Alaska Mathematics Standards
Math Tasks
Grade K

Going on a Shape Hunt
Naming and Identifying Shapes

Content Standard

K.G.1. Describe objects in the environment using names of shapes and describe their relative positions (e.g., above, below, beside, in front of, behind, next to).

K.G.2. Name shapes regardless of their orientation or overall size.

K.G.3. Identify shapes as two-dimensional (flat) or three-dimensional (solid).

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

Students will use what they know about geometric shapes to go on a shape hunt and discover the shapes that are in their environment.

Materials:

- *The Greedy Triangle* by Marilyn Burns (Scholastic, 1995)
- *Round Trip* by Ann Jonas (Greenwillow, 1983)
- *Eight Hands Round* by Ann Whitford Paul (HarperCollins, 1991)
- Chart paper or overhead projector
- Cardstock cut to 1" x 6"
- Clipboards or other portable writing surface
- Two-and three-dimensional geometric models

****Please see link below for shape hunt recording sheet (pg. 31):**
http://tinyurl.com/MathTasks-GradeK-Unit1

Part I

Gather students in a large group on the carpet. Introduce or review the names of the geometric shapes that they are learning in order to activate any prior knowledge they may have on shapes. You need to focus solely on two-dimensional shapes and eventually do this activity again solely using three-dimensional shapes. Read aloud the book that you have selected. The story should be read aloud in its entirety, pausing only to allow students to predict upcoming events. Predicting allows students to focus attention on reasoning, patterns, and problem solving while incorporating what they already know about geometric shapes with the ideas presented in the book. (SMP 1, 3, 6, 7, 8)

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Part II
Discuss the idea that shapes are not just in books but are all around us. Introduce the Shape Hunt Chant. As you say the chant, hold up the model of a circle you have prepared for student reference. When you reach the line that says, "Do you see a circle?" ask students to point to a circle in the classroom. Finish the song. You may wish to have students get up and move to the object they have selected instead of sitting on the carpet pointing. For example, when you say, "Do you see a circle?" pause and allow them to move to a location in the classroom where a circle is located. Once almost everyone is sitting by something, go on with "yes, we see a circle." This is especially beneficial for students who are kinesthetic learners.

Start a list of objects that are circles in the classroom on chart paper. Model various strategies for spelling words. For example, "Maria is pointing at the clock. Can you all point to the word clock in our classroom? Right, it's on a red card beside the clock. You read the letters while I print them on the chart. Jose is pointing at a plate in our house center. I don't see that word anywhere in our classroom. Let's try to write it together. P-p-plate. What letter do I need to print at the beginning of the word plate?" Another strategy is to point out words that are on the classroom word wall or located on posters or in other environmental print. Repeat the shape hunt chant. You can use the same shape and ask them to choose different objects. Or you can change the shape. If you do this, start a new list on another piece of chart paper. You may want to limit the number of shapes to four or five, depending on how long each "hunt" takes the students. You might also choose to focus only on two-dimensional or only on three-dimensional shapes. When you have gone through four or five shapes, you may choose to have students complete either the Two-Dimensional Task Sheet or the Three-Dimensional Task Sheet depending on what is most appropriate. Remind them to use classroom labels, the word wall, personal dictionaries, the charts just created, and their ability to sound out words to help them complete their work. (SMP 1, 3, 6, 7, 8)

PART III
Review the charts that you created with your students in Session 2.
Inform students that they will be going on a shape hunt outside the classroom. Have them brainstorm some other areas in the school where they could look for shapes such as the office, the library, the gymnasium, the cafeteria, or the hallways. You may choose to give each student a clipboard or portable writing surface, a pencil, and either the Two-Dimensional Task Sheet or the Three-Dimensional Task Sheet or both, depending on what they used in Session 2. Review with them how to complete the sheets. Ask students to choose different objects on this shape hunt than they chose during Session 2. Bring along the models of the shapes you used in Session 2.

At each location, choose one shape for students to look for. Show them the model of the shape. If they are completing the task sheets, they should complete the appropriate section. Review with them various strategies they can use to write the words on their sheet-they can sound it out, think about words they know that are similar, or look for environmental print. When you return to the classroom, allow students a few minutes at their seats to complete their task sheets. Remind them that they may want to check the word wall for words that they were uncertain how to spell correctly. (SMP 1, 3, 6, 7, 8)

Number Talk:
There is not a number talk available that is appropriate for this task.

Background Knowledge/Common Misconceptions:
Students often use incorrect terminology when describing shapes. For example, students may say a cube is a square or that a sphere is a circle. The use of two-dimensional shape names that appear to be part of a three-dimensional shape in order to name the three-dimensional shape is a common mistake. For example, students might call a cube a square because the student sees the face of the cube. Work with student to help them understand that the two-dimensional shape is a part of the object, but it has a different name.

Another common misconception is separating a square from the identified category of rectangles. A square exhibits the same characteristics of rectangles, however it is special rectangle because it sides are equal in length.

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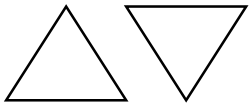
Students often mistake a change in size or orientation of a shape as a change in the name of the shape. One of the most common misconceptions in geometry is the belief that orientations are tied to shape. A student may see the second of the figures below as a triangle, but claim to not know the name of the first.



Students need to have many experiences with shapes in different orientations. For example, ask students to form other triangles with the two triangles in different orientations.

Formative Assessment Questions:

- How many shapes did you find?
- What types of shapes did you find?
- Did you find different kinds of the same shape?
- How can you describe the shapes that you found?
- What shapes were the easiest to find? Hardest?

Differentiation:

Extension

- Send home copies of the Two-Dimensional Task Sheet or the Three-Dimensional Task Sheet and have students go on a shape hunt at home.
- Allow students (with supervision) to use a digital camera to take pictures of all the shapes found in your classroom or your school and create a book of shapes. The book could have a section for each shape and each student could be responsible for writing the text for one page of the book.
- Have students pair up and visit the Sammy's Shapes website where they can identify specific shapes appropriate for their grade level and locate and describe the shapes. This website can be used during math work stations or center time.

http://primarygames.com/storybooks/sammy/start.htm

Intervention

- Give the child a picture of a space with shapes highlighted, for example: a picture of a grocery store aisle with the outline of the cereal box bolded. Have them place cut outs or manipulatives on top of the outline.

Vocabulary:

Circle
Square
Rectangle
Hexagon
Triangle

Alaska Mathematics Standards
Math Tasks
Grade K

Touch It, Count It, Chart It
Shapes and Orientation

Content Standard

K.G.1. Describe objects in the environment using names of shapes and describe their relative positions (e.g., above, below, beside, in front of, behind, next to).

K.G.2. Name shapes regardless of their orientation or overall size.

K.G.3. Identify shapes as two-dimensional (flat) or three-dimensional (solid).

K.G.4. Analyze and compare two-and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices), and other attributes (e.g., having sides of equal lengths).

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
Students will use a graphic organizer to document the corners and faces of a cylinder, cone, cube and sphere. They will also go on a shape hunt around the classroom to discover the shapes in their surroundings.

Materials:

- Geometric solid models for: cylinder, cone, cube, and sphere
- Graphic organizer chart
- Student copy of graphic organizer
- Names of geometric solids on index cards
- Index cards (for student labeling)
- Modeling clay or play dough
- *Captain Invincible and the Space Shapes* by Stuart J. Murphy, or similar text

****Please see link below for student graphic organizer/task sheet (pg. 58):**
http://tinyurl.com/MathTasks-GradeK-Unit1

Prepare a chart/graphic organizer to record the characteristics of the three-dimensional figures as you read the story *Captain Invincible and the Space Shapes.*

Part I
Read *Captain Invincible and the Space Shapes* by Stuart J. Murphy, or another book about 3D shapes. Pass solids (cylinder, cone, sphere, and cube) around and ask students to describe how each one looks and feels. Record these characteristics in the graphic organizer. Students will complete the Touch It, Count It, Chart It Task Sheet. Allow students to use solids to trace around with a pencil to determine the shape of its face. (SMP 1, 5, 6)

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Part II
Give each student 2-3 index cards. Have students go on a geometric solid shape hunt in the classroom to fill in the last column of the Touch It, Count it, Chart It, chart. Students tell the name of the solid it represents, write its name on an index card, and attach it to the item. Shapes can then be displayed in a "Solid Shapes Museum." As you circulate, observe the student's choices and listen to their conversations. Help students to understand they can learn to recognize the shapes even though they are not exactly the same as the model. During their shape hunt, and as students share their 3-D findings, ask the students questions such as:

- Is this object exactly like our model? How is it the same? How is it different?
- Which solid is the hardest to find in the classroom? Why?
- What do you notice about the faces of the objects? (SMP 1, 3, 5, 6, 7)

Teacher Reflection Questions:

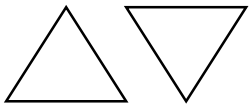
• Are students able to talk about where we find shapes in the real world?
• How are the students describing the shapes they are finding?
• Are they able to identify something easily from the classroom without referring back to the solid example?
• Do most students choose the solid they are most familiar with, such as a rectangular prism? Which ones are they not choosing?

Number Talk:
There is not a number talk available that is appropriate for this task.

Background Knowledge/Common Misconceptions:
Students often use incorrect terminology when describing shapes. For example, students may say a cube is a square or that a sphere is a circle. The use of two-dimensional shape names that appear to be part of a three-dimensional shape in order to name the three-dimensional shape is a common mistake. For example, students might call a cube a square because the student sees the face of the cube. Work with student to help them understand that the two-dimensional shape is a part of the object, but it has a different name.

Another common misconception is separating a square from the identified category of rectangles. A square exhibits the same characteristics of rectangles, however it is special rectangle because it sides are equal in length.

Students often mistake a change in size or orientation of a shape as a change in the name of the shape. One of the most common misconceptions in geometry is the belief that orientations are tied to shape. A student may see the second of the figures below as a triangle, but claim to not know the name of the first.



Students need to have many experiences with shapes in different orientations. For example, ask students to form other triangles with the two triangles in different orientations.

There are both 3-D (solid) and 2-D shapes (flat) shapes. Students should have a beginning understanding of the difference in sides and faces.

One way to explain how 3-D shapes are different from 2-D shapes is through discussion. "3-D shapes have a solid body. This is why it is easy hold them in our hand. 2-D shapes are flat, which is why it is easy to draw them on paper." If you use the term "solid" when talking about 3-D shapes, then discussing "face" on the 3-D shape is a little easier.

