this example only the 48 is adjusted to make an easy landmark number. The extra 2 that was added on must be subtracted.
--	--

Here is a Making Landmark or Friendly Numbers number talk for you to try with your classroom (this number talk includes single-digit numbers that are one away from a landmark or friendly number):

10 + 2	60 + 7
9 + 2	59 + 1 + 6
9 + 5	59 + 7
9 + 8	59 + 12
9 + 9	59 + 22

For additional number talks using this strategy please see *Number Talks* by Sherry Parrish.

Background Knowledge/Common Misconceptions:

Students should have had prior experiences and/or instruction with plane figures from first grade and kindergarten. Students should be familiar with identifying sides, vertices (corners), angles, circles, triangles, quadrilaterals (squares and rectangles), and pentagons. Students should have been exposed to these terms since as early as Kindergarten.

Teachers may want to spend some time watching this video to assist in teaching the necessary vocabulary.

<http://gadoe.georgiastandards.org/mathframework.aspx?PageReq=MathName>

Some students may think that a shape is changed by its orientation. They may see a rectangle with the longer side as the base, but claim that the same rectangle with the shorter side as the base is a different shape. This is why it is so important to have young students handle shapes and physically feel that the shape does not change regardless of the orientation, as illustrated below.



This task requires students to classify shapes. "As young students work at classification of shapes, be prepared for some of them to notice features that you do not consider to be "real" geometric attributes, such as "curvy" or "looks like a rocket." Children at this level will also attribute to shapes ideas that are not part of the shape, such as "points up" or "has a side that is the same as the edge of the board. In any sorting activity, the students should decide how to sort, not the teacher. This allows the students to do the activity using ideas they own and understand. By listening to the kinds of attributes that they use in their sorting, you will be able to tell what properties they know and use and how they think about their shapes." (Information quoted from Van de Walle and Lovin, *Teaching Student-Centered Mathematics: Grades 3-5*, pages 212-213)

Formative Assessment Questions:

- What are differences between a (triangle) and a (quadrilateral)?
- How do we determine, or decide, the name of a shape?
- Can you make that shape smaller? Larger?
- What would happen if you made that side longer? Would it still be the same shape?

Differentiation:

Extension

- Students who demonstrate an understanding of the shapes presented in this lesson may be introduced to heptagons (7 sides), octagons (8 sides), nonagons (9 sides), decagons (10 sides), and dodecagons (12 sides). Students can create these shapes using their geo-boards and add information regarding these shapes to their charts.
- Choose a polygon and create a picture using the shape. Describe it with mathematical words and then create a story about your picture.

Intervention

- Some students may have difficulty using the geoboards with rubber bands. These students can use dot paper instead. They can draw lines between the dots to create the various shapes.
- Use dot paper to model various shapes such as triangles, quadrilaterals, pentagons, hexagons, etc.

Vocabulary:

Side	Quadrilateral	Regular
Angle	Pentagons	Irregular
Vertex	Hexagons	
Triangle	Polygon	

References:

Parrish, Sherry. Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5. Sausalito: Math Solutions Publications, 2010

Alaska Mathematics Standards Math Tasks Grade K



Ribbon Fractions

Content Standard

2.G.2. Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.

2.G.3. Partition circles and rectangles into shares, describe the shares using the words *halves*, *thirds*, *half of*, *a third of*, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.

Mathematical Practices

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. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.

8. Look for and express regularity in repeated reasoning.

Task Description

In this task, students use ribbon to make equal shares and relate it to creating a number line. (Task is adapted from State of Victoria, Australia : Teaching Resources. Activity 6 http://www.education.vic.gov.au/studentlearning/teachingresources/maths/mathscontinuum/number/N25001P_2.htm)

Materials:

- For the teacher:
 - o Several pieces of ribbon cut into 1 yard pieces (these pieces will be used for student demonstration, 3-5 pieces may be necessary)
- For each group:
 - o 1 yard of ribbon (string or adding machine tape would also work)
 - o String
 - o paper clips
 - o ruler
 - o scissors
 - o unifix cubes or snapping cubes
- For Differentiation groups:
 - o Adding machine tape
 - o Unifix cubes

Part I

Show the class a length of ribbon that is one yard long and ask how to divide it into two equal pieces. You may wish to have volunteers come up and demonstrate their strategies. Some might suggest folding the ribbon in half so the two parts match and then cutting on the fold. Ask, "how do you know this will work?" Make sure

to have them explain their strategies, even if they are wrong! Make sure to demonstrate **ALL** strategies so those that are incorrect can see why what they are thinking does not work, (this is why the teacher will need so many pieces). Allow them an opportunity to change their thinking and have them explain **WHY** they changed their mind!

