Unpacking the MATHEMATICS Extended Academic Benchmarks: Essential Understandings





The purpose of this document is to define the essential academic concepts and skills contained within the extended *Mathematics Wyoming Academic Content Standards* and *Academic Benchmarks*. For students to have access to and show progress in the general academic curriculum, teaching and learning opportunities must align to these essential academic concepts. These concepts and skills (*enduring understandings*) define the challenging knowledge and skills that need to be effectively taught and learned for students with significant cognitive disabilities to succeed academically. They guide the development of challenging instructional activities for an individual student for the grade in which s/he is enrolled. These essential academic concepts also guide the development of goals and objectives within the Individualized Education Program. Additionally, this document can support collaboration with general education teachers to provide meaningful instruction at appropriate levels of challenge for individual students in multiple settings.

Essential academic concepts and skills are defined, instructional strategies are provided, and key resources (both educational websites and professional references) are listed to inform the implementation of standards-based instruction.

The five extended Mathematics Academic Content Standards are found on the following pages:

MATHEMATICS	
ACADEMIC CONTENT STANDARD 1. Number Operations and Concepts*:* Students sequence numbers and use number operations and related concepts to solve problems.	
Concepts and Skills	**Explanation**
Represent whole numbers	◆ To **represent** numbers is to link quantity with concrete, pictorial, and/or symbolic representations including objects, numerals or on number lines. ◆ A **whole number** is a counting number from zero to infinity. The whole numbers are: 0,1,2,3,4,5… ➧ **Example**: o The concept of *seven* can be represented with: ▪ the number *7*, ▪ the number 7 on a number line ▪ *seven* objects, ▪ a manual sign for *seven,* or ▪ *seven* pictures. ◆ Whole numbers can be represented as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, etc. ◆ **National Council of Teachers of Mathematics (NCTM) is a primary website for teaching mathematics standards:** ◆ http://www.nctm.org/standards/default.aspx?id=58&linkidentifier=id&itemid=58 ◆ http://www.nctm.org/eresources/journal_home.asp?journal_id=4 ◆ http://fcit.usf.edu/mathvids/plans/nctm.html ◆ http://www.teachervision.fen.com/pro-dev/teaching-methods/48939.html ◆ http://www.smartkidssoftware.com *("How Many Bugs in a Box?")* ◆ www.carroll.k12.org/instruction/elemcurricu/math/prompts.HTM ◆ www.attainment.com *(look for "Teaching to the Standards in Math")*

Recognize sets of similar objects	• A **set** is any collection of objects. • An **object** is something perceptible by one or more of the senses, especially by vision or touch; a material thing. • **Similar objects** are related in appearance or nature; alike though not identical. • http://www.springerlink.com/content/h24klx4515lhp172/ • http://www.onlinemathlearning.com/math-sets.html

Compare two sets of objects to identify more, less, and equal	• To **compare** is to tell how things are similar or different.
	• **Compare** the relationship between **sets** (a set is a collection of distinct objects) as more, less, and equal.
	• No matter how numbers are represented (objects, points on a scale, etc.), students can compare relationships between and among numbers.
	  • **Examples:**
	  o One more than
	  o One less than
	  o Higher / lower
	  o Greater than / bigger than / more than / larger than (7 is more than 4)
	  o Less than / smaller than / fewer than (4 is less than 7)
	  o More than
	  o Equal to / same as
	• As students gain an understanding of numbers and how to represent them, they have a foundation for understanding relationships among numbers.

Compare a set of whole numbers	• To **compare** is the relationship between and among whole numbers. See **compare** above. • A **whole number** is a counting number from zero to infinity. The whole numbers are: 0,1,2,3,4,5… • http://www.aaaknow.com/cmp.htm#topic26 • http://funschool.kaboose.com/formula-fusion/games/game_great_equations.html • http://www.free-training-tutorial.com/comparing-numbers-games.html

Order a set of whole numbers	• To **order** is to arrange according to value; placement of numbers in descending or ascending order.
	• Ordering provides opportunities for students to develop an understanding of:
	  • relative position - where a number is in relation to other numbers; and
	  • magnitude of number - how big a number is in relation to other numbers.
	• The range of numbers can be small or large (e.g., 5 – 8 or 10 – 20).

	• Numbers can be consecutive (e.g., 11, 12, 13, 14, 15) or nonconsecutive (e.g., 2, 4, 6 or 5, 10, 15). • As students' intuition about order and magnitude becomes more reliable, they can begin to understand the way systems of numbers work. • http://www.eduref.org/cgibin/printlessons.cgi/Virtual/Lessons/Mathematics/Number_Sense/NUS0202.html
Recognize coins	• **Recognize/differentiate coins** from other objects from learned knowledge of appearance or characteristics.

Identify coins (penny, nickel, dime, quarter)	• **Identify the names of the coins (**see **money recognition**); to recognize or establish as being a *particular* coin (penny, nickel, dime, quarter).
	• Penny
	  ◦ man (Lincoln) on the penny has a short beard (heads); the building on the other side (tails) has a flat top; and the color of the penny (reddish brown) is like no other coin.
	• Nickel
	  ◦ man (Jefferson) on the nickel has a ponytail low on his head (heads); the building on the other side (tails) has a round dome top; and the color is silver.
	• Dime
	  ◦ man (Roosevelt) on the dime doesn't have a beard or a ponytail (heads); coin is small and thin; and usually has ridges on the sides.
	• Quarter
	  ◦ heavier and bigger coin than the others; usually easiest for students to identify/ identify with; the markings can be tricky because Washington has the same hairstyle as Jefferson; and the states on the "tails" side of the commemorative quarters are different on different quarters.
	• http://www.teachertube.com/viewVideo.php?video_id=23073&title=Kindergarten_Coins_Song
	• http://www.moneyinstructor.com/art/kindergartenmoney.asp

Identify value of coins as *more*, *less*, or *equal* (penny, nickel, dime, quarter)	• **Value** is a numerical worth or amount. • **More**: one value is bigger than another; **less**: one value is smaller than another; **equal:** two values are equal or the same. • Although the concept of *less* is logically equivalent to the concept of *more* (selecting the set with more is the same as NOT selecting the set with less). The word *less* proves to be more

	difficult for children. A possible explanation is that children have many opportunities to use the word *more* but have limited exposure to the word *less*. To help children with the concept of *less,* frequently pair it with the word *more* and make a conscious effort to ask "Which is *less*?" questions as well as, "Which is *more*?" questions. For all three concepts (*more*, *less*, and *same*), children should construct sets using counters as well as make comparisons or choices between two given sets. ◆ http://www.rock-hill.k12.sc.us/teachers/bves/bhaile/coinquest/coinquest.htm
Express the value of coins as cents or dollar amount	◆ **Express/expression** is a symbol or a combination of symbols representing a value, relation, or the like. ◆ **Value** is a numerical worth or amount. ◆ http://www.teachertube.com/viewVideo.php?video_id=23073&title=Kindergarten_Coins_Song
Count objects	◆ **Count,** or **one-to-one**, is matching a verbal number word to a set of objects; to find the total number of objects. ◆ An **object** is something perceptible by one or more of the senses, especially by vision or touch; a material thing. Manipulatives are small objects that can be used for counting. ◆ Counting and one to one correspondence are the foundations of early math concepts. ◆ Meaningful counting activities can begin in preschool. Generally, children have a fair understanding of counting, but they must construct this idea through math experiences. Only the counting sequence is a rote procedure. The *meaning* attached to counting is the key conceptual idea on which all other number concepts are developed. ◆ Children still learning the skills of counting (matching oral number words with objects) should be given sets of blocks or counters that they can move, or pictures of sets that are arranged for easy counting: ◆ One to one correspondence ◆ For example, line up 5 (or more, or less) children and the same number of chairs in the front of the room. As the whole class counts from 1 to 5, the children sit down one at a time. When the target number is reached, it is repeated; the child who sat on the last number now stands and the count goes back to 1. ◆ Say numbers in order from 0-20 and 20-0; say the number before and after each numeral from 0-20. ◆ Match number words to numerals. ◆ Children should learn that the last number named represents the last object as well as the