It is natural for students to initially talk about the faces as "sides" but as you talk about them use the word face, not side. Gradually the students will pick up on this and will start calling the "sides" faces.

Formative Assessment Questions:

- How would you describe a solid shape?
- What solid shapes do you see in the classroom? Playground? Home?

Differentiation:

Extension

- Students could determine attributes and then use that information to graph objects from the "Shape Museum". Students could extend their search to the rest of the school and /or use cameras to take pictures of other items that represent 3-D solids. A home connection could be made by sending a parent letter asking students to search for solids they could bring back to school to add to the "Shape Museum."
- Have students use modeling clay or play dough to create some of the solids they identified as they search the classroom. Students can use a model shape to replicate, or compose the shape from memory.

Intervention

- Give struggling students cards with examples of 3-D solids that can be used when they are looking for objects for the "Shape Museum."

Vocabulary:

Face
Cylinder
Cone
Cube
Sphere
Corner

Alaska Mathematics Standards
Math Tasks
Grade K

Build a Marshmallow Shape
Identify and Build Shapes

Content Standard

K.G.3. Identify shapes as two-dimensional (flat) or three-dimensional (solid).

K.G.4. Analyze and compare two-and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices), and other attributes (e.g., having sides of equal lengths).

K.G.5. Build shapes (e.g., using sticks and clay) and draw shapes.

K.G.6. Put together two-dimensional shapes to form larger shapes (e.g., join two triangles with full sides touching to make a rectangle).

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 use toothpicks and marshmallows to create shapes.

Materials:

- Toothpicks
- 1 piece of construction paper for each student(black)
- Index cards
- Mini marshmallows (see task for choice)
- Bowls
- Small zippered plastic bags (1 per student to be used for investigation)
- *The Shape of Things* by Dayle Ann Dobbs

Comment:

As students make a square, accept both rectangle and square as an answer. Discuss that squares are special rectangles that have all sides the same length. Then ask, "How could we use marshmallows and toothpicks to change this shape so that it is still a rectangle but it is no longer a square?"

(Note to teacher: Remember, not all rectangles are squares, but all squares are rectangles!)

Part I
At a central meeting place, hand each student three toothpicks and marshmallows. Allow students to explore using toothpicks and marshmallows to create a line segment. This should be a quick discussion and exploration because students are going to have an extended time to create shapes in the next part of the task. Ask students what shape they could build using the 3 marshmallows and toothpicks. Allow every student the opportunity to explore and build the triangle.
(SMP 1, 3, 4, 5, 6)

Part II
Divide the class into groups. Place marshmallows and toothpicks in bowls on each table. Emphasize that their sculptures are going to be displayed. They will be responsible for explaining the process for making the sculptures to others. Allow groups to build as many different sizes and types of shapes as possible. Each time a new shape is constructed, it is placed in the middle of the group for other members to practice constructing. However, there should be no duplication of a shape in the center of the group. Once a new shape has been composed everyone in the group must complete that shape before moving on to discover a new one. This is an excellent opportunity for students to collaboratively work helping one another to work through a task.

At this point students might only be making flat shapes. Be sure to tell the students that they **can make any shape they want** as long as they can describe what it is and how they made it. If students do not begin to build 3-D shapes, probe through questioning and guidance.

Comment: *As students begin to build "solid"/3-D shapes, it is suggested to let them build as big as they possibly can. Bigger shapes will require more problem-solving and structural support. Students will be unable to make a circle using the marshmallows and toothpicks but should be challenged to attempt making one. Encourage students to justify their opinion either way. This could be an excellent intro to a class discussion.*

To draw to a close, have students label the names of their shapes on the index cards provided. Once all shapes have been labeled, have the students perform a gallery walk around the classroom to observe and mentally capture the shapes that other groups constructed.

As the gallery walk is taking place, students should discuss which shape models are common groups and which models can be added to their collection when they return. Students can also compare which group has created the most shapes.

After completing the gallery walk, allow groups the time to construct/add some of the new found shapes to their collection. After time has been given to the groups to add shapes, ask the students what information they would like to graph about the shapes constructed (most shapes, least shapes, etc...). Have each group of students share the list of shapes they made, create a bar graph, and discuss the results with students.

- How many groups made a cube?
- Which shape was made the most?
- Which shape was made by the fewest groups? (SMP 1-8)

Teacher Reflection Questions:

- Are students to create shapes using marshmallows?
- What shape was the most difficult for students to create?
- Are students able to identify the similarities and differences between the shapes they created?

Number Talk:

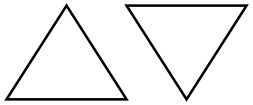
There is not a number talk available that is appropriate for this task.

Background Knowledge/Common Misconceptions:

Students often use incorrect terminology when describing shapes. For example, students may say a cube is a square or that a sphere is a circle. The use of two-dimensional shape names that appear to be part of a three-dimensional shape in order to name the three-dimensional shape is a common mistake. For example, students might call a cube a square because the student sees the face of the cube. Work with student to help them understand that the two-dimensional shape is a part of the object, but it has a different name.

Another common misconception is separating a square from the identified category of rectangles. A square exhibits the same characteristics of rectangles; however it is special rectangle because its sides are equal in length.

Students often mistake a change in size or orientation of a shape as a change in the name of the shape. One of the most common misconceptions in geometry is the belief that orientations are tied to shape. A student may see the second of the figures below as a triangle, but claim to not know the name of the first.



Students need to have many experiences with shapes in different orientations. For example, ask students to form other triangles with the two triangles in different orientations.

The students should have prior knowledge of solid geometric shapes and the vocabulary used to describe these shapes. Students will draw and name solid geometric shapes of a cube, cylinder, sphere, and cone and list the number of faces, edges, and vertices/corners of each figure.

Formative Assessment Questions:

- How many toothpicks would you need to build a _____?
- What makes shapes different from each other?
- How do shapes fit together and come apart?
- How are these shapes different from one another? How are they alike?
- What is the difference between flat and solid?

Differentiation:

Extension
- Have students create the largest possible 3-dimensional shape they can make.
- Have students make different types of triangles (scalene, isosceles, right, equilateral), and quadrilaterals (rectangle, square, rhombus, trapezoid, etc...). The key here is that shapes must be different not by size but by attributes.

Intervention
- Allow students to use straws or pipe cleaners to create shapes.
- Give students models of the shapes and have them reconstruct the shape they see.

Vocabulary:

Solid 3-D Shape	Square	Triangle
Flat Shape	Rectangle	Cube
Line Segment		

Alaska Mathematics Standards
Math Tasks
Grade K

Got Dots? (0-10)
Counting

Content Standard

K.CC.1. Count to 100 by ones and by tens.

K.CC.2. Count forward beginning from a given number within the known sequence.

K.CC.3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). Count to tell the number of objects.

K.CC.4. Understand the relationship between numbers and quantities; connect counting to cardinality.

a. When counting objects, say the number names in standard order, pairing each object with one and only one number name and each number name with one and only one object.
b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
c. Understand that each successive number name refers to a quantity that is one larger.

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

This task contains numerous activities where students can engage using the different representations of numbers. (Adapted from VDW Backline Masters)

Materials:

• Dot cards (recommend printing multiple sets of cards on tag board and laminating)

****Please see link below for dot cards (pg. 23):**
http://tinyurl.com/MathTasks-GradeK-Unit2

• **Dot Flash:**
Teacher/Student flashes a dot card to class/partner and quickly covers it up. Students must say the quantity of dots they saw and describe how they know what they saw. Example: I saw 4 dots because I saw a group of 3 dots and there was one left over to make 4.The difficulty in the game can be increased by the amount of time that the dots are shown to students. (SMP 1, 3, 6, 7)

• **Count 'Em:**
A card is turned over. The first player to say the quantity of dots on the cards keeps that card. Partner must count the dots on the card to verify. No assuming. (SMP 6, 7)

• **One More/Less:**
Same as dot flash but students need to say either 1 more or less than the dots on the card. Whether it is more or less must be established before the game begins. (SMP 1, 3, 6, 7)

• **Who Has More/Less/Same?:**
2 players turn over 1 card at the same time. The first player to identify which card has more/less/same keeps the 2 cards. (SMP 3)

• **Line 'Em Up:**
Give a student a set of cards and have them line the cards up in a specific order: least to greatest – forward counting sequence, greatest to least – backward counting sequence. (SMP 1, 3, 6, 7)

Kindergarten students are extremely creative and continuously invent new games. Have students create a game using the cards and share with classmates. Van de Walle's *Teaching Student Centered Mathematics K-3*, lists numerous ways to incorporate subitizing activities into the classroom. A greater variety of dot cards and dot plates can be found online and Van de Walle's Blackline Masters Series at: http://www.ablongman.com/vandewalleseries/volume_1.html

In addition Van de Walle suggests numerous ways that activities and tasks can be repeated throughout the school year as centers or stations.

Teacher Reflection Questions:

• Are students able to rote count accurately?
• Are students able to count dots with one-to-one correspondence?
• Are students able to subitize?
• Are students able to compare quantities to determine more, less, or same?
• Are students able to line cards up in a specific order (least to greatest – forward counting sequence or greatest to least –backward counting sequence)?

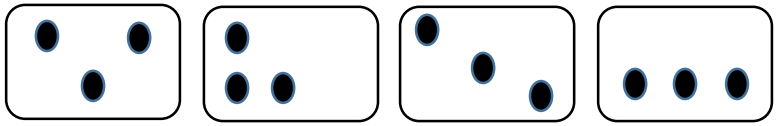
Number Talk:

Dot Images:

Showing students an organized arrangement of dots for a few seconds and then asking them to share how many they see encourages subitizing and fluency. Incorporating dot images into classroom number talks provides opportunities for students to work on counting, seeing numbers in a variety of ways, subitizing and learning combinations.

The following dot image number talk consists of three problems that are to be given sequentially. As each problem is shown, ask students, "How many dots do you see? How do you see them?" As the child is telling you what they see, connect the child's thinking to a number sentence by circling the dot arrangement the child describes and writing a correlating number sentence.

Example: Dot images with the Number 3



Please see *Number Talks* by Sherry Parrish (pgs. 71-81) for more examples of dot image number talks and for dot cards using numbers 3-10.

Background Knowledge/Common Misconceptions:

Some students might not see zero as a number. Ask students to write 0 and say zero to represent the number of items left when all items have been taken away. Avoid using the word none to represent this situation. Some students might think that the count word used to tag an item is permanently connected to that item. So when the item is used again for counting and should be tagged with a different count word, the student uses the original count word. For example, a student counts four geometric figures: triangle, square, circle and rectangle with the count words: one, two, three, and four. If these items are rearranged as rectangle, triangle, circle and square and counted, the student says these count words: four, one, three, and two.