Once the class has come to an agreement about how to cut the ribbon then cut it. **Make sure to tape an original uncut ribbon (the unit) to the board for comparison.** Label it as 1. Discuss how each section is one half of the original ribbon. Have someone hold up the cut pieces (separately) and compare them to the uncut piece (the unit). Tape them to the board and label them with half written above each section. Ask students "Why does it take both parts to make one whole piece?" The goal of this task is to have students understand the terms "halves, thirds, and fourths".

Part II

Divide the class into groups, with some groups of three and some groups of three or four children. Give each group a piece of ribbon that is one yard long and present them with this problem: How could you divide this ribbon so that each person in your group gets an equal piece? You might use string or adding machine tape depending on what you have available. Make it clear that all of the students in the group should get pieces that are the same length. Suggest that students do not cut the ribbon until the whole group agrees that they can make equal parts. If a group cuts their ribbon and then sees that the pieces are not of equal size, provide them with another ribbon and have them try again. **Make sure they can explain to you WHY they need another ribbon and what their new strategy will be for cutting it this time!**

After ample work time is given, allow groups to share the strategies they used. Some might fold the ribbon into 3 or 4 pieces and then cut it. Others might use something to measure the ribbon and make equal parts using a ruler. The measuring could also be done with other non-standard measures –such as Unifix cubes, snapping cubes etc. During the discussion ask the following questions:

- Does each person in the group have a ribbon that is the same size?
- What fraction could be used to explain how much of the whole each person in the group received?

*Some might fold the ribbon in half and then in half again to create 4 equal parts. If this happens be sure to have those students explain why this strategy works for creating fourths. If the students demonstrate an understating of this then you pose the following question: "Now that this ribbon is folded into fourths could I use the same strategy to create another fraction? (i.e. eighths). If I use this strategy on a ribbon folded in thirds what would I create? (i.e. sixths). Can you think of other examples of this same kind of thinking?"

After the group discussion, allow all students to carry their ribbon pieces back to their desk (or floor) and ask the following questions:

- Does each person in the class now have a piece of ribbon the same size? (no)
- Why are some ribbon pieces longer than others?
- What would you expect the pieces to be like for the members of a group of 6? 10? (Pieces would be smaller)

Part III

Write the fraction words halves, thirds, quarters, and fourths on the board and have a student come up and tape their piece of ribbon underneath the correct spot. Have the students explain which fractional piece they think is the largest and smallest and how they decided. Listen for them to say that if the ribbon is only shared two ways the piece is larger. If it is shared four ways, it is smaller. Make sure that the students can explain that this is because more people need a piece of the ribbon.

Draw a number line that is the length of one uncut piece of ribbon on the board with zero at one end and 1 and the other. Tape an uncut piece of ribbon underneath the one. Ask, "Why did I place this uncut piece of ribbon here? (because it is one whole piece of ribbon) RIGHT! So where should we tape the half piece of ribbon? How about the third piece and the fourth piece? Listen and look for student recognition and understanding that there are numbers that live in-between other (whole) numbers. Check for transfer of understanding by asking if they can show the placement of halves, thirds, quarters, and fourths on a number line (the line goes from zero to one, so halfway would be $1/2$.)

Number Talk:

Even though this task involves geometry standards, it is still important to practice number talks daily. There is an example of a number talk appropriate for 2nd grade below. However, feel free to choose or create a number talk that is relevant and/or needed for the students in your classroom.

Strategy: Making Tens: Number Line

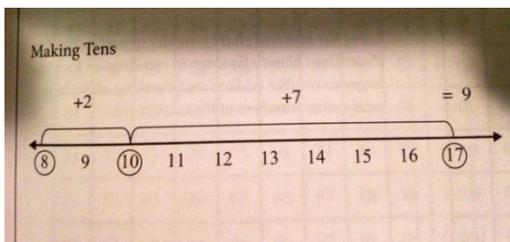
Making tens is an important focus in the primary grades. By now students should be able to break numbers apart quickly to make ten. The focus of this strategy is to be able to utilize fluency with ten to expedite adding. Being able to take numbers apart with ease, or fluency, is the key to using this strategy.