	total number of objects in the collection. • Use naturally occurring opportunities to help develop number concepts by posing questions such as, "How many pencils do we need at this table?" or "Shall we count how many steps to the playground?" • www.funbrain.com (click All Games, then click on Bunny Count) • http://funschool.kaboose.com/preschool/games/game_counting_on_a_cloud.html • http://www.usu.edu/teachall/text/disable/programs/count.htm • Counting and One-to-One Correspondence: Preschool and Kindergarten Maths Activities http://www.suite101.com/content/counting-and-onetoone-correspondence-a66847#ixzz13zzSe5ik
Add by ones	• **Add** means to join two or more numbers (or quantities) to get one number (called the sum or total). • Vocabulary related to addition may include: *sum*, *total*, *all together*, *plus*, *in all*, and *putting together*. • Addition can be represented with objects, fingers, mental images, drawings, sounds (e.g. claps), acting out situations, verbal explanations, expressions or equations. • Show and tell how the sum was obtained using objects, pictures or numbers. • http://balancedassessment.concord.org/docs/p002.pdf

Break a sum into parts	• **Sum** is the total or whole amount, the result of adding; taking apart or decompose addition problems.
	• Take the sum and break it into as many different combinations as possible. The breaking can be done by starting with the number (sum) of counters, Unifix cubes, strips of paper, Cuisenaire rods, etc.
	  ◆ **Example**:
	  ▪ If 5 is the sum, break it into 0+5, 1+4, 2+3, 3+2, 4+1, and 5+0.
	• http://www.oswego.org/ocsd-web/games/SumSense/sumadd.html

Count by twos	• **Counting by twos** is sometimes called "skip counting" because every other number or count is skipped. Each count is two more than the previous count.
	  ◦ 2, 4, 6, 8, 10, 12, 14
	• Count by twos with words:
	  ◦ two, four, six, ten, twelve, fourteen, etc.
	• Use number lines with 2's in bold or a different color.
	• Make 100's chart with 2's highlighted.
	• http://www.studyzone.org/testprep/topic1.cfm?TopicID=120
	• http://balancedassessment.concord.org/docs/p013.pdf ("Dot to Dot" learning)
	• http://members.learningplanet.com/act/count/free.asp (planet game where you can choose what number to count by)
	• http://www.helpingwithmath.com/printables/others/lin0301number36.htm (number line to 100 by 2's)
	• http://www.helpingwithmath.com/printables/others/lin0301number27.htm (number line to 50 by 2's)
	• http://www.helpingwithmath.com/printables/worksheets/numbers/ski0301counting_01.htm (counting by 2's and filling in the missing numbers)

Count by fives	• **Counting by fives** with numbers creates number patterns with numbers ending in "5" or "0"
	• Count by fives with numbers:
	  ◦ 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100
	• Count by fives with words:
	  ◦ five, ten, fifteen, twenty, twenty-five, thirty, thirty-five, forty, forty-five, fifty, fifty-five, sixty, sixty-five, seventy, seventy-five, eighty, eighty-five, ninety, ninety-five, one hundred
	• A number pattern exists when counting by fives:
	  ◦ The numbers first end with the number five and then end with a zero each time 5 is added. This pattern is repeated: 5, 0, 5, 0, 5, 0, etc.
	• Use number lines with 5's in bold or a different color.
	• Make 100's chart with 5's highlighted.
	• www.ehow.com/video_4403080_**teaching-skip-counting-5**_s.html
	• www.ehow.com/video_4403079_**teaching-skip-counting**-2_s.html
	• http://www.studyzone.org/testprep/topic1.cfm?TopicID=119

	• http://members.learningplanet.com/act/count/free.asp • http://www.helpingwithmath.com/printables/others/lin0301number12.htm (number line to 100 by 5's) • http://www.helpingwithmath.com/printables/worksheets/numbers/ski0301counting_02.htm (counting by 5's and filling in the missing numbers) • http://www.aaaknow.com/k4a_cox1.htm

Count by tens	• **Counting by tens** creates number patterns with all numbers ending in a zero and the first digits are the same as the numbers when you count (1, 2, 3, 4, 5, etc.).
	• Count by tens with numbers:
	  ◆ 10, 20, 30, 40, 50, 60, 70, 80, 90, 100
	• Count by tens with words:
	  ◆ ten, twenty, thirty, forty, fifty, sixty, seventy, eighty, ninety, one hundred
	• Use number lines with 10's in bold or a different color.
	• Make 100's chart with 10's highlighted.
	• www.ehow.com/video_4403081_**teaching-skip-counting**-10_s.html
	• Videos for **teaching skip counting by 10's**
	• www.answerbag.co.uk/.../**teaching-skip-counting**.../d7c9a863-a342-d3f4-1d4d-cd5ea07968b6
	• http://www.studyzone.org/testprep/topic1.cfm?TopicID=118
	• http://www.helpingwithmath.com/printables/worksheets/numbers/ski0301counting_03.htm (counting by 10's and filling in the missing numbers)
	• http://www.aaaknow.com/g25g1_x1.htm

Multiply by twos	• **Multiplication** is a mathematical operation where a number is added to itself a number of times; the process of finding the number or quantity (*product*) obtained by repeated additions of a specified number or quantity. • Vocabulary related to multiplication may include: *product*, *times*, *twice*, *total*, and *multiplied by*. • Demonstrate the concept of multiplication as repeated addition and arrays. • www.squidoo.com/**counting** • http://www.helpingwithmath.com/by_subject/multiplication/multiplication.htm • www.**multiplication**.com/**teaching**activities.htm • www.ehow.com/video_4403079_**teaching-skip-counting**-2_s.html • Videos for **teaching skip counting by 2's**

	• www.lessonplanspage.com/Math**CountingByTwos**1.htm • http://www.multiplication.com/teachingactivities.htm
Divide by twos	• **Division** is grouping a number into equal parts; to separate into equal parts by a divisor; dividing by twos is "halving." • Vocabulary related to division may include: *divisor*, *dividend*, *quotient*, *goes into*, *split equally*, or *each*. • Demonstrate the concept of division as repeated subtraction and as sharing. • http://www.numbernut.com/basic/div_1to9.shtml • http://www.learninggamesforkids.com/math_games/division/flash-cards-divide-by-two.html • http://www.songsforteaching.com/carlsherrill/youjusttakehalf.htm