This task contains numerous activities where students engage in subitizing activities.

Subitizing introduces basic ideas of cardinality-"how many", ideas of "more" and "less," ideas of parts and wholes and their relationships, beginning arithmetic, and, in general, ideas of quantity. Developed well, these are related, forming webs of connected ideas that are the building blocks of mathematics through elementary, middle, and high school, and beyond. (Clements & Sarama, Learning and Teaching Early Math, 2009)

The subitizing of quantities can be achieved with dot cards, ten frames, and base-ten manipulatives later on. Using recognizable patterns like the ones found on dice are patterns that are instantly recognizable to most kindergarten students to game play. Many of the tasks included throughout this unit involving subitizing and dot cards should be continued throughout the year.

Formative Assessment Questions:

- How do you know that you counted correctly?
- How many dots did you see?
- How do you know?
- What way did you see the dots grouped together?
- How many dots away from 5 is your number? How many dots would you need to make 10? (anchoring 5&10)

Differentiation:

Extension & Intervention

- Increasing or decreasing the quantity of dots on a card can help with differentiating subitizing

Vocabulary:

More Less Same

References:

Clements, Douglas H., and Julie Sarama. Learning and Teaching Early Math: The Learning Trajectories Approach. New York: Taylor & Francis 2009

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

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Alaska Mathematics Standards
Math Tasks
Grade K

Fill the Chutes
Counting

Content Standard

K.CC.2. Count forward beginning from a given number within the known sequence.

K.CC.4. Understand the relationship between numbers and quantities; connect counting to cardinality.
- **a.** When counting objects, say the number names in standard order, pairing each object with one and only one number name and each number name with one and only one object.
- **b.** Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
- **c.** Understand that each successive number name refers to a quantity that is one larger.

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 use counters and a number cube to play a game.

Materials:

- 20 counters per player
- 1 number cube (six sided die)
- Fill the Chutes game board

****Please see link below for Chutes game board (pg. 44):**
http://tinyurl.com/MathTasks-GradeK-Unit2

Part I
Place all the counters in a central pile where all players have access to them. Players take turns rolling the die and collecting/placing the corresponding amount of counters in their chute that matches the roll on the die.

Both players must count out loud the total number of counters in their chute as they are added.

If a player has 3 spaces remaining unfilled and they roll 4 they cannot fill up the chute and have a leftover or unused counter. The chutes must be filled exactly. (SMP 1, 2, 3, 4, 5, 6, 7)

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Part II
After students have had an opportunity to engage in the activity the purpose of the roll alternates each time.

Player 1 rolls and adds counters to the chute as they count out loud. On the next roll player 1 removes counters from the chute counting backwards. The first player to fill the chute wins the game. This version of the activity helps with counting forward/backwards number sequence with a starting a number other than 0 or 1. (SMP 1, 2, 3, 4, 5, 6, 7)

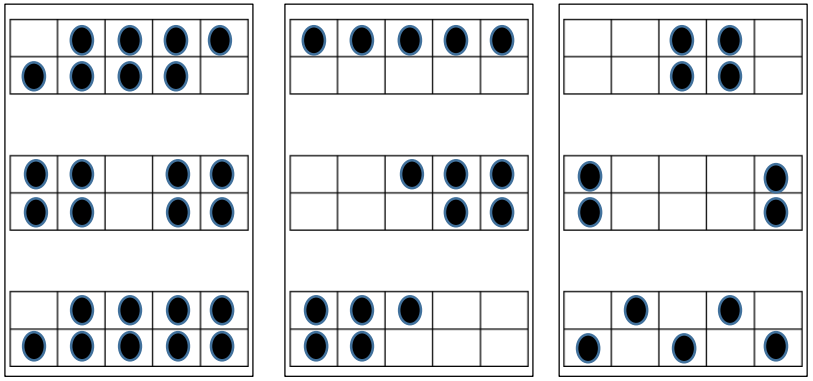
Teacher Reflection Questions:

- Are students able to count dots/counters with one-to-one correspondence?
- Are students able to count forward/backward number sequence with a starting number other than 0 or 1?

Number Talk:
Ten Frames can be used to foster fluency, subitizing, working with place value, and computing with addition and subtraction. Varying the questions posed to students can change the purpose and focus of each ten-frame.

Questions such as: "How many more do we need to make ten? How many are left after removing three?" are great computation questions that compliment this "Fill the Chutes" task.

Five-and-ten frames can be used as a single row of five (five-frame), two rows of five (ten-frame), or as two ten-frames together to provide the opportunity to work with numbers to twenty. Five and ten-frame number talks are each designed to be used in a single session, in any order. The focus for the numbers 3 to 9 is to ask students, "How many dots' do you see? How do you see them?" With frames for the number 10, the question shifts to, "How many more to make ten?"



Example: As each number talk is shown; ask students "How many more do we need to make ten?"

Additional examples of five-and-ten frames can be found in *Number Talks* by Sherry Parrish (pgs. 90-96).

Background Knowledge/Common Misconceptions:
Children will learn how to count (matching counting words with objects) before they understand that the last count word indicates the *amount* of a set or the *cardinality* of a set. Children who have made this connection are said to have the *cardinality principle*, which is a refinement of their early ideas about quantity. (Van de Walle, 2006)

Formative Assessment Questions:

- What number did you roll?
- How many counters do you have in your chute right now?
- What number do you need to roll to fill your chute?
- Which chute has the most? Least

Differentiation:

Extension

- Change the value of each space to 10 and have students skip count by 10 to 100. Note: the chute won't be filled if students play to 100. After students are familiar with skip counting forward by tens they may alternate rolls to skip count backwards and forwards. You may also make a version with no individual spaces instead the playing board would consist of columns. This allows for a variety of counters to be used, including paper clips, pennies, etc. Use only one type of counter when playing, of course!

Intervention

- Because the students must say the total number of counters out loud, the numerals for each space could be written on the game board to help with number recognition and counting forward and backwards.

Vocabulary:

Most
Least

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

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Alaska Mathematics Standards
Math Tasks
Grade K

More or Less
Counting

Content Standard

K.CC.1. Count to 100 by ones and by tens.

K.CC.2. Count forward beginning from a given number within the known sequence

K.CC.3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects). Count to tell the number of objects.

K.CC.4. Understand the relationship between numbers and quantities; connect counting to cardinality.

a. When counting objects, say the number names in standard order, pairing each object with one and only one number name and each number name with one and only one object.

b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.

c. Understand that each successive number name refers to a quantity that is one larger.

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 use dice and a spinner to play a game called "more or less." This game involves adding and subtracting and providing justification for their answers.

Materials:

Version 1 (Numbers 0-8)
- Recording Sheet and game board
- 20 red/yellow counters
- 6 sided dice (1-6)
- More/Less Spinner or Dice

Materials:

Version 2 (Numbers 2-11)
- Recording Sheet and game board
- 20 red/yellow counters
- 6 sided dice (4-9) (use wooden block)

****Please see link below for recording sheet, game board and spinner templates (pg. 62):**
http://tinyurl.com/MathTasks-GradeK-Unit2

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Comment:
There are 2 versions of this game. Each version can be played with more/less 1 OR more/less 2. The spinners provided can be used or dice/wooden blocks can be used to take place of the spinners. The following description is generic for both games.

Player 1 rolls the die (1-6) or (4-9) and spins the spinner (more/less or more/less 1&2). The player covers the number which represents the die and the spinner combined.

Part I (More/Less):
Example: if player 1 rolls a 5 and then spins less, they can cover any number less than 5. (4, 3, 2, 1 or 0) Watch the number the student covers as it relates to covering 3 in a row. Are they randomly picking a number to cover? Or are they choosing the number to cover based on their best chance to cover 3 in a row? (SMP 1-8)

Part II (More/Less 1&2):
Example: if you roll a 5 and spin 2 more, you count forward 2 from 5 to end at seven.

As students play, they record the number they rolled on the recording sheet. Then they record what they spun (more/less, 1 more, 1 less, etc...). Students then record what they covered on the game board. They justify this in the "because" section by writing an equation or another justification for covering. (Example: A player could say she rolled one more than 8. That's 9, because one more is the next number, so in the space she wrote "it's next.") First player to get 3 counters in a row wins. (SMP 1-8)

Teacher Reflection Questions:

- Are students able to identify numbers 0-10?
- Are students able to identify 1 more or less than a given number?
- Are students able to identify 2 more or less than a given number?
- Are students able to write numerals correctly?

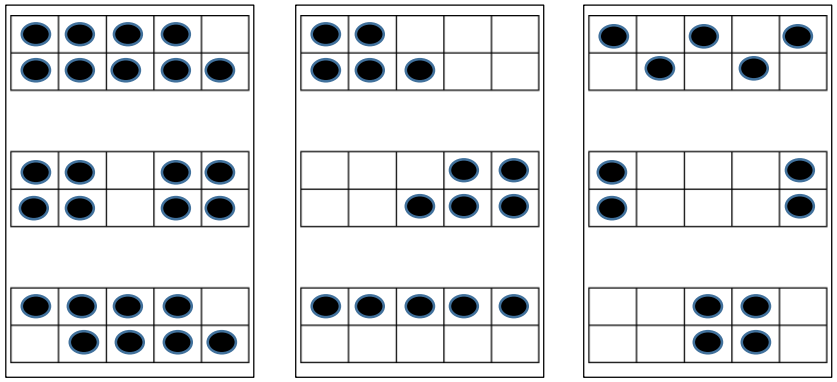
Number Talk:

Five and Ten Frames can be used to foster fluency, subitizing, working with place value, and computing with addition and subtraction. Varying the questions posed to students can change the purpose and focus of each ten-frame.

Questions such as: "How many more do we need to make ten? How many are left after removing three?" are great computation questions that compliment this "More or Less" task.

Five-and-ten frames can be used as a single row of five (five-frame), two rows of five (ten-frame), or as two ten-frames together to provide the opportunity to work with numbers to twenty. Five and ten-frame number talks are each designed to be used in a single session, in any order. The focus for the numbers 3 to 9 is to ask students, "How many dots' do you see? How do you see them?" With frames for the number 10, the question shifts to, "How many more to make ten?"

Example: As each number talk is shown; ask students, "How many more do we need to make ten? How many are left after removing ____?"



Additional examples of five-and-ten frames can be found in *Number Talks* by Sherry Parrish (pgs. 90-96).