For Example:

$8 + 9$ $(7 + 1) + 9$ $7 + (1 + 9)$ $7 + 10 = 17$	<p>By changing the 8 to a 7 + 1 the student can restructure the problem to create a combination of 10 with 1 + 9.</p>
<p>Or</p> $8 + 9$ $8 + (2 + 7)$ $(8 + 2) + 7$ $10 + 7 = 17$	<p>The student could also choose to make a 10 by breaking apart the 9 into 7 + 2 and combining the 2 with the 8 to create 10.</p>

Using this strategy with a number line:

A number line allows the students to visualize the action of the operation. See picture below for the correct use of the open number line for 8 + 9:



Try using the number talk below using the Making Ten strategy and a number line:

$7 + 3$	$8 + 2$
$7 + 5 + 3$	$2 + 4 + 8$
$3 + 6 + 7$	$8 + 3 + 2$

For more number talks using the strategy please see *Number Talk* by Sherry Parrish.

Background Knowledge/Common Misconceptions:

(Information quoted from Van de Walle and Lovin, *Teaching Student-Centered Mathematics: Grades K-3*, page 253-254)

“During the discussions of students’ solutions (and discussions are essential!) is a good time to introduce the vocabulary of fractional parts. This can be quite casual and, at least for younger children, should not involve fraction symbolism. When a brownie or other region has been broken into equal shares, simply say, “We call these fourths. The whole is cut into four parts. All of the parts are the same size-fourths.

Children need to be aware of two aspects or components of fractional parts: (1) the number of parts and (2) the equality of the parts (in size, not necessarily in shape). Emphasize that the number of equal parts or fair shares that make up a whole determines the name of the fractional parts or shares. They will be familiar with halves but should quickly learn to describe thirds, fourths, fifths, and so on.”

Formative Assessment Questions:

- Does each person in the group have a ribbon that is the same size? How do you know for sure?
- What fraction could be used to explain how much of the whole each person in the group received?
- Does each person in the class now have a piece of ribbon the same size? (no)
- Why are some ribbon pieces longer or shorter than others?
- What would you expect the pieces to be like for the members of a group of 6? 10? 100? (Pieces would be smaller)

Differentiation:**Extension**

Give students a new length of ribbon, and tell them it is $\frac{1}{2}$ of a length. Allow them to decide what the whole length would be.

Make a connection to candy bars. Ask students whether they would rather have a half, third, or a fourth of a candy bar. Again have them explain their thinking. This would be a great topic for journal writing!

Intervention

If students are having difficulty, provide them with pre-cut fractional parts of circles and rectangles to manipulate to create “the whole” from halves, thirds, and fourths

Vocabulary:

Fraction
Equal Parts
Whole
Half/halves
Thirds
Fourths
Quarters

References:

Parrish, Sherry. *Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5*. Sausalito: Math Solutions Publications, 2010

Van de Walle, John A., and Lou Ann H. Lovin. *Teaching Student-Centered Mathematics: Grades K-3, Volume 1*. Pearson, 2006

Alaska Mathematics Standards Math Tasks Grade 2



Sharing Equally

Content Standard

2.G.3. Partition circles and rectangles into shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.

Mathematical Practices

- 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. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.
5. Use appropriate tools strategically.
- 6. Attend to precision.**
7. Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.
8. Look for and express regularity in repeated reasoning.

Task Description

In this task, students explore equal parts and start to learn about halves and fourth.

Materials:

- Math Journal
- "Sharing Equally" Student recording form
- *Give Me Half* by Stewart Murphy, or similar text

****Please see link below for "Sharing Equally" student recording form (pg. 51):**

<http://tinyurl.com/MathTasks-Grade2-Unit5>

Part I

Begin the lesson by asking students this question: "Have you ever had to share something before?"

Hold up an even set number of items, and ask the students for suggestions on how you could share these items with one other person. Have students record their answer in their math journals including pictures and words. This will allow you to begin to see how students see "sharing". This will produce a variety of results, possibly including students may describe handing objects out one at a time, some students will match all the items up into pairs and then take half of each pair, and some students may even describe cutting each item in half and then giving each person a series of halves. Have students share their explanations and illustrations with the class.

Part II

Read *Give Me Half* by Stewart Murphy or some other similar book that describes sharing things equally between two people. As you read, stop to discuss the ways the children are sharing the items in the story. Present students with the situation:

Jessica and Katie wanted to share a cake equally. The cake was in the shape of a rectangle. Katie said, "There are two ways to cut the cake to make equal size pieces. Either cut from one vertex to the opposite vertex or cut from the midpoint of one side to midpoint of the opposite side. Those are the only two ways to make one straight cut and have two equal size pieces." Jessica said, "No, there are other ways to make one cut and share the cake equally besides the ways that you named." Who is right? Students should explain their thinking on their student recording form using pictures and words.