Complete addition problems using single digit numbers	• **Add** means to join two or more numbers (or quantities) to get one number (called the sum or total).
	• A **digit** is one of the ten Arabic number symbols 0 through 9; a symbol used in a system of numeration.
	• Vocabulary related to addition may include: *add, sum, plus, increase,* and *total*.
	• Addition can be represented with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions or equations.
	• Can use horizontal or vertical format.
	• Strategies may include:
	  ◦ Counting on
	  ◦ Doubles 4+4=8
	  ◦ Near Doubles 3+3=6 so 3+4=7
	  ◦ One more, one less
	  ◦ Making tens
	• www.lessonplanspage.com/MathAddTwo**SingleDigits**UnderTen1.htm
	• www.teach-nology.com/themes/math/addsub/
	• www.mathabacus.com/books.html
	• http://themathworksheetsite.com/add_single_vert.html
	• www.funbrain.com (math baseball game)

Complete addition problems using double digit numbers less than 20	• A **double digit number** is a two-digit integer from 10 to 99. • An integer, or whole number, is any of the natural numbers (positive or negative) or zero;

	an integer is a number that is not a fraction.
	• Strategies may include:
	  ◆ Break apart numbers: thinking of numbers in terms of their parts and adding part of a number at a time
	  ▪ 12 + 18
	  ▪ 10 + 2 + 10 + 8
	  ▪ 10 + 10 + 2 + 8
	  ▪ 20 + 10 = 30
	  ◆ Landmark numbers, which are numbers that end in zero:
	  ▪ 18 + 6; think 18 + 2 = 20; then 20 + 4 = 24
	  ▪ 20 is the landmark number.
	  ◆ Estimation to find a number that is close to the exact answer.
	• www.dositey.com/**add**sub/**add**2basic.html
	• www.**less**onplanspage.com/Math**Add**TwoSingle**Digit**sUnderTen1.htm
	• www.ed.helper.com
	• www.kidsmathblog.com/**teaching-double-digit-addition**-no-regrouping/

Complete subtraction problems using single digit numbers	• **Subtract** is to take one quantity away from another. • A **digit** is one of the elements that collectively form a system of numeration; "0 and 1 are digits" • **Single digit** numbers are: 0,1,2,3,4,5,6,7,8,9 • Vocabulary related to subtraction may include: *remainder*, *difference*, *less, less than*, *fewer*, *how many more*, *minus*, *taking apart*, *taking from*, *decrease*, *take away*, and *deduct*. • Subtraction can be represented with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions or equations. • Understand subtraction as an unknown added problem (e.g., subtract 10-7 by finding the number that makes 10 when added to 7) • http://www.athens.edu/vinsobm/lesson_34.htm • http://www.helpingwithmath.com/resources/games/magnet_sub_to9/SubTo9.html • http://www.numbernut.com/basic/activities/sub_quiz_1-v.shtml • http://www.kidzone.ws/math/subtraction.htm
Recognize a whole can be represented by parts/fractions	• A **whole** has no fractional parts. • A **fraction** is a number that expresses part of a group; a fraction is part of an entire object; any rational number that is not an integer.

	• Fractional parts are equal shares, equal-sized portions or fair shares of a whole or unit. A unit can be an object or a collection of things. • Fractional parts have special names that tell how many parts of that size make the whole. • Emphasize that the number of parts that make up a whole determines the name of the fractional parts or shares. • Students can use fractions to show parts of a group. • Use drawings, diagrams or models to show the concept of fractions as part of a whole. • Use fractions along with visual fraction models to represent parts of a whole. • Types of models may include area or region models (e.g., pattern blocks, pie pieces, grid or dot paper), length models (e.g., number lines, Cuisenaire rods, line segment drawings, etc.) and set models (e.g., drawings using X's and O's, two-color counters in loops on paper). • By using parallel number lines, each showing a unit fraction and its multiples, students can see fractions as numbers, note their relationship to one whole (1), and see relationships among fractions, including equivalence. • http://www.enchantedlearning.com/math/fractions/ • http://nlvm.usu.edu/en/nav/category_g_1_t_1.html (click on Fractions - Parts of a Whole) • http://www.mathplayground.com/thinkingblocks.html • Math Made Easy: **Recognizing** & Placing **...** • www.tlsbooks.com/**recognizingfractions**.pdf • http://www.aaaknow.com/fra.htm#topic1 • http://www.primaryresources.co.uk/maths/mathsB6.htm
Recognize two equivalent halves as a whole	• **Equivalent** is having the same value or amount. • **Halves** are one of two equal parts into which a whole can be divided. • The size of a fractional part is relative to the size of the whole. • http://www.mathsolutions.com/documents/0-941355-33-0_L2.pdf • http://www.eturo.org/files/Separating%20a%20Whole%20Object%20into%20Halves%20&%20or%20Fourths.pdf • http://www.helpingwithmath.com/resources/activities/act_fractions01.htm • http://mathforum.org/varnelle/knum.html • www.themathpage.com/arith/**equivalent-fractions**.htm
Compare objects to identify which is *more*, *less*, and *equal* using wholes and halves	• **Compare** as **more**: one value is bigger than another; as **less**: one value is smaller than another; and as **equal**: two values are equal or the same. • Though the concept of *less* is logically equivalent to the concept of *more* (selecting the set

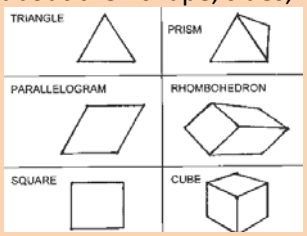
	with more is the same as NOT selecting the set with less), the word *less* proves to be more difficult for children. A possible explanation is that children have many opportunities to use the word *more* but have limited exposure to the word *less*. ◆ To help children with the concept of less, frequently pair it with the word "more" and make a conscious effort to ask "which is less?" questions as well as "which is more?" questions. ◆ For all three concepts (more, less, and same), children should construct sets using counters as well as make comparisons or choices between two given sets. ◆ Give students a collection of fractional parts (halves) and identify or label them as such. Call out a "number" of the parts and have students put them together and then discuss if it is more, less or equal to a whole. ◆ http://mathforum.org/varnelle/knum.html ◆ http://www.education.com/worksheet/article/more-less-equal-comparing-numbers/ ◆ http://fcit.usf.edu/mathvids/plans/cmls/C_intro.html
Recognize the sum of three halves as greater than a whole	◆ **Sum** is to add or join three halves as greater than one whole. ◆ A fraction is a number that expresses part of a group; a fraction is part of an entire object. ◆ **Half** or **halves** are one of two equal parts into which a whole can be divided. ◆ **Greater than** or as more: one value is bigger than another. ◆ Gather several representations of halves (circles, squares, pattern blocks, Cuisenaire rods) and identify how many of the pieces make one whole. Discuss that adding one more half makes the sum bigger than the whole. ◆ http://www.themathpage.com/arith/fractions.htm ◆ http://www.ixl.com/ ◆ http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks2/maths/fractions/index.htm ◆ http://www.rblewis.net/technology/EDU506/WebQuests/basicfractions/fractions.html ◆ http://www.homeschoolmath.net/teaching/teaching-fractions.php
Recognize the quantity of one and one half as the sum of three halves	◆ See **Recognize two equivalent halves as a whole** (p. 11). ◆ See **Recognize the sum of three halves as greater than a whole** (above). ◆ See above websites for **Compare objects to identify which is *more*, *less*, and *equal* using wholes and halves** (p.11), and **Recognize the sum of three halves as greater than a whole**.
Identify the sum of five fourths as greater than a whole	◆ **Sum** is the total or whole amount; the result of adding. ◆ **Greater than** implies "more." ◆ A **fourth** is one of four equal parts into which a whole can be divided.