Background Knowledge/Common Misconceptions:

Some students might not see zero as a number. Ask students to write 0 and say zero to represent the number of items left when all items have been taken away. Avoid using the word none to represent this situation. Some students might think that the count word used to tag an item is permanently connected to that item. So when the item is used again for counting and should be tagged with a different count word, the student uses the original count word. For example, a student counts four geometric figures: triangle, square, circle and rectangle with the count words: one, two, three, and four. If these items are rearranged as rectangle, triangle, circle and square and counted, the student says these count words: four, one, three, and two.

The concept of "more", "less" and the "same" are basic relationships contributing to the overall concept of number. Children begin to develop these ideas before they begin school. Children entering kindergarten can almost always choose the set that is "more" if presented with sets that are quite obviously different in number.

Formative Assessment Questions:

- How do you know that you counted correctly?
- What does "more" mean? What does "less" mean?
- What numbers do you need to win?
- Why did you choose that number?
- If you spun "2 more" what number would you need to roll to win?

Differentiation:

Extension

- Have the students model their actions using a ten-frame or Rekenrek. This will also help students to record their actions.

Intervention

- Allow the students to model with a ten frame or through the use of a number line.

Vocabulary:

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 K

Riddle Me This
Identifying Numbers

Content Standard

K.NBT.1. Compose and decompose numbers from 11 to 19 into ten ones and some further ones (e.g., by using objects or drawings) and record each composition and decomposition by a drawing or equation (e.g., 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight or nine ones.

K.CC.4. Understand the relationship between numbers and quantities; connect counting to cardinality.

a. When counting objects, say the number names in standard order, pairing each object with one and only one number name and each number name with one and only one object.

b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.

c. Understand that each successive number name refers to a quantity that is one larger.

K.CC.6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group (e.g., by using matching, counting, or estimating strategies).

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

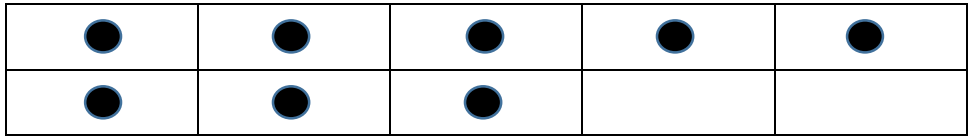
In this task, students will try to identify a number through a riddle. As students become comfortable with this task, they will then have the opportunity to create their own number riddles.

Materials:

- *Riddle Me This*? task cards
- Single or Double Ten Frame
- Counters

****Please see link below for *Riddle Me This* task cards (pg. 54):**
http://tinyurl.com/MathTasks-GradeK-Unit3

Create a number on a ten frame. Invite students to discuss and share everything they notice about the number. Example if the number 8 is on the 10 frame:



3 more than 5 2 less than 10 4 groups of 2
2 groups of 3 and 2 more 3 groups of 2 and 2 more 2 groups of 4

Riddle for "8"-*I am a number. I am more than 5. If you give me 2 more dots I would make a 10. I am a 1-digit number. What number am I?*

I am a number. I have a 5 and 2 more. What number am I? I am a number.

I am 1 less than 6. What number am I?

Make up riddles about numbers from 0-20 and have students try and identify the mystery number.

This task can be repeated throughout the year. As students become more comfortable with the concept and with reading and writing, have them make their own mystery riddles and share them with classmates. Students can use the *Riddle Me This?* task cards to help create riddles. When modeling riddles to students, it is extremely beneficial to model using the task cards. (SMP 2, 5, 8)

Comment:

Create a word bank that students can use to help them write their riddles. Some possible suggestions to add to your word bank could be:
I am more than ____
I am less than____
I am ____ counters more/less than ____
I am a ____-digit number, etc....

Teacher Reflection Questions:

- Are students able to describe a numeral in multiple ways?
- Are students able to count forward and backward from a given numeral?
- Are students able to identify how far a given numeral is from a given benchmark number?
- Are students able to use math vocabulary such as more and less correctly to provide clues about their quantity for their partner?

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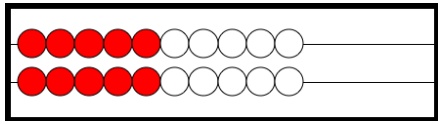
Number Talk:

Rekenreks are an important tool to help students reason about numbers, subitize, build fluency, and compute using number relationships. The rekenrek is composed of two rows of stringed beads with five beads of one color and five beads of another color on each row. They are colored in groups of five to help students "see" or subitize the quantity of five. The teacher has the option of only using one row of beads at a time to build fluency up to ten or using both rows to work on fluency with numbers up to twenty.



Rekenrek number talks consist of three to five problems; each sequentially labeled A, B, C and so on. The sequence of problems within a given number talk allows student to apply strategies from previous problems to subsequent problems or provides opportunities for students to reason with the same quantity from multiple perspectives.

As each problem is show on a rekenrek, ask students, "How many beads do you see? How do you see them?"

Example: Rekenreks with the number 3

A. 0 on top 2 on bottom	**A.** 1 on top 1 on bottom	**A.** 3 on top 0 on bottom
B. 1 on top 2 on bottom	**B.** 2 on top 1 on bottom	**B.** 2 on top 1 on bottom
C. 3 on top 0 on bottom	**C.** 1 on top 2 on bottom	**C.** 0 on top 3 on bottom
D. 2 on bottom 3 on top	**D.** 0 on top 3 on bottom	

Additional examples of rekenreks can be found in *Number Talks* by Sherry Parrish (pgs. 82-88).

Background Knowledge/Common Misconceptions:

The relationships of one more than, two more than, one less than, two less than are important for all numbers. However, these ideas are built on and connected to the same concepts for numbers less than 10. The fact that 17 is one less than 18 is connected to the idea that 7 is one less than 8. Children may need help in making this connection after some quality time spent in the exploration of these numbers.

Formative Assessment Questions:

- How do you know that you counted correctly?
- What is a good way to justify your answer?
- What strategy are you using to solve the riddle?
- Is the number closer to 10 or 20? How do you know?

Differentiation:

Extension

•Use a higher number and increase the rigor of the questions in the riddle.

Example:

I am a number,
I have 1 group of 5 and 7 ones.
What number am I?

Intervention

- In a small group, have student answer riddles about smaller numerals.
- Use a 5-frame or 10-frame riddles to limit the possible answers to the riddle.

Vocabulary:

Riddle
Strategy
Justify

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

Does How I Measure Matter?
Attributes of Objects

Content Standard

K.MD.1. Describe measurable attributes of objects (e.g., length or weight). Match measuring tools to attribute (e.g., ruler to length). Describe several measureable attributes of a single object.

K.MD.2. Make comparisons between two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.*

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

During this task, students will describe and compare objects by their size and measurement.

Materials:

- Chart paper
- Bags with 5 items of various length, weight, height and capacity in each bag (one per group).
  Examples could include: a box of crayons, a marker, a pencil, a glue stick, paperclip, etc.
- Measure Matter Student task sheet

****Please see link below for student task sheet and all other printable materials (pg. 26):**
http://tinyurl.com/MathTasks-GradeK-Unit4

Part I

Gather students together at meeting area and show two items such as a crayon and a pencil. Ask, "Which do you think is longer?" Whisper your answer to your elbow partner. Then share with the class. "Why do you think that? How can we prove that?" Discuss how you decide which is longer. Select two students to demonstrate how you can measure to determine which is longer. Have one student line up the ends of the items and another student place the items side by side but not line up the ends of the items. Ask students, "Why are common endpoints important when comparing length?" Model on chart paper how to write a math statement about the two objects. For example:

My crayon  **is shorter than my pencil**  **.**

Part II
Tell students they are going to explore comparing objects and writing true measurement description. Explain that, as a group, they are to compare five objects of varying sizes. Give each group a pre-made bag of items such as books, pencils, crayons, glue sticks, paperclips, etc.

Once they have their bag of objects, they are to lay the objects they have chosen on their table. Students choose 2 items at a time to compare. They should compare the two objects and write a true math statement to describe the comparison of common attributes.

All students in the group do not have to choose the same two objects to compare. Different comparisons between partners will encourage more productive discussions. For example, a pair of scissors may be longer than a paper clip but shorter than a book. Students can have these discussions when deciding where to place the objects on their recording sheet. Again, please note, students are only comparing 2 items at a time.

When students complete their comparisons, let them discuss their findings. Emphasize the importance of aligning endpoints on both objects to compare length. Observe as students compare to make sure they are lining the endpoints up correctly.

Allow students time to share their comparisons. Record these findings on a class chart for later reference. This gives an opportunity to communicate their discoveries in mathematical language. Discuss with the whole group why it DOES matter how you measure.

Teacher Reflection Questions:

- Are students able to compare objects by their size and can they explain why this would be important?
- Are students able to use mathematical language to describe the measurement of attributes of items?
- Can students decide or offer ideas for how to organize/record information?
- Are students able to explain how to record results? Do they understand why this is important to do?
- Can students explain why we need to have common endpoints when comparing the height or length of two objects?

Number Talk:

There is not a number talk available that is appropriate for this task.

Background Knowledge/Common Misconceptions:
- Comparing unlike attributes (comparing the weight of this object to the length of that one)
- The length of objects change according to how they are placed next to each other when measuring (not lining up the endpoints)
- Placing units for measurement with gaps (not placing units side-by-side)

It is important to keep several big ideas in mind when circulating throughout the room having math conversations with your students:
- It is important that the students clearly identify the attribute being measured.
- It is important that the students realize that BOTH objects must share the attribute before a comparison can be made.
- The lining up of the endpoints for an accurate measurement is important.

Formative Assessment Questions:
- What attributes did you measure?
- Are there any more ways to compare these objects?
- Why did you decide to measure it this way?
- Which object is heavier (longer, taller, holds more, etc.)? How do you know?
- If I hold the objects like this (without the endpoints lined up), does your measurement description change?

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Differentiation:

Extension

• Students can be encouraged to find objects throughout the room that can be measured with identified attributes, or choose another bag to discuss and record observations.
• Encourage students to find different comparisons for the same object. For example, the stool is shorter than the door but it is taller than the desk.
• Encourage students to compare different attributes of the same two objects.
• Students can categorize the items they have in the bags: these are larger than _____; these are small than _____.