Part III

Present students with a similar situation as above but this time they need to share the cake between 4 friends. Ask questions such as, "What will happen to the size of the pieces? Would you rather share with 4 friends or 2 friends? Why? How many different ways could they cut the cake and still have four equal pieces? What do you think we should call each of these four pieces? Why wouldn't the name thirds or fifths or sixths make sense for these pieces? What would those pieces look like? Would they be bigger or smaller than fourths? Bigger or smaller than halves? How do you know? How many pieces (halves or fourths) do we need in order to talk about the whole cake?"

Number Talk:

Even though this task involves a geometry standard, it is still important to practice number talks daily. There is an example of a number talk appropriate for 2nd grade below. However, feel free to choose or create a number talk that is relevant and/or needed for the students in your classroom.

Strategy: Doubles/Near-Doubles: Number Sentence

Beginning as early as kindergarten, children are able to recall sums for many doubles. This strategy capitalizes on this strength by adjusting one or both numbers to make a double or near-doubles combination.

For Example:

$8 + 9$ $8 + (8 + 1)$ $(8 + 8) + 1$ $16 + 1 = 17$	<p>The student could choose from several doubles/near-doubles combinations to solve the problem:</p> <p>$8 + 8$ Using this double requires the student to decompose 9 into 8 + 1.</p>
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$8 + 9$ $\begin{array}{r} +1 \\ 9 + 9 = 18 \\ -1 \\ \hline 17 \end{array}$ $8 + 9$ $\begin{array}{r} +2 \\ 10 + 10 = 20 \\ -3 \\ \hline 17 \end{array}$	<p>$9 + 9$ Using this double requires the student to add an extra 1 and then subtract it from the total.</p> <p>$10 + 10$ Using this double requires the student to add 3 extra and then subtract the extra 3 from the total.</p>
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Below is a number talk with the Doubles/Near-Doubles strategy for you to try with your classroom:

$11 + 11$	$15 + 15$
$12 + 12$	$16 + 16$
$11 + 12$	$15 + 14$
$11 + 10$	$15 + 16$

For additional number talks with this strategy please see *Number Talks* by Sherry Parrish.

Background Knowledge/Common Misconceptions:

(Information quoted from Van de Walle and Lovin, *Teaching Student-Centered Mathematics: Grades K-3*, partial excerpts, pages 252-258)

While this task is supporting a geometry standard, it also builds fraction understanding through manipulation of shapes. It is important for teachers to understand the connections inherent in the task. "The first goal in the development of fractions should be to help children construct the idea of *fractional parts of the whole*-the parts that result when the whole or unit has been partitioned into *equal-sized portions* or *fair shares*. Children seem to understand the idea of separating quantity into two or more parts to be shared fairly among friends. They eventually make connections between the idea of fair shares and fractional parts. Sharing tasks are, therefore, good places to begin the development of fractions.

Students initially perform sharing tasks (division) by distributing items one at a time. When this process leaves leftover pieces, it is much easier to think of sharing them fairly if the items can be subdivided. Typical "regions" to share are brownies (rectangles), sandwiches, pizzas, crackers, cake, candy bars and so on.

Problem difficulty is determined by the relationship between the number of things to be shared and the number of sharers. Because children's initial strategies for sharing involving halving, a good place to begin is with two, four, or even eight sharers, many children will deal out two to each child and then halve each of the remaining brownies."...

"It is a mistake to think that fractional parts such as sixths or eighths are conceptually more difficult than halves or thirds. Note that in the discussion of sharing, halves, fourths, and eighths were explored prior to thirds, sixths, and fifths. This is done because successive halving of parts is a natural process for young children. The number of parts does not correlate with conceptual difficulty. Most state curricula would lead you to believe differently. In fact, if we want children to generalize the concept of fractional parts and connect to this generalization the numeric names of thirds, fourths, fifths, and so on, they must be exposed to more than just halves and thirds in the earliest stages of exploring fractions."

Formative Assessment Questions:

- When sharing, how do you make sure all parts are equal?
- Do equal parts have to be the same shape? Why?
- Is there more than one way to cut something in half?
- Is there more than one way to cut something into fourths?