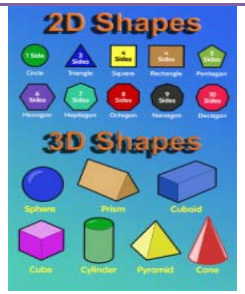
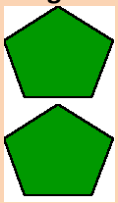
	• Display some pie piece fraction parts for students. Tell students what type of piece is being shown and as you are displaying them, count them together: "*one*-fourth, *two*-fourths, *three*-fourths, *four*-fourths, *five*-fourths". Ask, "If we have five-fourths, is that more than one whole, less than one whole or the same as one whole?" As you display them, put the first four together to make the "whole" circle and then the last fourth next to the whole. • See above websites for **Compare objects to identify which is *more*, *less*, and *equal* using wholes and halves, Recognize the sum of three halves as greater than a whole**, and parts/fractions (p. 10).
Recognize the equivalency of four quarters and a whole	• **Equivalency** means having the same value. • One of four **equal** parts into which **one whole** may be divided. • Show examples of quarters with paper (folded in fourths), money, Cuisenaire rods, number lines, two sided/colored counters. • http://www.blurtit.com/search/?query=How+Many+Fourths+Equal+One+Whole%3F&st=rk&cid=3359831126&page=q9205373.html • http://www.suite101.com/content/developmental-delays-money-skills-a25650 • See above websites for **Compare objects to identify which is *more*, *less*, and *equal* using wholes and halves** (p. 11); **Recognize the sum of three halves as greater than a whole** (p. 12), and parts/fractions (p. 10).
Recognize the equivalency of four quarters and a dollar	• **Equivalency** means having the same value. • See **Identify coins (penny, nickel, dime, quarter (**p. 4); see **Identify value of coins as *more*, *less*, or *equal* (penny, nickel, dime,** and **quarter)** (p. 4). • http://www.lessonplanet.com/search?keywords=equivalent+coins&media=lesson • http://www.livestrong.com/article/219580-how-to-teach-the-value-of-coins-to-children/ • http://www.mathworksheetwizard.com/grade2/grade2money.html • http://www.suite101.com/content/developmental-delays-money-skills-a25650 • http://www.ixl.com/ • http://www.enchantedlearning.com/math/money/coins/dime/ • http://www.apples4theteacher.com/java/counting/money.html
Recognize the equivalency of ten dimes and a dollar	• **Equivalency** means equality of value. • Use hundreds chart to teach counting by 10's. Put transparent highlight tape in the hundreds chart on the wall and eventually take the tape out and replace with dimes. • See above websites for **Recognize the equivalency of four quarters and a dollar.**

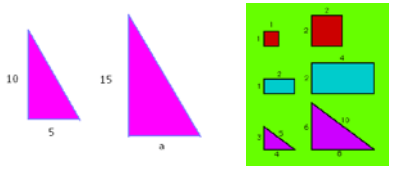
Recognize the sum: five quarters is greater than one dollar	◆ **Sum** is the total or whole amount, the result of adding. ◆ **Greater than** means "more." ◆ After teaching "25¢, 50¢, 75¢, a dollar" jingle, show students five quarters and begin singing, placing one quarter on the table for each amount said. Help them recognize five quarters is greater than one dollar because you still have one left after the jingle in over. ◆ See above websites for **Recognize the equivalency of four quarters and a dollar.**
Use 1 to 1 proportions to solve problems using money	◆ A **proportion** is a part in its relation to a whole comparison; also defined as the equality of two ratios written as an equation. ◆ **1 to 1** means both parts of the ratio are equal in value (e.g., eight quarters is the same as two dollars).
Provide a reasonable guess (given a mathematical problem)	◆ **Reasonable guess,** or estimate, is a judgment of the approximate value of something. ◆ A **word problem** is a mathematics exercise expressed as a hypothetical situation explained in words, pictures, symbols, etc. ◆ http://www.cliffsnotes.com/Section/Math-Word-Problems-Glossary.id-305499,articleId-59801.html ◆ http://www.lessonplanet.com/search?keywords=estimation+to+solve+problems&media=lessons
Provide a reasonable estimate (guess) given two variables	◆ **Estimate** is a judgment of the approximate value of something; a quantity capable of assuming any of a set of values; a symbol representing such a quantity. ◆ A **variable** is the lettered term in algebra. It is the one that can change (e.g., 7**X**; **X** is the variable while 7 is the constant). ◆ Given two variables or answer choices, students estimate/guess the more reasonable choice, and then explain their answers. ◆ http://www.aaaknow.com/est27bx2.htm ◆ http://www.aaaknow.com/est.htm ◆ http://www.bbc.co.uk/skillswise/numbers/wholenumbers/whatarenumbers/rounding/index.shtml
Use quantitative labels (*more/less, larger/smaller*) when making an estimation	◆ **Quantitative** relates to a number or quantity that can be counted or measured. ◆ **Estimation** is a judgment of the approximate value of something.
Use estimation to determine a number needed to solve a problem	◆ **Estimation** is a judgment of the approximate value of something. ◆ A **word problem** is a mathematics exercise expressed as a hypothetical situation explained in words, pictures, symbols, etc. ◆ When dealing with word problems, help students determine which part of the problem is

	given and which part needs to be determined/solved. ◆ http://www.ixl.com/math/practice/grade-6-estimate-to-solve-word-problems (Word problems, although high in difficulty, provide good examples.)
Use estimation to determine the sum of two values	◆ **Estimation** is a judgment of the approximate value of something. ◆ **Sum** is the total or whole amount, the result of adding ◆ Break numbers/values down into 10's and 1's; add the tens, then the ones to come up with an estimate of the actual sum.

ACADEMIC CONTENT STANDARD 2. Geometry: Students recognize, sort, compare and contrast geometric shapes and objects and relationships.	
Concepts and Skills	**Explanation**
Recognize and sort geometric shapes (circle, square, triangle)	◆ To **recognize shapes** is to differentiate shapes from other objects. ◆ To **sort** is to put into groups according to an attribute or criteria. ◆ **Geometric** shapes are flat shapes including square, circle, ellipse, triangle, rectangle, rhombus, trapezoid, parallelogram, pentagon, and hexagon. ◆ Plane Geometry is about flat (2-dimensional) shapes; a surface or space bounded on all sides by lines or planes. ◆ Solid Geometry is about solid (3-dimensional) shapes like spheres and cubes. ◆ http://www.mcrel.org/pdf/curriculum/5021cm_shapes.pdf ◆ http://www.mathworksheetwizard.com/kindergarten/shapes.html ◆ http://www.lessonplanspage.com/MathGeometricShapesIntroK1.htm ◆ http://www.instructorweb.com/lesson/geometryshapes.asp
Identify and pair objects as *same* or *different*	◆ To **identify** is to recognize or establish something as being a particular thing; ◆ To **pair** is to put things together according to an attribute or criteria (*same* or *different*) ◆ http://www.kidport.com/GradeK/Math/MeasureGeo/MathK_Shapes.htm
Identify two-dimensional objects	◆ **Two-dimensional** means having two dimensions (length and width), and being contained in one plane. ◆ Distinguish between defining attributes (triangles are closed and three sided) verses non-defining attributes (color, orientation, overall size). ◆ http://www.amathsdictionaryforkids.com/dictionary.html
Recognize similarities between two- and three-dimensional objects	◆ To **recognize** is to know to be something that has been perceived before. ◆ **Similarities** between objects can include shape, lines, and angles; that two objects both have the same shape. For example, all circles are similar to each other; all squares are similar to each other. ◆ A **two dimensional object/shape** shows only the width and height of an object, like a square or polygon (e.g., circle/sphere, square/cube, triangle/pyramid, rectangle) ◆ Plane Geometry is about flat (2-dimensional) shapes; a surface or space bounded on all