Intervention

• Allow students to work through the stages at a speed that is appropriate for their performance level. Some students may need additional experiences acting out problems, using manipulatives, or drawing pictures.
• Give students cards with pictures of different objects. Have the student choose two cards and tell whether one item is longer, shorter, or the same as the other item. The other students can use a "thumbs up" signal if they agree and a "thumbs down" if they don't agree. If the student does not agree, they have to be able to explain their reasoning.
•Put together baggies that have two items in them. Have students compare the items in these bags by making Unifix cube trains for each object and then comparing the length of the trains.
• Draw a line or provide a box with a low lip to help the student line up the endpoints.
• Provide the student with copies of "Does How I Measure Matter? recording sheet and copies of cut outs. The student can use these pictures and measurement description to scaffold their learning.

Vocabulary:

Smaller than
Larger than
Measure Compare
Shorter
Longer
Same
Different

Alaska Mathematics Standards
Math Tasks
Grade K

Ordering Containers
Attributes of Objects

Content Standard

K.MD.1. Describe measurable attributes of objects (e.g., length or weight). Match measuring tools to attribute (e.g., ruler to length). Describe several measureable attributes of a single object.

K.MD.2. Make comparisons between two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.*

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

For this task, students will discuss and experiment with the volume of different containers.

Materials

- A variety of containers (at least 10 containers per group)
  Example: small boxes, cups, bowls, bottles, etc.
- Substances to fill containers: beans, sand, water, rice
- Funnel
- Student task sheet

****Please see link below for student task sheet (pg. 61):**
http://tinyurl.com/MathTasks-GradeK-Unit4

Gather students on meeting area. Show the students two containers; examples could include: a coffee cup and a gallon jug. Pose this question, "Which holds more liquid?" Allow various students to respond. Include "How do you know?" questions. Use a substance to fill the one of the containers and then pour the substance into the other container to determine if it would hold more, less, or the same amount. Model on a chart how to write a math statement about the two objects. For example:

My  **milk jug holds more than my**  **coffee cup.**

Show the students that you have many different sizes of containers for each group. Have students make estimates about which container holds more and which container holds less. Allow children to use a substance (sand, water, rice, beans, etc.) to fill the containers. Discuss which container holds the most, or the least. The students should record their observations about the comparisons.

All students in the group do not have to choose the same two objects to compare. Different comparisons between partners will encourage more productive discussions. For example, a coffee cup may hold less than a pitcher but more than a lid. Students can have these discussions when writing their measurement description. Again, please note students are only comparing 2 items at a time.

When students complete their comparisons, let them discuss their findings. Observe as students compare to make sure they are accurately filling the containers.

Allow students time to share their comparisons. Record these findings on a class chart for later reference. This gives an opportunity to communicate their discoveries in mathematical language. Discuss with the whole group why it DOES matter how you measure.

Teacher Reflection Questions:
- Are students able to determine which items hold more or less than others?
- Are students able to compare objects by their size and explain why this would be important?
- Are students able to use mathematical language to describe the measurable attributes of items?
- Can students decide or offer ideas for how to organize and record information?
- Are students able to explain how to record results? Do they understand why this is important to do?

Number Talk:
There is not a number talk available that is appropriate for this task.

Background Knowledge/Common Misconceptions:
- Comparing unlike attributes (comparing the weight of this object to the length of that one)
- The length of objects change according to how they are placed next to each other when measuring (not lining up the endpoints)
- Placing units for measurement with gaps (not placing units side-by-side)

Introducing capacity (how much something can hold) can be tricky with kindergarten students. You will want to consider the skill of conservation when working with capacity. Some students may need extra guidance with understanding how different shaped objects can hold more or less. You may want to set up a water investigation station to let the students explore different types of containers and how much they hold. You will also want to reinforce the identification of the unit of measurement. It is important to keep several big ideas in mind when circulating throughout the room having math conversations with your students:

- It is important that the students clearly identify the attribute being measured.
- It is important that the students realize that BOTH objects must share the attribute before a comparison can be made.
- Keeping a careful count of how much of the substance it takes to fill an object is important

Formative Assessment Questions:
- What attributes did you measure?
- Are there more ways to compare these objects?
- Why did you decide to measure it this way?
- Which object holds more or less? How do you know?
- If I fill one container with beans and the other container with water, can I still compare how much they hold? Why or why not?

Differentiation:

Extension

• Provide the student with several other containers for students to choose from. Containers that students use in their world allow for real life understanding (milk cartons from lunch, small cereal boxes, pop tart boxes, and macaroni noodle boxes). Students can make predictions before comparing amounts. Allow time for students to discuss and record observations.

• Encourage students to compare different attributes of their containers (the macaroni box is taller than the pop tart box).

Intervention

• Have students pour the material into two identical containers so they can compare which holds more or less. This direct comparison will assist them in seeing the comparisons more clearly. Using a larger material such as small counting bears, fruit loops, etc. so that students can count the amount needed to fill the containers might by helpful.

• Provide the student with copies of a recording sheet to help organize their thinking. See the "Ordering Container" example page.

Vocabulary:

More
Less
Measure
Compare

Alaska Mathematics Standards
Math Tasks
Grade K

Shake and Spill Addition
Addition & Subtraction

Content Standard

K.OA.1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps) acting out situations, verbal explanations, expressions, or equations.

K.OA.3. Decompose numbers less than or equal to10 into pairs in more than one way (e.g., by using objects or drawings, and record each decomposition by a drawing or equation). For example, 5=2+3 and 5=4+1.

K.OA.4. For any number from 1-4, find the number that makes 5 when added to the given number and, for any number from 1-9, find the number that makes 10 when added to the given number (e.g., by using objects, drawings or 10 frames) and record the answer with a drawing or equation.

K.OA.5. Fluently add and subtract numbers up to 5.

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

Using counters, students will explore number relationships within 5 and 10. They will also learn how to write addition number sentences with various equations that equal 5 and 10.

Materials:

- Two-color counters
- One small cup, per student (like a mouthwash cup)
- One dry-erase marker per student
- Shake and Spill recording sheet for addition
- *Anno's Counting House* by Mitsumasa Anno, or another similar counting book

(Task adapted from Marilyn Burns' Shake and Spill activity found in *About Teaching Mathematics: A K-8 Resource*)

****Please see link below for recording sheet (pg. 44):**
http://tinyurl.com/MathTasks-GradeK-Unit5

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Begin this task by "reading" the math picture book, *Anno's Counting House* (Anno 1982) or a similar book. As some of the children in the story move to the other house, ask questions such as, "Who's gone? How many are gone? If ____ are gone, how many must be in the first house?" With rich conversation during this story, all combinations of ten will be discussed.

After reading, begin an investigation to explore number relationships within 5 (and later within 10). Give each student a cup of five double-sided counters. Ask students to swirl the cup of counters and then spill them on their table or work space. How many red counters do you see? How many yellow? Then show students how to record what they see using a number sentence. Allow them to write on their table, using their dry-erase marker, the same number sentence. Repeat this process until you see that a majority of your students are ready to practice on their own.

When showing students how to record a number sentence, make sure to identify all the parts: the addends, the equal sign (can be read, "the same as"), and the answer to an addition number sentence, or sum. Take care to ensure that students can differentiate between the term "sum" and the word "some". Once students demonstrate an understanding of the activity, allow them to do the activity on their own. Assign each student a number of counters to work with according to his or her ability level (5 or 10). Each student will swirl and spill the counters in his cup, draw what they see, and write a number sentence that describes what is shown.

Possible solutions:
5 = 0 + 5, 5 + 0 = 5, 4 + 1 = 5, 1 + 4 = 5, 3 + 2 = 5, 2 + 3 = 5

10 + 0 = 10, 0 + 10 = 10, 9 + 1 = 10, 1 + 9 = 10, 8 + 2 = 10, 2 + 8 = 10

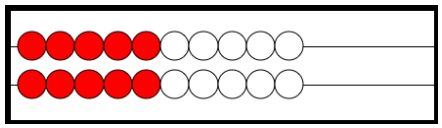
7 + 3 = 10, 3 + 7 = 10, 6 + 4 = 10, 4 + 6 = 10, 5 + 5 = 10

Possible questions that engage students:
When recording the number of red sides and yellow sides each time you spill the counters, do you think you'll get one result more often than others? If so, what will it be? How do you know?

Teacher Reflection Questions:

- How many number combinations were students able to make with 5 or 10?
- What did they notice about the combinations?

Number Talk:
Rekenreks are an important tool to help students reason about numbers, subitize, build fluency, and compute using number relationships. The rekenrek is composed of two rows of stringed beads with five beads of one color and five beads of another color on each row. They are colored in groups of five to help students "see" or subitize the quantity of five. The teacher has the option of only using one row of beads at a time to build fluency up to ten or using both rows to work on fluency with numbers up to twenty.



Rekenrek number talks consist of three to five problems; each sequentially labeled A, B, C and so on. The sequence of problems within a given number talk allows student to apply strategies from previous problems to subsequent problems or provides opportunities for students to reason with the same quantity from multiple perspectives.

As each problem is show on a rekenrek, ask students, "How many beads do you see? How do you see them?"

Example: Rekenreks with the number 10

A. 5 on top 5 on bottom	A. 6 on top 4 on bottom	A. 7 on top 3 on bottom
B. 4 on top 6 on bottom	B. 5 on top 5 on bottom	B. 5 on top 5 on bottom
C. 3 on top 7 on bottom	C. 4 on top 6 on bottom	C. 6 on top 6 on bottom
D. 2 on bottom 8 on top	D. 5 on top 5 on bottom	D. 7 on top 3 on bottom

Additional examples of rekenreks can be found in *Number Talks* by Sherry Parrish (pgs. 82-88).

Background Knowledge/Common Misconceptions:

Students may over-generalize the vocabulary in word problems and think that certain words indicate solution strategies that must be used to find an answer. They might think that the word more always means to add and the words take away or left always means to subtract. When students use the words take away to refer to subtraction and its symbol, teachers need to repeat students' ideas using the words minus or subtract. For example, students use addition to solve this Take from/Start Unknown problem: Seth took the 8 stickers he no longer wanted and gave them to Anna. Now Seth has 11 stickers left. How many stickers did Seth have to begin with?

If students progress from working with manipulatives to writing numerical expressions and equations, they skip using pictorial thinking. Students will then be more likely to use finger counting and rote memorization for work with addition and subtraction. Counting forward builds to the concept of addition while counting back leads to the concept of subtraction. However, counting is an inefficient strategy. Teachers need to provide instructional experiences so that students progress from the concrete level, to the pictorial level, then to the abstract level when learning mathematics.