Differentiation:**Extension**

- Students can attempt to divide other polygons into equal halves, thirds, and fourths.

Intervention

- Students who are having difficulty can use pattern blocks, fraction strips, index cards, or construction paper shapes which they can compare and/or cut into equal parts.

Vocabulary:

Whole	Half	Thirds
Equal Parts	Fourths	Vertex
Equally	Thirds	

References:

Parrish, Sherry. *Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5*. Sausalito: Math Solutions Publications, 2010

Van de Walle, John A., and Lou Ann H. Lovin. *Teaching Student-Centered Mathematics: Grades K-3, Volume 1*. Pearson, 2006

Alaska Mathematics Standards Math Tasks Grade 2



Are We Odd or Even?

Content Standard

2.OA.3. Determine whether a group of objects (up to 20) is odd or even (e.g., by pairing objects and comparing, counting by 2s). Model an even number as two equal groups of objects and then write an equation as a sum of two equal addends.

Mathematical Practices

- 1. Make sense of problems and persevere in solving them.**
- Reason abstractly and quantitatively.
- 3. Construct viable arguments and critique the reasoning of others.**
- 4. Model with mathematics. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.**
- Use appropriate tools strategically.
- 6. Attend to precision.**
- Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.
- Look for and express regularity in repeated reasoning.

Task Description

In this task, students will determine strategies to use classmates to decide whether the class has an odd or even amount of students.

Materials:

- Unifix cubes, or similar manipulatives
- Chart paper
- Markers

Part I

Units 2 and 4 have provided students with opportunities to explore how some numbers (up to 20) can be separated into two equal groups. This prior knowledge will allow students to understand that even numbers can be separated into two equal groups (equal addends). For example, students begin to understand 12 is even because $6 + 6 = 12$ (two equal groups of 6). Whereas, students begin to understand 13 is odd because it cannot be separated into two equal groups. Additionally, students may realize that when there is an even number of objects, each object will have a partner and with an odd number of objects, there will be one object left over. For example, 8 is an even number because it can be shown as XX XX XX XX, whereas 9 is an odd number because it can be shown as XX XX XX XX X.

Pass out 20 unifix cubes, or other similar manipulatives to each partnership. Review observations students made about odd and even numbers during the "Bumpy or Not Bumpy" activity (even numbers are "not bumpy" and odd numbers are "bumpy"). Ask students how they might be able to use cubes to determine whether numbers are even or odd. Students should suggest separating the cubes into equal groups or partners to determine if the number is even or odd. If students do not make these suggestions, teachers should refer to the first part of Part I for possible discussions and explorations.

Invite students to work with partners to show how various numbers (up to 20) are even or odd. Make observations, listen to student conversations, and ask students formative assessment questions such as:

- How are you using the cubes to decide whether ____ is even or odd?
- How are the cubes helping you to decide whether ____ is even or odd? Why?
- How can you use cubes to show ____ is an even number?
- How can you use cubes to show ____ is an odd number?

Part II

Special note: Because many classrooms have more than 20 students, this activity will allow students to apply their knowledge to larger numbers.

Gather students together and pose the question “How can we use ourselves (teacher not included) to determine if our class has an odd or even number of students?” Record various student responses on chart paper. At this point, students should make suggestions such as “We can see if we can separate ourselves into two equal groups.” and “We can see if we each have a partner.”

As a class, decide which strategy to use first and how students should begin “sorting” themselves. Monitor student progress. Once students have sorted themselves, have students determine whether they are even or odd.

As a class, decide which strategy to use next and how students should begin “sorting” themselves. Monitor student progress. Once students have sorted themselves, have students determine whether they are even or odd (students should notice that they should have the same answer as in the previous attempt; however, if they do not have the same answer, this would provide a good opportunity for students to “check” their results). Encourage students to discuss the two strategies they used.

At this point, if the class is an even number, ask students what the two equal addends are that add up to the total number of students. For example, if your class has a sum of 22, students $11 + 11 = 22$. If your class has an odd number, students should understand that odd numbers cannot be separated into two equal groups and the sum cannot be represented with two equal addends.