	sides by lines or planes. ◆ A **three-dimensional object/shape** has three dimensions: length, width, and height (e.g., cube, cylinder, cone, triangular prism) versus a two-dimensional object that only has length and width. Three-dimensional objects have depth and are solid shapes. ◆ Solid Geometry is about solid (3-dimensional) shapes like spheres and cubes. ◆ Describe circle, squares, rectangles, triangles, hexagons, pentagons, and octagons by telling about their shape, sides, lines, and angles.  ◆ Recognize similarities between: circle/sphere, square/cube, triangle/pyramid, etc. ◆ http://www.icteachers.co.uk/children/sats/3d_shapes.htm ◆ http://www.amathsdictionaryforkids.com/dictionary.html (visual from online Math Dictionary) ◆ http://illuminations.nctm.org/ActivityDetail.aspx?ID=84 (Helps students determine if certain two-dimensional nets can be folded into three-dimensional cubes.) ◆ http://mste.illinois.edu/courses/ci332fa02/folders/cohort1/hroe/Lessons.htm
Identify two- and three-dimensional geometric shapes of the *same* and/or *different* positions and sizes	◆ See **Recognize similarities between two- and three-dimensional objects** (p. 15). ◆ **Identify** two- dimensional geometric shapes (circles, squares, rectangles, triangles, etc.) into groups as *same* or *different* when positioned on a grid system, having the same and/or different sizes, and in the same orientation or rotated. Contrast sides, shapes, corners, etc. ◆ **Identify** three- dimensional geometric shapes (spheres, prisms, cubes, etc.) into groups as *same* or *different* when shown having the same and/or different sizes and in the same orientation or rotated. Contrast sides, shapes, corners, etc.

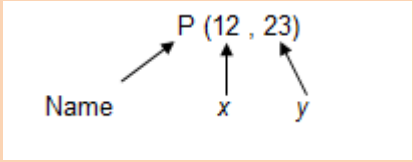
	 • http://mathforum.org/dr.math/faq/formulas/faq.figuredef.html • http://ritter.tea.state.tx.us/math/training/materials/MTR/K-5/lessons/geometry2.pdf • http://illuminations.nctm.org/LessonDetail.aspx?id=L237
Labels two-dimensional geometric figures (*triangle*, *squares*, *circles*)	• To **label** is to identify or designate with a name or label; to name, describe or classify. • A **two dimensional object/shape** shows only the width and height of an object, like a square or polygon (e.g., circle/sphere, square/cube, triangle/pyramid, rectangle). • See **Identify two-dimensional objects** (p. 15) • http://www.mathworksheetwizard.com/kindergarten/shapes.html • http://media.wiley.com/product_data/excerpt/41/04712255/0471225541.pdf
Labels three-dimensional figures (*cubes*, *cylinder*)	• To **label** is to identify or designate with a label; to name, describe or classify. • A **three-dimensional object/shape** has three dimensions: length, width, and height (e.g., cube, cylinder, cone, triangular prism) versus a two-dimensional object that only has length and width. Three-dimensional objects have depth and are solid shapes. • See **Recognize similarities between two- and three-dimensional objects** (p. 15 – 16) • http://www.abcteach.com/free/t/three_dimen_b.pdf • http://rpdp.net/adm/uploads/math/1787Math7Ch10NOTESMeasurement.Three.DimensionalFigures.pdf
Identify a pair of congruent geometric shapes	• **Congruent** means having the same shape **AND** same size.  • http://www.nsa.gov/academia/_files/collected_learning/elementary/geometry/Geometry

	_Go_Getters.pdf • http://www.beaconlearningcenter.com/weblessons/congruentconcentration/default.htm • http://www.learnnc.org/lp/pages/3028
Identify similar geometric shapes	• **Similar** means the same shape, **but NOT NECESSARILY** the same size. • Shapes that are the same, except for their size, are called "similar". • If one **shape** can become another using resizing, then the **shapes** are **Similar.**  • All circles are similar to each other, all squares are similar to each other, and all equilateral triangles are similar to each other. On the other hand, ellipses are *not* all similar to each other, *nor* are hyperbolas all similar to each other. If two angles of a triangle have measures equal to the measures of two angles of another triangle, then the triangles are similar. • Images for **similar shapes**
Organize congruent and similar geometric shapes on a grid system	• See **congruent** and **similar** above; see **geometric shapes** (p. 15). • A **grid system** is a rectangular array of squares or rectangles of equal size, such as in a crossword puzzle; A network of horizontal and vertical lines that intersect to form squares or rectangles.

Identify lines of symmetry in congruent geometric shapes	• A **line of symmetry** divides a symmetrical object in half (2 congruent sides); the **line of symmetry** is the imaginary line where you could fold the image and have both halves match exactly.
	• A **line of symmetry** divides a figure into to halves that are the ***mirror images*** of each other.
	• **Example**:
	  ◦ Fold a square sheet of paper exactly in half. When you unfold the paper you will see the crease down the center. That is an example of a line of symmetry. Both sides of an object must be equal to be symmetrical.
	  ◦ Fold that same piece of paper in half again; using a pair of scissors, cut half a heart out of it using the crease as a line going down the "middle" of the heart. Unfold the finished construction. You'll have a heart (nice work!), and that fold you made

	in the paper is the line of symmetry for the figure. The line of symmetry divides any shape into mirror images. • http://wiki.answers.com/Q/What_is_a_line_of_symmetry#ixzz19udlH95J • http://www.amathsdictionaryforkids.com/dictionary.html (visual example of **line of symmetry** in online Math Dictionary) • http://www.mathsisfun.com/definitions/line-symmetry.html • **Line of Symmetry** - YourTeacher.com - Geometry Help (video for defining line of symmetry)
Compare geometric relationships to solve problems	• To **compare** is to tell how things are similar or different. • Explain the geometric relationship used to solve the problem. • **Example**: ◆ Explain why two given triangles are congruent, similar or neither.
Identify a reflection (flip)	• **Reflection,** or **flip,** is a transformation in which the figure is the mirror image of the original; mirror view. • A transformation changes the position of a shape on a coordinate plane. • A coordinate plane contains two perpendicular axes (x and y) intersecting at a point (origin). • Fold paper to demonstrate the reflections about a line. • http://www.amathsdictionaryforkids.com/dictionary.html (Search for "reflection" and also "flip" for great visuals.) • http://balancedassessment.concord.org/docs/p011.pdf ("Shirts in the Middle" activity from Balanced Assessment site) • http://www.misterteacher.com/abc.html • http://www.mathsisfun.com/definitions/reflection-symmetry.html • http://www.shodor.org/interactivate/discussions/TranslationsReflecti/
Organize reflections (flips) of images with original images	• Given an **original image** and two images, pick the image that is a reflection (flip) of the original image. • http://www.ixl.com/math/practice/grade-2-flip-turn-and-slide • http://illuminations.nctm.org/activitydetail.aspx?id=27 .
Represent geometric figures resulting from reflections (flips) on a coordinate system	• A **coordinate system** is a plane containing two perpendicular axes (x and y) intersecting at a point (origin). • Describe the relative position of each new point of the image as the pre-image is reflected