"When parts of a set are known, addition is used to name the whole in terms of the parts." (Van de Walle & Lovin 2006) Shake and Spill allows children to focus on a single number for the entire activity. It is important to give the children time to work on a single number (usually to 4 or 5, at first) throughout the activity, allowing them opportunities to explore through a variety of materials and methods of joining or separating. As their understanding of concepts develop, encourage students to extend their understanding with higher numbers. Allowing students multiple opportunities to participate in these types of activities gives them the chance to think about number relationships in a relaxed setting (Burns 2007; Van de Walle & Lovin 2006).

This activity reinforces the concept of addition (and the inverse, subtraction) through part-part-whole models. For students to see the two parts and the whole, the two parts must be kept as two separate parts.

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Formative Assessment Questions:

- Does the order of the addends change the sum? Can you explain your thinking?
- How do you know when your answer makes sense?

Differentiation:

Extension

- Play, "Five-Frame Tell-About" (Van de Walle, page 46). This game could also be changed to "Ten-Frame Tell-About".

Intervention

- Allow students who have difficulty with organization to use a 5 or 10s frame. As they spill the counters, have them fill up the frames with the counters and then record their findings.
- Students may use a part-part-whole mat for this activity. An example of part-part-whole mat can be seen below.

Whole	
Part	Part

Vocabulary:

Addends
Equal Sign
Number Sentence
Sum

References:

Burns, Marilyn. About Teaching Mathematics, A K-8 Resource. Sausalito: Math Solutions Publications, 2007

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 K

Shake and Spill Subtraction
Addition & Subtraction

Content Standard

K.OA.1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps) acting out situations, verbal explanations, expressions, or equations.

K.OA.3. Decompose numbers less than or equal to10 into pairs in more than one way (e.g., by using objects or drawings, and record each decomposition by a drawing or equation). For example, 5=2+3 and 5=4+1.

K.OA.4. For any number from 1-4, find the number that makes 5 when added to the given number and, for any number from 1-9, find the number that makes 10 when added to the given number (e.g., by using objects, drawings or 10 frames) and record the answer with a drawing or equation.

K.OA.5. Fluently add and subtract numbers up to 5.

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

Using counters, students will explore number relationships within 5 and 10. They will also learn how to write addition and subtraction number sentences.

Materials:

- Two-color counters
- One small cup, per student (like a mouthwash cup)
- One dry-erase marker per student
- Shake and Spill recording sheet for subtraction
- *Anno's Counting House* by Mitsumasa Anno, or another similar counting book

(Task adapted from Marilyn Burns' Shake and Spill activity found in *About Teaching Mathematics: A K-8 Resource*)

****Please see link below for recording sheet (pg. 49):**
http://tinyurl.com/MathTasks-GradeK-Unit5

Review the activity of Shake and Spill from the previous lesson. Ask students to share what patterns they may have noticed while working with the same number. After several students have had an opportunity to share, explain that this time, students will write the total number of counters they begin with and then subtract the number of yellow counters that are spilled.

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Before beginning, model the activity for the group. You will be "Player A" and the class will act as "Player B". Using a set of five or ten, spill the counters in the cup and identify how many yellow counters are shown. Then think aloud, "So, if I started off with 5 (or 10) counters, and there are _____ yellow spilled, how many red counters were spilled? How many more do I need to get to 5 (or 10)? " All students will use their math hands to predict how many red counters were spilled (scan to see who has made a logical prediction and those who's prediction are illogical. Intervention may be needed for those that demonstrate a lack of number sense.). After all students make a prediction with their math hands, reveal the number of red counters that were spilled. Next, ask a volunteer to show the class how to write an addition and subtraction number sentence that would describe the situation you modeled. Encourage them to share their math thinking. Repeat this process until you feel that students are ready to practice this same activity independently (or with a partner). Once students are ready, assign each student a number that is appropriate for their performance level and allow them to begin working. As you walk around to assess students, stop and ask the following questions (or those similar to assess student learning):

• What number did you start off with? So, if there are ___ yellow counters, how many red counters do you think there are? How do you know without counting?

Teacher Reflection Questions:

• Can students explain the strategies they used to determine how many red counters were spilled?
• What do the students notice about this version of this game that is alike or different from the addition version?

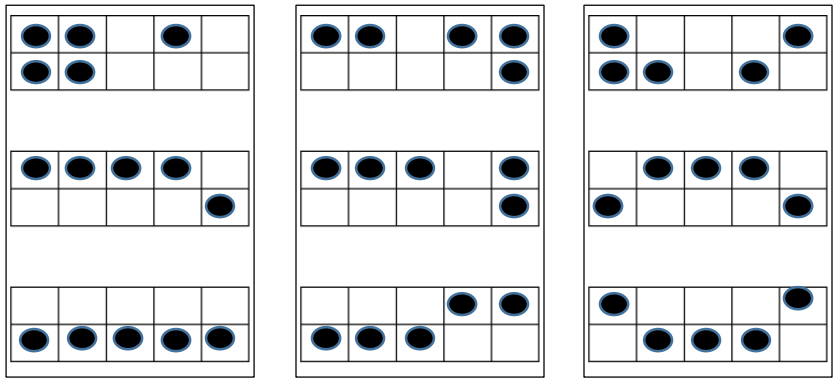
Number Talk:

Five and Ten Frames can be used to foster fluency, subitizing, working with place value, and computing with addition and subtraction. Varying the questions posed to students can change the purpose and focus of each ten-frame.

Questions such as: "How many are left after removing three?", "If we start with ten and remove six, how many do we have left?", "How do you see five?" are great computation questions that compliment this "Shake and Spill Subtraction" task.

Five-and-ten frames can be used as a single row of five (five-frame), two rows of five (ten-frame), or as two ten-frames together to provide the opportunity to work with numbers to twenty. Five and ten-frame number talks are each designed to be used in a single session, in any order. The focus for the numbers 3 to 9 is to ask students, "How many dots' do you see? How do you see them?" With frames for the number 10, the question shifts to, "How many more to make ten?"

Example: As each number talk is shown; ask students, "How many more do we need to make ten? How many are left after removing ____?"



Additional examples of five-and-ten frames can be found in *Number Talks* by Sherry Parrish (pgs. 90-96).

Background Knowledge/Common Misconceptions:

Students may over-generalize the vocabulary in word problems and think that certain words indicate solution strategies that must be used to find an answer. They might think that the word more always means to add and the words take away or left always means to subtract. When students use the words take away to refer to subtraction and its symbol, teachers need to repeat students' ideas using the words minus or subtract. For example, students use addition to solve this Take from/Start Unknown problem: Seth took the 8 stickers he no longer wanted and gave them to Anna. Now Seth has 11 stickers left. How many stickers did Seth have to begin with?

If students progress from working with manipulatives to writing numerical expressions and equations, they skip using pictorial thinking. Students will then be more likely to use finger counting and rote memorization for work with addition and subtraction. Counting forward builds to the concept of addition while counting back leads to the concept of subtraction. However, counting is an inefficient strategy. Teachers need to provide instructional experiences so that students progress from the concrete level, to the pictorial level, then to the abstract level when learning mathematics

"In part-part-whole model, when the whole and one of the parts are known, subtraction names the other part." (Van de Walle &Lovin 2006) Even when there is a remove action, the situation in this next activity ends with two parts clearly distinct. It is important for you to have a discussion with your students, which includes showing them how an addition and subtraction sentence can be written for the same situation, to help them connect addition and subtraction. (More information can be found in Chapter 3 of Teaching Student-Centered Mathematics: Grades K-3, Van de Walle & Lovin 2006)

Formative Assessment Questions:

• How do you know when your answer makes sense?

Differentiation:

Extension

• "Grab Bag Subtraction" (adapted, Burns 2007) Children can work in pairs or independently for this activity. Fill a paper bag with any set of tiles or cubes (to 5 or 10) and write the quantity of items in the bag on the front of the sack. Students will reach in the bag and take some out, showing how many were removed. Both students will predict how many they think are left inside of the bag. Then they will check their predictions and record the addition and subtraction number sentences.

Intervention

• Students may use a part-part-whole mat for this activity. Make sure that students flip the mat so that the "whole" section is first, showing that the one part is removed from the whole. An example of a part-part whole mat can be seen below.

Whole	
Part	Part

Vocabulary:

Subtraction Addition Difference Number Sentence

References:

Burns, Marilyn. About Teaching Mathematics, A K-8 Resource. Sausalito: Math Solutions Publications, 2007

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 K

Dropping Pennies
Addition & Subtraction

Content Standard

K.OA.1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps) acting out situations, verbal explanations, expressions, or equations.

K.OA.2. Add or subtract whole numbers to 10 (e.g., by using objects or drawings to solve word problems).

K.OA.3. Decompose numbers less than or equal to10 into pairs in more than one way (e.g., by using objects or drawings, and record each decomposition by a drawing or equation). For example, 5=2+3 and 5=4+1.

K.OA.4. For any number from 1-4, find the number that makes 5 when added to the given number and, for any number from 1-9, find the number that makes 10 when added to the given number (e.g., by using objects, drawings or 10 frames) and record the answer with a drawing or equation.

K.OA.5. Fluently add and subtract numbers up to 5.

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
Students will drop pennies and record all of the ways that they can drop on a recording sheet. They will then use this experience to solve word problems involving penny combinations.

Materials:

- Pencil
- Recording sheet
- Pennies

****Please see link below for recording sheet (pg. 76):**
http://tinyurl.com/MathTasks-GradeK-Unit5

Part I
Review or introduce a penny, and discuss how both sides of the penny are different. Be sure that students understand which side is heads on the coin and which side is tails. Draw a chart that is similar to the Dropping Pennies recording sheet. Give each student 3 coins and have them explore all of the ways that the coins can drop and record the possible combinations. DO NOT complete the chart. Take only a few combinations and then present students with Part II.

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Part II
Comment: there are more squares provided on the recording sheet than actual combinations. This is so that students can justify their answer.

Sam dropped 5 pennies on the ground. Some were heads up and some were tails up. How might the pennies have fallen? Show all the ways the coins could have landed on the ground.

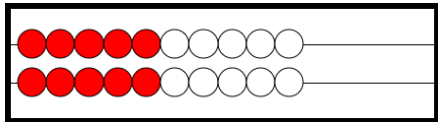
In closing have students share the combinations they found and any strategies they used to solve the problem.

Teacher Reflection Questions:

- Do students notice a pattern?
- Can students identify what pair of addends they have the most of? The least of?
- Are students able to determine how many more they will need to make five, without counting?