Number Talk:

This task will lend itself to a number talk about these numbers:

3,5,7,9

2,4,6,8

You could use multiple different strategies with students to come to the realization that:

$$1 + 1 = 2$$

$$2 + 2 = 4$$

$$3 + 3 = 6$$

However, the numbers 3, 5, 7 and 9 cannot in any way be put into two **equal** groups. (For more information, refer to *Number Talks, grades K-5* by Sherry Parrish)

Discussion questions that are appropriate during number talks:

- How did you think about that?
- How did you figure it out?
- What did you do next?
- Why did you do that? Tell me more.
- Who would like to share their thinking?
- Did someone solve it a different way?
- Who else started the problem this way?
- Who else used this strategy to solve the problem?
- What strategies do you see being used?

Background Knowledge/Common Misconceptions:

(Information quoted from Van de Walle and Lovin, *Teaching Student-Centered Mathematics: Grades K-3*, page 291)

“The categorization of numbers as odd or even is an important regularity in our number system. All too often students are simply told that the even numbers are those that end in 0, 2, 4, 6, or 8 and odd numbers are those that end in 1, 3, 5, 7, or 9. While of course this is true, it is only an attribute of even and odd numbers rather than a definition that explains what even or not even (i.e., odd) really means.”

After concluding the Bumpy or Not Bumpy Task, “students should be able to classify numbers in to the categories that we call odd and even. **After they have conceptualized these classes of numbers**, the appropriate labels of *odd* and *even* can be applied.”

Formative Assessment Questions:

- How can you use manipulatives to determine whether a number is even or odd?
- What strategies can you use to decide if a number is even or odd?
- How can you show (prove) ____ is even?
- How can you show (prove) ____ is odd?

Differentiation:**Extension**

- Challenge students to determine if larger numbers are even or odd.

Intervention

- Provide additional opportunities for students to work with manipulatives to develop an understanding of even and odd.

Vocabulary:

Odd

Even

Equal Groups

References:

Parrish, Sherry. *Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5*. Sausalito: Math Solutions Publications, 2010

Van de Walle, John A., and Lou Ann H. Lovin. *Teaching Student-Centered Mathematics: Grades K-3, Volume 1*. Pearson, 2006

Alaska Mathematics Standards Math Tasks Grade 2



What's In The Bag?

Content Standard

2.OA.3. Determine whether a group of objects (up to 20) is odd or even (e.g., by pairing objects and comparing, counting by 2s). Model an even number as two equal groups of objects and then write an equation as a sum of two equal addends.

Mathematical Practices

- 1. Make sense of problems and persevere in solving them.**
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- 4. Model with mathematics. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.**
- 5. Use appropriate tools strategically.**
- 6. Attend to precision.**
- Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.
- Look for and express regularity in repeated reasoning.

Task Description

In this task, students will use real life objects to determine whether the number of objects is odd or even. Specifically, students will explore how even numbers can be split into two equal groups.

Materials:

- Various manipulatives (counters, base-ten blocks, unifix cubes, beans in bags labeled A –J, 1 set per partner)
- Paper, crayons, pencils

Special Note:

This task can be repeated several times in small groups or in a center.

Part I

Gather students together in class meeting area. Display the questions, "What is even? What is odd?" The teacher will need to guide discussion into mathematical talk and not story sharing. Be prepared to guide students' thinking into conversations about something such as sharing carrot snacks between two friends.

Part II

Have two students come up and practice sharing the cubes the teacher has placed in front of them. For example, the teacher would place 6 cubes in front of 2 students and ask them if they can share the total evenly (fairly). As students are sharing, record each shared quantity on a chart labeled "We can share equally between 2 groups/ We cannot share equally between 2 groups." After several student pairs share the cubes (different quantities each time), lead class in discussion about information on the chart. The conversation should be directed to build the understanding that groups shared evenly are called even numbers and ones which do not share evenly are called odd numbers. The chart can be relabeled as EVEN and ODD.

Part III

Students work in partners with 10 different bags of items. These should be made in advance and could be shared between various partners. Each bag should be labeled A –J. Once students have determined which groups are odd and which are even, they will work together and create a bar graph of the number of odd and even draws they had with their partner. Students should be prepared to share their graph with others.

Part IV

Students individually will create their own number line from 0-20. The teacher calls out numbers and students first label the numbers as they teacher calls them out and then students labels as odd or even using red and blue crayons. Students will share with a table partner to check their labeling.

Number Talk:

Strategy: Breaking Numbers into Place Value

This number talk consists of three sequential problems. The sequence of problems allows students to apply strategies from previous problems to subsequent problems. Once students being to understand place value, this is one of the first strategies they utilize. Each addend is broken into expanded form and like place value amounts are combined.