	across either the x or y axis. ◆ http://balancedassessment.concord.org/docs/e021.pdf
Identify characteristics of parallel, perpendicular and intersection lines	◆ **Parallel lines** are always the same distance apart; two lines on a plane that never meet. ◆ **Perpendicular lines** intersect at right angles to each other. ◆ **Intersection** describes when two lines cross over one another. ◆ http://datadeb.files.wordpress.com/2010/03/content-cardparallel.png ◆ http://www.homeschoolmath.net/teaching/g/parallel_and_perpendicular.php ◆ http://www.mathsisfun.com/definitions/parallel-lines.html ◆ http://www.mathsisfun.com/perpendicular-parallel.html
Identify the change in position on a one-step geometric transformation of a geometric shape on a grid system	◆ **Transformation** is a change in position or size. ◆ Transformation will only be one of the following: translation (slide), a reflection (flip) or a rotation (turn). ◆ Describe the relative position on the coordinate plane of the new points of the image as the pre-image is transformed through one of the following: translation (slide), reflection (flip) or rotation (turn). ◆ http://www.amathsdictionaryforkids.com/ (click on T for transformation. Click through examples to show change in position.) ◆ http://mconn.doe.state.la.us/lessonplans.php?task=LP_view&lesson_id=5089&dispPage=10
Classify and compare angles of different acuity (*small/large*)	◆ **Angles** are the amount of turning between two lines meeting at a common point. ◆ Two rays that share the same endpoint form an **angle**. The point where the rays intersect is called the vertex of the angle. The two rays are called the sides of the angle. ◆ Begin by showing students a 90° angle; present various other angles drawn and then cut out. Use a T-chart for students to place the angles in two categories – smaller than 90°, bigger than 90°. ◆ http://www.mathleague.com/help/geometry/angles.htm
Identify angles and parallel lines in a four-sided figure	◆ Identify which (if any) pairs of lines in a four-sided figure are parallel. ◆ Identify which (if any) pairs of angles in a four-sided figure are congruent. ◆ http://datadeb.files.wordpress.com/2010/03/content-cardparallel.png ◆ http://www.homeschoolmath.net/teaching/g/parallel_and_perpendicular.php

Identify the perpendicular lines in a four-sided figure	◆ Two lines that meet at a right angle are **perpendicular**. ◆ When shown a four-sided figure, have students extend each line. Identify that each set of intersections are perpendicular lines (90° angles). ◆ http://math.about.com/od/geometry/ss/linessegments_5.htm
Identify a geometric figure based on mathematical description	◆ When given a description of a geometric figure/shape, including such things as the number of sides and angles, whether it has congruent sides and if so, how many, and whether the figure has parallel lines and/or perpendicular lines, identifies the described figure.
Recognize geometric shape and/or objects in the environment	◆ Name various shapes or objects in the student's world, give choices (or not) about what geometric shape it is similar to. ◆ http://www.uen.org/Lessonplan/preview.cgi?LPid=21489
Identify the perimeter around a rectangle	◆ **Perimeter** is the distance around the outside of a shape. ◆ http://balancedassessment.concord.org/docs/e019.pdf ("Gardens of Delight" site)
Differentiate distance between two pairs of points presented on a graph or coordinate plane	◆ **Coordinates of a point** are written as an "ordered pair" as shown below. The letter P is simply the name of the point and is used to distinguish it from others.  ◆ The two numbers in parentheses are the x and y coordinates of the point. The first number (x) specifies how far along the x (horizontal) axis the point is. The second is the y coordinate and specifies how far up or down the y axis to go. It is called an ordered pair because the order of the two numbers matters - the first is *always* the x (horizontal) coordinate. ◆ **Coordinate plane** is a plane containing two perpendicular axes (x and y) intersecting at a point (origin) ◆ Explain whether a given pair of points located on a graph or coordinate grid is farther apart, closer together, or the same distance apart as a second pair of points located on the same graph or coordinate grid.

ACADEMIC CONTENT STANDARD 3. Measurement: Students use tools to apply numbers and concepts to length, capacity, time, and weight.	
Concepts and Skills	**Explanation**
LENGTH	
Recognize length using non-standard measurement units	• Measuring with **non-standard** units means measuring things with blocks, pencils, hands, feet, etc. as long as the items used to measure are all the same size (e.g., identical lengths of yarn or paper clips). • Tell about how many objects it would take to make a **length** equal to the object being measured. • http://www.learnnc.org/lp/pages/3729?ref=search • http://www.learnnc.org/lp/pages/3773?ref=search (Lesson using book "*How Big is a Foot?"* by Rolf Myller) • http://illuminations.nctm.org/LessonDetail.aspx?ID=L124 (Lesson using book "*Ladybug on the Move"* by Richard Fowler) • http://www.nsa.gov/academia/_files/collected_learning/elementary/geometry/measuring_up.pdf • http://www.center.edu/pub/docs/chapter7.pdf
Demonstrate length using standard measurement units (*one-inch* and *one-foot* increments)	• Measuring with **standard units** means measuring with inches, feet, yards, centimeters or meters, using rulers and other measuring devices. • Measures length using one inch increments (how many includes how long) and one foot increments (how many feet long). • http://www.apples4theteacher.com/measure.html (Measure the Bear interactive activity) • http://www.matsuk12.us/176520115151338437/lib/176520115151338437/5.5_notes_key.pdf • http://www.mathsisfun.com/measure/us-standard-units-introduction.html
Identify a one-yard increment	• A **yard** is a standard measurement unit equal to 3 feet or 36 inches. • Identifies an increment as one yard.

	◆ http://mathforum.org/library/drmath/view/58075.html
Compare customary (standard) units of length (*inches*, *feet*, *yards*, *miles*)	◆ **Compare** is to state the similarities or differences (e.g., greater, less, equal to) between two customary units of length. ◆ http://www.op97.k12.il.us/longfellow/tools/measurement.pdf ◆ http://atlantis.coe.uh.edu/archive/science/science_lessons/scienceles3/length/length.html ◆ http://www.mathmammoth.com/preview/Measuring_Customary_Units_of_Length.pdf ◆ http://mathforum.org/library/drmath/view/58075.html ◆ www.rtmsd.org/744112562095924/lib/.../measurement.ppt
Estimate measurement of length (*inches*, *feet*)	◆ **Estimate** is a judgment or reasonable guess of the approximate length of something. ◆ http://www.apples4theteacher.com/measure.html ("Measure the Bear" interactive activity)
Determine which customary unit of length is appropriate to measure an item	◆ The **customary units** to measure length are *inches*, *feet*, *yard,* and *mile*. ◆ **Determine** or decide the appropriate unit to measure. ◆ Gather items that measure exactly one inch, one foot, one yard. Then use various items from the classroom (pencil, desk top, chalk/white/SMART board, eraser, poster board, bulletin board) and have students determine which increment would be used to measure each. ◆ http://chalk.richmond.edu/education/projects/webunits/measurement/length1.html
VOLUME/CAPACITY	
Demonstrate capacity using non-standard units	◆ **Capacity** is a unit of measurement of volume. ◆ **Volume** is the measure of how much space an object takes; **volume** often refers to liquid volume, which is defined as the amount of space taken up by a liquid, which spreads completely to fill its container. ◆ Use non-standard volume units (cups, spoons, bottles) to fill a container and count the number used. ◆ Compare and order volumes of containers using non-standard volume units. ◆ Use a variety of objects to measure the amount a container can hold. ◆ Build with blocks and count the number of blocks used. ◆ http://nzmaths.co.nz/volume-and-capacity-units-work ("Volume and Capacity Units of