Number Talk:

Rekenrek: Finding Different Ways to Make a Given Number:



Initially use only the top row of beads. Cover the bottom row with a folded sheet of card or piece of fabric. Begin by sliding the red beads to the left and the white beads to the right on the top row of the rekenrek. Choose a number to build. "Let's see how many ways we can build 6 by sliding beads from each side to the middle. What if I slide 4 red beads from the left and 2 white beads from the right? Does that make 6 beads? Can you think of another way to make 6? Record the different ways 6 can be built. This activity should be repeated many times using different numbers from 1-10. Once children are confident using the top row, combinations can be found using both the top and bottom rows. Children can record the different ways they find to build the given number.

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:
Numbers are related to each other through a variety of number relationships. The number 7, for example, is 3 more than 4, two less than 9, composed of 3 and 4 as well as 2 and 5, is three away from 10, and can be quickly recognized in several patterned arrangements of dots. These ideas further extend to an understanding of 17, 99, and beyond. Number concepts are intimately tied to the world around us. Application of number relationships to the real world marks the beginning of making sense of the world in a mathematical manner (Van de Walle, 2010).

Students may over-generalize the vocabulary in word problems and think that certain words indicate solution strategies that must be used to find an answer. They might think that the word more always means to add and the words take away or left always means to subtract. When students use the words take away to refer to subtraction and its symbol, teachers need to repeat students' ideas using the words minus or subtract. For example, students use addition to solve this Take

from/Start Unknown problem: Seth took the 8 stickers he no longer wanted and gave them to Anna. Now Seth has 11 stickers left. How many stickers did Seth have to begin with?

If students progress from working with manipulatives to writing numerical expressions and equations, they skip using pictorial thinking. Students will then be more likely to use finger counting and rote memorization for work with addition and subtraction. Counting forward builds to the concept of addition while counting back leads to the concept of subtraction. However, counting is an inefficient strategy. Teachers need to provide instructional experiences so that students progress from the concrete level, to the pictorial level, then to the abstract level when learning mathematics.

Formative Assessment Questions:

- Are there any more was to decompose the number 5?
- Why did you decide to do it his way?
- Are you sure that you have found them all? Why do you think so?
- Did you develop a strategy to find your answers?
- Did you identify any patterns or rules?

Differentiation:

Extension

- Instead of giving the student 5 pennies, they could use 5 coins that have total value of 20 cents or less. At the end of the task, students would be asked to add up their coins and justify their total value using numerals, pictures, and words. This could be recorded on the back side of the page.

Intervention

- Have the students act out the problem by dropping pennies on the ground and recording the result. No result can be repeated. Because all combinations may never be the result of acting out this task, have the student determine the missing solution(s) through questioning.

Vocabulary:

Most
Least
Heads
Tails

References:

Van de Walle, John A., Karen S. Karp, Jennifer M. Bay-Williams. Elementary and Middle School Mathematics: Teaching Developmentally. Pearson, 2010

Alaska Mathematics Standards
Math Tasks
Grade K

Ten Flashing Fireflies
Addition & Subtraction

Content Standard

K.OA.1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps) acting out situations, verbal explanations, expressions, or equations.

K.OA.2. Add or subtract whole numbers to 10 (e.g., by using objects or drawings to solve word problems).

K.OA.3. Decompose numbers less than or equal to10 into pairs in more than one way (e.g., by using objects or drawings, and record each decomposition by a drawing or equation). For example, 5=2+3 and 5=4+1.

K.OA.4. For any number from 1-4, find the number that makes 5 when added to the given number and, for any number from 1-9, find the number that makes 10 when added to the given number (e.g., by using objects, drawings or 10 frames) and record the answer with a drawing or equation.

K.OA.5. Fluently add and subtract numbers up to 5.

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

After reading and acting out the book, *Ten Flashing Fireflies*, students will use unafix cubes to solve and model problems with the number 10. Students will also use unafix cubes to experiment with all of the different number combinations that can add up to ten.

Materials:

- *Ten Flashing Fireflies* by Philemon Sturges or similar book
- "Ten Flashing Fireflies" work mat
- "Ten Flashing Fireflies" recording sheet
- Flashlights
- 10 centimeter cubes

****Please see link below for work mat and recording sheet (pg. 22):**
http://tinyurl.com/MathTasks-GradeK-Unit6

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Comments
This task can be completed over a period of two to three days. The counting book, *Ten Flashing Fireflies* by Philemon Sturges or a similar book, will set the stage for establishing the concept of number combinations. Each page of the story will introduce a different combination of 10.

Part I
Read the story to the students and have students act it out. Set the scene by dimming the lights and providing flashlights. Select 10 students and give each student a flashlight to shine on the wall to represent fireflies. Designate a spot on the wall as "the jar" and the rest of the wall is "the night sky". As students model the story with flashlights, have them share the strategy they are using. As you read the story, have students take turns modeling the bugs with the flashlights.

Part II
After modeling the story with flashlights, gather students to a meeting area and ensure each student has (10) centimeter cubes and the Ten Flashing Fireflies work mat. During this solve and share session it is important that students respect each other's think time. Choosing problems from the Ten Flashing Fireflies problems type chart, ask students to solve and model the problem using their work mat.

Comment: The problem types provided incorporate numbers to 10. Using a different total number of "fireflies" (or cubes) for each problem will increase the problem solving strategies that are required of students. This task can be modified to match part-part-whole for just the number 10 for students to work with specific number relationships.

Part III
Distribute 10 centimeter cubes (or other counting objects) to represent fireflies and Ten Flashing Fireflies work mat to each student or small group of students. Begin by reading the first couple of pages of *Ten Flashing Fireflies* by Philemon Sturges or similar book to the class. As the story begins, pause at each page and allow students to represent the action using the cubes on the work mat. Allow students the opportunity to discuss the strategies they are using to solve the problems on the first couple of pages. After students have discovered two possible combinations of fireflies in the jar and night sky, present students the Ten Flashing Fireflies task sheet: *There are 10 fireflies flying around. How many fireflies could be in the jar, and how many could be in the night sky? Find all of the possible combination of fireflies that could be in the jar or in the night sky. Record and explain your thinking using a table.* Have students work through the task that identifies how many fireflies could be in the jar or in the night sky. Once students have completed the task, finish reading *Ten Flashing Fireflies* so that students can verify their combinations and share the strategies they used to solve the task. Have students discuss what was easy and what was difficult for them during today's problem solving.

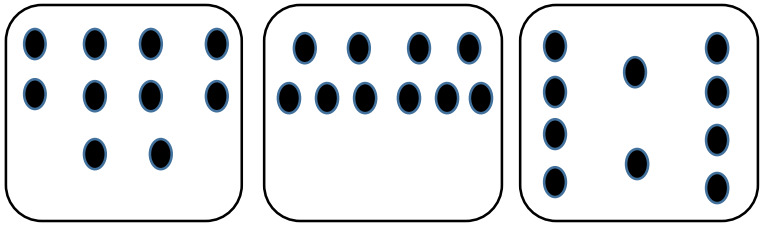
Teacher Reflection Questions:
- What counting strategies are students using as they separate (or add) information?
- Can students separate objects from a larger set of objects?
- Are students able to explain what happens when some objects are removed from a set of objects? Added to a set of objects?
- Can students explain how to find out what is left when one quantity is removed from another?
- Can students explain patterns as the story develops?

<u>Number Talk:</u>

Dot Images:
Showing students an organized arrangement of dots for a few seconds and then asking them to share how many they see encourages subitizing and fluency. Incorporating dot images into classroom number talks provides opportunities for students to work on counting, seeing numbers in a variety of ways, subitizing and learning combinations.

The following dot image number talk consists of three problems that are to be given sequentially. As each problem is shown, ask students, "How many dots do you see? How do you see them?" As the child is telling you what they see, connect the child's thinking to a number sentence by circling the dot arrangement the child describes and writing a correlating number sentence.

Example: Dot images with the Number 10



Please see *Number Talks* by Sherry Parrish (pgs. 71-81) for more examples of dot image number talks and for dot cards using numbers 3-10.

Background Knowledge/Common Misconceptions:

Students may over-generalize the vocabulary in word problems and think that certain words indicate solution strategies that must be used to find an answer. They might think that the word more always means to add and the words take away or left always means to subtract. When students use the words take away to refer to subtraction and its symbol, teachers need to repeat students' ideas using the words minus, subtract, or find the difference between. For example, students use addition to solve this Take From/Start Unknown problem: Seth took the 8 stickers he no longer wanted and gave them to Anna. Now Seth has 11 stickers left. How many stickers did Seth have to begin with?

If students progress from working with manipulatives to writing numerical expressions and equations, they skip using pictorial thinking. Students will then be more likely to use finger counting and rote memorization for work with addition and subtraction. Counting forward builds to the concept of addition while counting back leads to the concept of subtraction. However, counting is an inefficient strategy. Teachers need to provide instructional experiences so that students progress from the concrete level, to the pictorial level, then to the abstract level when learning mathematics.

As you tell the addition or subtraction stories, have children act out the stories using a variety of manipulatives to represent the fireflies. Once children are comfortable acting out the stories and demonstrate proficiency with acting them out, model for students how to record matching number sentences. Be sure to refer to the plus sign as "and", the equal sign to "is the same as", and the subtraction sign as "minus". Students should understand the meaning of the symbols and how the symbols connect to the stories.

As you create word problems for your students, base them on people, animals, or objects that you are discussing in other content areas or that the students can connect with for other reasons. Learning is tied to emotion and if students can connect with the problem, they are more likely to be engaged and therefore, learn through their experience.

Formative Assessment Questions:

- What strategy did you use?
- Did you think of the words "more" or 'less"? How?
- Is there another way you could have solved the problem?
- Were there more fireflies in the jar or night sky?
- What would you have to do to make the night sky and jar equal?

Differentiation:

Extension

• As students develop proficiency with solving each type of addition and subtraction structure, have them write their own problems for others to solve.

• Exploring number relationships to 20 can also be used to extend this task. The same concept can be used, but students would model part-whole problems using 20 counting objects.

Intervention

• Allow students to work with smaller numbers within 5 so that they can practice using efficient strategies to solve the problems. Counting strategies are efficient at this stage, but will become inefficient and distracting as numbers get larger. As students begin to understand the relationships among numbers, they will begin learning number facts at a recall level (Carpenter et al. 1999).

Vocabulary:

Strategy
Combination
More
Less
Equals

References:

Carpenter, T.P., and R. Lehrer. Teaching and Learning Mathematics With Understanding. E Fennema and T.A. Romberg, 1999

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

A Fishing Tale
Addition & Subtraction

Content Standard

K.OA.1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps) acting out situations, verbal explanations, expressions, or equations.