Example:

$24 + 38$	
$(20 + 4) + (30 + 8)$	Each addend is broken into its place value.
$20 + 30 = 50$	Tens are combined.
$4 + 8 = 12$	Ones are combined.
$50 + 12 = 62$	Totals are added from the previous sums.

The following number talk is composed of smaller two-digit numbers that does not require re-grouping:

$20 + 20$
$23 + 25$
$24 + 21$
$22 + 26$

For this particular number talk I would focus a class discussion on whether or not the answers are odd or even numbers. Ask students to begin looking for a pattern in their answers in relation to their addends.

Discussion questions that are appropriate during number talks:

- How did you think about that?
- How did you figure it out?
- What did you do next?
- Why did you do that? Tell me more.
- Who would like to share their thinking?
- Did someone solve it a different way?
- Who else started the problem this way?
- Who else used this strategy to solve the problem?
- What strategies do you see being used?

For more number talks using this strategy please see *Number Talks* by Sherry Parrish.

Background Knowledge/Common Misconceptions:

(Information adapted from North Carolina DPI Instructional Support Tools)

Students should have had prior experiences and/or instruction with addition. They should begin to relate multiplication as repeated addition. Please see Units 2 and 4 for addition support. If you have not already done tasks where students have split a group of 20 (or fewer) items into two equal groups then this needs to be done before attempting this task. Provide several experiences where students are able to investigate all the numbers 0-20 to see which ones can be split into two equal groups. This is a good opportunity to review the concepts of “not bumpy” (even) and “bumpy” (odd) numbers and now build on the understanding of how this connects to repeated addition. Having students write addition equations for the even numbers they are able to split into two equal groups is a good way to introduce the concept of repeated addition. Students should recognize that all even numbers can be expressed using two of the same addends (ex. $2+2=4$, $3+3=6$, again focusing on equal addends sets the stage for repeated addition, leading into multiplication.)

This task will focus on the use of strategies; however, it is important to note the focus is on conversations as students engage in experiences with repeated addition. Initially, students apply base-ten concepts and use direct modeling with physical objects or drawings to find different ways to solve problems. They move to inventing strategies that do not involve physical materials or counting by ones to solve problems. Student-invented strategies likely will be based on place-value concepts, the commutative and associative properties, and the relationship between addition and subtraction. These strategies should be done mentally or with a written record for support. It is vital that student-invented strategies be shared, explored, recorded and tried by others. Recording the expressions and equations in the strategies horizontally encourages students to think about the numbers and the quantities they represent instead of the digits. Not every student will invent strategies, but all students can and will try strategies they have seen that make sense to them. Different students will prefer different strategies.

Formative Assessment Questions:

- What strategies did you use to decide if a number of odd or even?
- Can you show that answer in a different way?
- How can you demonstrate this with a picture?
- How could you write this in a number sentence?

Differentiation:**Extension**

- Encourage students to determine whether or not they can come up with a rule for any number that would tell whether or not the number is odd or even. Have students record their rule on an anchor chart and present their even/odd rule to the class.

Intervention

- Some students will need to use manipulatives to help to determine or represent the number of objects in each group.
- Give the student a 0-20 chart to help them skip count to determine the number of objects in each group.

Vocabulary:

Even
Odd
Shared Equally
Bar Graph
Number Line

References:

Parrish, Sherry. Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5. Sausalito: Math Solutions Publications, 2010

Alaska Mathematics Standards Math Tasks Grade 2



Add It Up!

Content Standard

2.OA.3. Determine whether a group of objects (up to 20) is odd or even (e.g., by pairing objects and comparing, counting by 2s). Model an even number as two equal groups of objects and then write an equation as a sum of two equal addends.

Mathematical Practices

- 1. Make sense of problems and persevere in solving them.**
- Reason abstractly and quantitatively.
- 3. Construct viable arguments and critique the reasoning of others.**
- 4. Model with mathematics. Students draw pictures using dot cards, number lines, picture cards, and counters to represent and compare quantities or sets.**
- Use appropriate tools strategically.
- 6. Attend to precision.**
- Look for and make use of structure. Students will use tally marks to represent benchmarks (5, 10) of counting.
- Look for and express regularity in repeated reasoning.

Task Description

In this task, students will use a growing understanding of odd and even numbers to form problems solving strategies for adding numbers

Materials:

- Various manipulatives (counters, base-ten blocks, unifix cubes, beans) in bags. Need multiple bags with even number of items and multiple bags with an odd number of items
- Group Recording Sheet

Special Note:

This task will take a few days as students repeat the work several times. Each opportunity will provide students with more time to describe their thinking and deepen their conceptual understanding of how these two concepts connect.