	Work," click on non-standard units section)
Demonstrate capacity using customary (standard) units	◆ The U.S. **Customary Units** for measuring volume are *cup*, *pins*, *quarts* and *gallon*. ◆ Use customary units for measuring volume to demonstrate/show appropriate use of these units to measure volume. ◆ http://www.cpsb.org/resources/cbt/webfolios/st_john/stacie.reed/lesson.htm ◆ http://nzmaths.co.nz/volume-and-capacity-units-work
Compare the relationship between customary units of capacity	◆ **Compare** is to state the similarities or differences (e.g., more, less, equal to) between two customary units of capacity including cups, pints, quarts, and gallons. ◆ http://www.learningresources.com/text/pdf/1209INS.pdf ◆ http://www.theteacherwebsite.com/mrgallonmanproject-tools.pdf (Gallon Guy plan, also Big G) ◆ http://www.cpsb.org/resources/cbt/webfolios/st_john/stacie.reed/lesson.htm ◆ http://nzmaths.co.nz/volume-and-capacity-units-work (Click on "Comparing and Ordering" section.) ◆ http://www.teachertube.com/viewVideo.php?video_id=2101&title=Capacity ("Capacity" Teacher Tube Video) ◆ www.rtmsd.org/744112562095924/lib/.../measurement.ppt
Determine which customary unit of capacity is appropriate to measure a quantity	◆ **Determine** or decide the appropriate **customary unit** of **capacity** or **volume** is appropriate to measure a quantity of liquid. ◆ Gather clear containers that measure one cup, one pint, one quart and one gallon. Gather various liquid-filled items (school milk carton, can of soda, bottle of medicine, jug of milk, bottle of water, juice box) and allow students to compare and determine which is appropriate to measure that amount of liquid.
Order customary units of capacity	◆ **Order** units of capacity relative to their volume (e.g., smallest to largest, least to most). ◆ Gather clear containers that measure one cup, one pint, one quart and one gallon. Fill each with colored water and have students arrange them in order of smallest amount to largest and then the opposite – largest amount to smallest. ◆ http://nzmaths.co.nz/volume-and-capacity-units-work (Click on "Comparing and Ordering" section)

Associate the metric unit of liter to capacity	◆ A **liter** is a metric unit of volume equal to approximately 1.056 liquid quarts. ◆ Gather various items that measure capacity (cup, pint, quart, gallon) as well as a one liter container (preferably all containers would be clear); fill up the one liter with colored water then pour, one at a time, that amount into each of the others. ◆ http://www.mathleague.com/help/metric/metric.htm ◆ http://www.mathsisfun.com/measure/metric-system-introduction.html
Compare customary units of length and volume given same number of units	◆ **Compare** is to state the similarities or differences (more, less, the same as) between customary units of length and capacity given the same number of units (e.g., compare 1 inch and 1 foot; 1 cup and 1 gallon) ◆ http://nzmaths.co.nz/volume-and-capacity-units-work (click on "Comparing and Ordering" section)
WEIGHT	
Identify *heavy* and *light* (weight) using non-standard measurement units	◆ **Identify** or recognize non-standard measurement units (**measuring** things with blocks, pencils, hands, feet, etc. as long as the items used to **measure** with are all the same) as heavy or light. ◆ Put objects in order: heavy, heavier, heaviest – light, lighter, lightest. ◆ Gather various objects (math book, paper clip, cup, pencil, shoe, piece of paper, etc.) and place in students hand one at a time and discuss heavy and light. ◆ http://www.kindergarten-lessons.com/teaching-measurement.html
Compare relationship between customary units of weight (*ounces* and *pounds, pounds* and *tons*)	◆ **Compare** is to state the similarities or differences (e.g., more, less, the same as) between customary unit of weight. ◆ The common or **customary units** for measuring **weight** in the **customary** system are ounces, pounds, and tons. ◆ http://www.quia.com/jg/65838.html ◆ http://www.onlineunitconversion.com/ (click on "Weight conversions"; choose what unit you would like to convert from/to) ◆ www.rtmsd.org/744112562095924/lib/.../measurement.ppt
Determine which customary unit of weight is appropriate to measure an item	◆ **Determine** or select the appropriate customary unit of weight to measure items or objects. ◆ The common or **customary units** for measuring **weight** in the **customary** system are ounces, pounds, and tons. ◆ Gather weights that weigh one ounce and one pound. Gather various classroom items

	(book, pencil, paper clip, chair, desk, water bottle) and have students hold the classroom item in one hand and the weight in the other, determine together which would be the **appropriate unit to measure the item**. Use a balance scale if appropriate to see the actual comparison. ◆ http://www.onlinemathlearning.com/measurement-of-weight.html
Apply estimation of weight to compare objects	◆ **Estimate** is a judgment or reasonable guess of the approximate weight of something. ◆ **Compare** is to state the similarities or differences (e.g., more, less, the same as) between customary unit of weight. ◆ Tell about how many objects it would take to balance the weight of something being measured. ◆ http://www.lessonplanspage.com/MathEstimateWeightObjectsIdeas4.htm
Identify the appropriate tool to measure customary units of length, weight, and volume	◆ **Identify** or recognize the appropriate tool (e.g. inch vs. foot, ounces or tons, cup vs. gallon) to measure length, weight, and volume using c**ustomary units**. ◆ http://www.lessonplanspage.com/MathThanksgivingChoosingProperStandardMeasurementUnitsK2.htm ◆ http://www.beaconlearningcenter.com/weblessons/measuringtools/default.htm
Recognize equivalency using customary units of measurement to solve problems	◆ **Equivalency** is a state of being essentially equal. ◆ **Recognize** or identify equivalency in customary units of measurement to solve problems. ◆ http://www.lessonplanspage.com/MathThanksgivingChoosingProperStandardMeasurementUnitsK2.htm ◆ http://www.teach-nology.com/teachers/lesson_plans/math/measurement/
TIME	
Describe time events	◆ **Describe** is to convey an idea or impression; to tell or write about; give a detailed account of; to picture in words; ◆ **Time events** are significant occurrences or happenings that occur in the past, present, or future. ◆ the system of those sequential relations that any **event** has to any other, as past, present, or future ◆ http://balancedassessment.concord.org/docs/p009.pdf (TV shows activity)
Identify tools associated with measuring time	◆ **Tools** for measuring time include: analog clock, digital clock, sundial, calendar, stopwatch, and pendulum.