K.OA.2. Add or subtract whole numbers to 10 (e.g., by using objects or drawings to solve word problems).

K.OA.3. Decompose numbers less than or equal to10 into pairs in more than one way (e.g., by using objects or drawings, and record each decomposition by a drawing or equation). For example, 5=2+3 and 5=4+1.

K.OA.4. For any number from 1-4, find the number that makes 5 when added to the given number and, for any number from 1-9, find the number that makes 10 when added to the given number (e.g., by using objects, drawings or 10 frames) and record the answer with a drawing or equation.

K.OA.5. Fluently add and subtract numbers up to 5.

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
Students will begin this task but using unafix cubes to make a prediction. They will then begin to use numbers, pictures and words to explain their thinking when solving word problems using different number combinations.

Materials:

- 10 connecting cubes (5 red/5 blue)
- Recording sheet

****Please see link below for recording sheet (pg. 50):**
http://tinyurl.com/MathTasks-GradeK-Unit6

Part I
Place the 10 connecting cubes in a bag and explain to students that you are pretending the cubes in the bag are fish and the bag is the lake. Ask for one volunteer to catch 3 fish from the bag. Ask students for their prediction as to what color fish will be caught. Have the volunteer "fish" out 3 cubes and ask the students if any of the predictions were accurate. Ask students how to show the combination of cubes using numbers, pictures, and words.

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Part II
Present students with the connecting cubes and the story problem. Strongly encourage students to use numbers, pictures, and words to explain and represent their thinking. Once students have solved the problem, they should verify their combinations with another student to justify and explain their reasoning.

Comment: There are 3 different versions of the task that can be presented to students. Each version of this task increases in complexity because the number of people fishing increases which expands the possibilities. These story problems can also be used in sequence to scaffold learning.

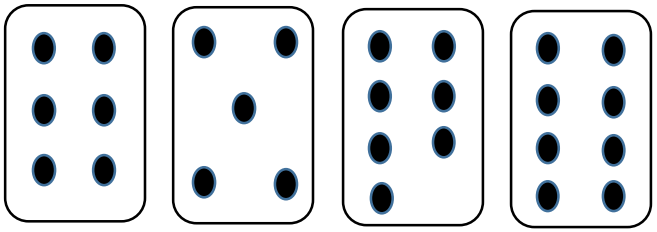
Story Problem #1
Tony went fishing for redfish and bluefish. He caught a total of 5 fish. What are the possible combinations of fish that Tony could have caught? Show your thinking using numbers, pictures, and words.

Story Problem #2
Andrea and Tony went fishing for redfish and bluefish. Andrea caught some redfish and Tony caught some bluefish. They caught a total of 5 fish. What are the possible combinations of fish that Andrea and Tony could each have caught? Show your thinking using numbers, pictures, and words.

Teacher Reflection Questions:
- Are students able to identify their strategy for solving the problems?
- Did students notice any patterns as they worked through the problems?

Number Talk:

Dot Cards: 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:
Students may over-generalize the vocabulary in word problems and think that certain words indicate solution strategies that must be used to find an answer. They might think that the word more always means to add and the words take away or left always means to subtract. When students use the words take away to refer to subtraction and its symbol, teachers need to repeat students' ideas using the words minus, subtract, or find the difference between. For example, students use addition to solve this Take From/Start Unknown problem: Seth took the 8 stickers he no longer wanted and gave them to Anna. Now Seth has 11 stickers left. How many stickers did Seth have to begin with?

If students progress from working with manipulatives to writing numerical expressions and equations, they skip using pictorial thinking. Students will then be more likely to use finger counting and rote memorization for work with addition and subtraction. Counting forward builds to the concept of addition while counting back leads to the concept of subtraction. However, counting is an inefficient strategy. Teachers need to provide instructional experiences so that students progress from the concrete level, to the pictorial level, then to the abstract level when learning mathematics.

It is extremely important to have students use story numbers, equations, drawings and models to represent their work. In the early years, story problems provide an excellent place to begin this habit. This is especially true before students have developed methods of computation. It is important to show students that explanations are needed, nearly always using words and numbers and often pictures as well. There is not a table designed for this task so that students can continue to plan and organize representations to show their work.

Formative Assessment Questions:

- Are there more ways to decompose the number 5?
- Why did you decide to do it this way?
- Are you sure that you have found them all? Why do you think so?
- Did you develop a strategy to find your answers?
- Did you identify any patterns or rules?

Differentiation:

Extension
- Story problem: *Shandra, Andrea, and Tony all went fishing and they each caught at least 1 fish. They caught a total of 5 fish. They caught 3 different types of fish (yellow tail tuna, bluefish and redfish). What could each of the 3 people have caught?*
- Story problem: *Shandra, Andrea, and Tony all went fishing. They caught a total of 5 fish. They caught 3 different types of fish (yellow tail tuna, bluefish and redfish). What are the possible combinations of fish that Shandra, Andrea, and Tony could have caught? Show your thinking using numbers, pictures, and words.*

Intervention
- As intervention you could have only one person fishing and place 10 counters in a bag (5 of two different colors) and have the student "fish" them out of the bag. After the student has pulled 5 counters out of the bag, have them record their "catch". (example: 3 blue and 2 red, or 1 blue and 4 red)Because the student is determining the different combination of 5 fish that can be caught, no combination can be repeated, however, this should be discovered and realized by the student through teacher questioning.

Vocabulary:
Strategy
Combinations
Patterns
Rules

Alaska Mathematics Standards
Math Tasks
Grade K

How Many Ways To Get To 10?
Addition & Subtraction

Content Standard

K.OA.1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps) acting out situations, verbal explanations, expressions, or equations.

K.OA.2. Add or subtract whole numbers to 10 (e.g., by using objects or drawings to solve word problems).

K.OA.3. Decompose numbers less than or equal to10 into pairs in more than one way (e.g., by using objects or drawings, and record each decomposition by a drawing or equation). For example, 5=2+3 and 5=4+1.

K.OA.4. For any number from 1-4, find the number that makes 5 when added to the given number and, for any number from 1-9, find the number that makes 10 when added to the given number (e.g., by using objects, drawings or 10 frames) and record the answer with a drawing or equation.

K.OA.5. Fluently add and subtract numbers up to 5.

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

During this task students will develop the generalization that the total number of paired combinations to make a number is one more than the number itself.

Materials:

- *12 Ways to Get to 11*, by Eve Merriam, or a similar book
- Eleven 2 colored (red/yellow) counters per student
- How Many Ways to get to 10? recording sheet

****Please see link below for recording sheet (pg. 63):**
http://tinyurl.com/MathTasks-GradeK-Unit6

Comment: This task will take place over 2 days. Many students are unaware that the total number of paired combinations to make a number is one more than the number itself. Example: there are 3 paired combinations to make the number 2 (0 + 2, 2 + 0, and 1 + 1) and 6 paired combinations for the number 5 (5 + 0, 0 + 5, 3 + 2, 2 + 3, 4 + 1, 1 + 4). This task will allow students to develop this generalization for number combinations. It is extremely important that the students recognize this generalization and that it is not pointed out by the teacher.

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Part I
Gather students together in a meeting place. Give each student 11 counters and begin reading the story, *12 Ways to Get to 11*, by Eve Merriam. As the story is read, have the students separate their counters into a model that reflects what is happening in the story. After each page, stop, discuss, and record the numerals for the combinations on chart paper or the board. (Example: if there were 9 pinecones and 2 acorns, the students would model a pile of 9 and 2. The teacher would record 9 and 2 on the chart paper after verifying that students were correct.

Comment: it is important to note that some combinations in the story will have greater than 2 addends which should be recorded as 3 and 3 and 3 and 1 and 1. The important part is that students are able to recognize that 11 can be decomposed into smaller units.

Part II
From the 11 counters that students have, ask them to gather 10. In pairs, have students explore all the possible combinations of 2 numbers when combined to make 10. Have students record their responses on the How Many Ways to Get to 10? recording sheet.

Comment: there are more squares than possible combinations. This is so students will need to justify and explain how they know they have found all of the possible combinations. As students work through the task, observe the strategies they are using to find the combinations for 10. Once partners have justified that they have found all the possible combinations to 10, as a group, have students share their number combinations and the strategies they used.

Number combinations to 10:

0 and 10	10 and 0	1 and 9	9 and 1	8 and 2	2 and 8
3 and 7	7 and 3	6 and 4	4 and 6	5 and 5	

Part III
As students explore and identify all the possible number combinations, record them on the board or chart paper. At this point in the year, some students will be independently able to organize and complete Part III and all students should be encouraged to do so.

Number	1	2	3	4	5	6	7	8	9	10
Number Combinations	2	3	4	5	6	7	8	9	10	11

Have a discussion with students about the pattern they see between the number itself and the total number of combinations for that number. Ask why this information is important and how it can help them going forward.

Teacher Reflection Questions:

- What strategies did students use to identify their number combinations?
- Were students able to identify a pattern for how many combinations there are for a given number?

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Number Talk:

Dot Cards: 1 more/1 less/10 more/10 less
The following four prompts are written on the board:

one more
one less
ten more
ten less

The teacher flashes a dot or ten frame card as the 'starting number'. The first student selects one prompt. For example, if the teacher flashes a card showing '5' the first student might say, "one more than 5 is 6", the second student might say, "ten more than 6 is 16", and the third student might say, "one less than 16 is 15". Continue until all students have had a turn.

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?*

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Reading and writing the combinations serve as a means of encouraging reflective thought focused on part-whole relationships. Writing can be done in the form of drawings, numbers written in the blanks (____ and ____), or addition equations. There is a clear connection between part-part-whole concepts and addition and subtraction ideas.

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Formative Assessment Questions:

- Are there more ways to decompose the number 10?
- Why did you decide to do it this way?
- Are you sure that you have found them all? Why do you think so?
- Did you develop a strategy to find your answers?
- Did you identify any patterns or rules?

Differentiation:

Extension

- Have students pick a number from 11-19 and test their generalization.

Ask how many combinations of number pairs there are for 16, 19, and 100. Do the students immediately apply the generalization rule they just invented?

Intervention

- Give students a set of playing cards, Ace through 10, of two different colored suits. (hearts and spades, for example) Have them combine a red card with a black card to make the number 10. Make one a double ten frame, make one 10-frame represent the red cards and the other represent the black cards.

Vocabulary:

Combination
Pine Cone
Acorn

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