Part I

The teacher will gather students together for large group work. In advance, the teacher should create multiple bags of even materials and multiple bags of odd materials. Guide students in making connections about what happens when we combine two bags with even amounts, what happens when we combine bags with odd amounts, and what about when we combine bags with one of each. What is the result?

Students will need to record their findings as they combine bags such as: Bag A had 7 and Bag B had 4, therefore adding an odd and an even number which resulted in an odd number; however when I combined Bag A with 7 and Bag C with 3, I had a total of 10 which I know is an even number. This is all with manipulatives, students are not writing the number sentences yet. The teacher should allow time for students to predict whether the total will be odd or even and why they think the number will be odd or even.

Part II

After students have had extensive work describing all these combinations, go back to the bag combinations with writing addition sentences talking about addition sentences. This time students will connect the combinations with writing the number sentences, connecting repeating addition to even and odd. Use rich math language as you question students and repeat the questions about combinations. What are our addends? What do we know about those numbers? How will knowing if it's even or odd help us determine the answer?

This task is one that can be moved to a center once students have had ample time in class discussion. This task is designed to be repeated several times.

Number Talk:

Strategy: Adding Up in Chunks

This strategy is similar to the Breaking Each Number into Its Place Value strategy except the focus is on keeping one addend whole and adding the second number in easy-to-use chunks. The strategy is slightly more efficient than the Breaking Each Number into Its Place Value strategy, since you are not breaking apart every number.

Example:

A. $45 + 28$ $45 + (20 + 8)$ $45 + 20 = 65$ $65 + 8 = 73$	In Example A, 45 is kept whole while 28 is broken into its place value and added in parts to the 45.
B. $45 + 28$ $(40 + 5) + 28$ $40 + 28 = 68$ $68 + 5 = 73$	Example B demonstrates that either number can be kept whole. This time the 28 is kept intact while 45 is broken into combinations that make the problem easier to solve.

Here is an Adding Up in Chunks number talk to try with you students (this number talk focuses on adding multiples of ten to any number):

$7 + 10$	$16 + 10$
$7 + 20$	$16 + 20$
$7 + 30$	$16 + 40$
$7 + 40$	$16 + 42$

For this particular number talk I would focus a class discussion on whether or not the answers are odd or even numbers. Ask students to begin looking for a pattern in their answers in relation to their addends.

For more number talks using this strategy please see *Number Talks* by Sherry Parrish.

Background Knowledge/Common Misconceptions:

(Information quoted from Van de Walle, Karp, and Bay-Williams, *Elementary and Middle School Mathematics: Teaching Developmentally*, page 266-267)

“An interesting category of number structures is that of odd and even numbers. Students will often observe that the sum of two even numbers is even, that the sum of two odd numbers is even, or that the sum of an even and odd number is always odd. Similar statements can be made about multiplication.

Students will provide a variety of interesting proofs of odd/even conjectures. As with other conjectures, they typically begin by trying lots of numbers. But here it is a bit easier to imagine that there just might be two numbers ‘out there’ that don’t work. Then students turn to the definition or a model that illustrates the definition. For example, if a number is odd and you split in two, there will be a leftover. If you do this with the second odd number, it will have a leftover also. So if you put these two together, the two leftovers will go together so there won’t be a leftover in the sum. Students frequently use models such as bars of snap cubes to strengthen their arguments.”

Formative Assessment Questions:

- What strategies are you using to determine how many _____ are in your group?
- Can you show that answer in a different way?
- How can you demonstrate this with a picture?
- How could you write this in a number sentence?
- Do you have the same number of any of your objects? Why do you think this is the case?
- What makes a number even? What makes a number odd?
- How can knowing if a number is even or odd help you with addition sentences?
- What is an addend?

Differentiation:**Extension**

- Students work independently with grab bags of items and justify their answers.

Intervention

- Students use manipulatives to show their work.

Vocabulary:

Addend

Odd

Even

Addition Sentences

References:

Parrish, Sherry. *Number Talks: Helping Children Build Mental Math and Computation Strategies, Grades K 5*. Sausalito: Math Solutions Publications, 2010

Van de Walle, John A., Karen S. Karp, Jennifer M. Bay-Williams. *Elementary and Middle School Mathematics: Teaching Developmentally*. Pearson, 2012