Associate activities with time of day	◆ Relate **time to daily activities** or time events such as lunch, specials, reading, etc. ◆ http://classroom.jc-schools.net/basic/math-time.html
Identify time to the hour	◆ **Identify** or recognize telling time to the hour. ◆ An analog clock has two hands: long hand = minutes, short hand = hour. ◆ Label a large analog clock with the words "minutes" for the long hand and "hour" for the short hand (stretch the minute word out so it is long and make the hour word short like the hands of the clock). ◆ http://datadeb.files.wordpress.com/2010/03/02-read-time-to-the-hour.pdf ◆ http://www.kidsolr.com/earlychildhood/page4.html ◆ http://www.myschoolhouse.com/courses/O/1/12.asp ◆ http://www.helpingwithmath.com/printables/worksheets/wor0301time01.htm ◆ http://www.fi.edu/time/Journey/JustInTime/contents.html ◆ http://classroom.jc-schools.net/basic/math-time.html
Pair an activity with today, tomorrow, and yesterday	◆ **Pair** or match an activity or time event to the appropriate time reference: today, tomorrow, and yesterday. ◆ Use a calendar with today, tomorrow and yesterday highlighted. ◆ http://www.lessonsnips.com/docs/pdf/measurementtime.pdf ◆ http://library.salve.edu/ace/kit1/Lesson1.pdf
Identify perimeter	◆ **Perimeter** is the distance around the outside of a shape; the sum of the distance of all the lengths of the sides of an object; it is the length of such a boundary.
Determine perimeter of a square	◆ **Perimeter** is the distance around the outside of square; since a square has 4 sides of equal length, the formula for determining the perimeter is 4 x length of a side ◆ http://www.mathgoodies.com/lessons/vol1/perimeter.html ◆ http://www.mathleague.com/help/geometry/area.htm ◆ http://balancedassessment.concord.org/docs/e019.pdf ("Gardens of Delight") ◆ http://www.enchantedlearning.com/math/
Identify one side of a non-square rectangle as longer than another side	◆ A **non-square** is any rectangle that does not have all of its sides of equal length will be a non-square rectangle. ◆ A square is a special form of rectangle. In a rectangle, all its interior angles are right angles. If all four sides are the same length, it's a square. If not, it's a non-square rectangle. ◆ http://wiki.answers.com/Q/What_does_a_nonsquare_rectangle_look_like#ixzz1BoiRAHfM

	• http://mathforum.org/library/drmath/view/59007.html

Identify the area of geometric shapes (*square*, *rectangle*, and *triangle*)	• **Area** is the surface included within a set of lines; specifically, the number of unit squares equal in measure to the surface.
	• Measure the area of a shape by finding the total number of same-size units of area required to cover the shape without gaps or overlaps.
	• **Examples of** Area of geometric shapes formulas:
	  ◦ Area of a square = side x side
	  ◦ Area of a rectangle = length x width
	  ◦ Area of a triangle = ½ base x height
	• http://www.coolmath.com/reference/areas.html
	• http://www.microbiologybytes.com/maths/1010-9.html
	• http://www.mathleague.com/help/geometry/area.htm

Identify circumference of a circle	• **Circumference** is the line that goes round or encompasses a circular figure and the distance measured by this line. • **Identify** or recognize the circumference of a circle. • http://www.teachertube.com/viewVideo.php?video_id=38335&title=Circle_Song_2 ("Circle Song" Teacher Tube Video) • http://www.mathleague.com/help/geometry/area.htm

ACADEMIC CONTENT STANDARD

4. Algebra: Students recognize and extend patterns and use numbers and symbols to solve problems.

Concepts and Skills	Explanation

Recognize one element of a two-element repeating pattern	• An **element** is a member of a pattern.
	• A **pattern** is a set of objects, shapes, numbers or other stimuli that are repeated in a predictable way; a pattern constitutes a set of numbers or objects in which all the members are related with each other by a specific rule.
	• A **repeating pattern** is a cyclical repetition of an identifiable core. The core is the shortest string of elements that repeat. In this skill there are only two elements.
	• **Repeating patterns** can be depicted through objects, pictures, shapes or numbers; they can also be physical actions or auditory stimuli, such as clapping rhythms, musical notes, etc.
	• **Examples** of a two-element repeating pattern:
	  ◦ AB AB AB AB
	  ◦ 3& 3& 3&
	• For this skill students must recognize one of the elements as always being in the first/last position.
	• http://www.icoachmath.com/SiteMap/Pattern.html
	• http://www.k12math.com/kindergarten-math/Patterns.htm
	• http://www.learner.org/courses/teachingmath/gradesk_2/session_04/section_03_c.html (Lesson introduces repeating auditory patterns through physical actions and auditory stimuli.)
	• http://www.learner.org/courses/teachingmath/gradesk_2/session_04/section_03_c.html
	• http://illuminations.nctm.org/LessonDetail.aspx?ID=L154 (In this activity, students analyze how repeating patterns are generated.)
	• http://www.emints.org/ethemes/resources/S00000622.shtml (Various sites show different patterns with numbers and objects. Instruction in how to decipher patterns, determine what comes next in several online pattern games, and classroom activity ideas. There are links to eThemes Resources on Math: Virtual Manipulatives and Math:

	Tessellations.) ◆ http://www.linkslearning.org/Kids/1_Math/2_Illustrated_Lessons/5_Patterns/index.html (Site includes examples of patterns, distinction between patterns/non-patterns, identification of cores of patterns, identification and practice of extending patterns, recognizing the same pattern in different images, matching patterns in different objects, a glossary for patterns, and growing patterns.)
Recognize one element of a three -element repeating pattern	◆ See **Recognize one element of a two-element repeating pattern** (p. 26) ◆ Examples of a three-element repeating pattern: ABC ABC ABC or @5* @5* @5*. For this skill students must recognize one of the elements as always being in the first/middle/last position. ◆ **Examples**: ◆  ◆ A repeating pattern is a cyclical repetition of an identifiable core. The core is the shortest string of elements that repeat. For example:  This is a repeating pattern in the form ABB, since it has three elements (blue, red, red) as the core. ◆ http://illuminations.nctm.org/LessonDetail.aspx?ID=L155 (In this activity, students create and analyze repeating patterns using pattern units of three, four or five squares.) ◆ http://www.ixl.com/math/practice/grade-2-repeating-patterns (Game practice for three element repeating pattern.) ◆ http://www.shodor.org/interactivate/activities/PatternGenerator/ (Interactive site for practicing patterns.)
Recognize two elements of a four-element repeating pattern	◆ See **Recognize one element of a two-element repeating pattern** (p. 25) ◆ For this skill, students must recognize two elements of the four-element repeating pattern. ◆ **Examples** of a four-element repeating pattern: ◆ ABCD ABCD ABCD or !2#4 !2#4 !2#4 ◆ **Example**:

	 • http://standards.nctm.org/document/eexamples/chap4/4.1/index.htm (Site explores making patterns using computer-generated patterns; interactive figure illustrates how patterns look.) • http://www.shodor.org/interactivate/activities/PatternGenerator/ (Interactive site for practicing patterns.)
Differentiate two four-element repeating patterns	• See **Recognize one element of a two-element repeating pattern** (p. 26) and **Recognize two elements of a four-element repeating pattern** (p. 27). • Given two different four-element repeating patterns, students need to be able to identify the difference(s). • http://standards.nctm.org/document/eexamples/chap4/4.1/index.htm (Site explores making patterns using computer-generated patterns; interactive figure illustrates how patterns look.)
Extend three-element repeating pattern up to one place	• **Extending** a repeating pattern refers to continuing the core of the pattern at least one more character. • For this skill, students should extend the three-element pattern at least one character. • **Examples**: ◆ XYZ XYZ XYZ (answer: X) or 2B6 2B6 (answer: 2). • http://www.linkslearning.org/Kids/1_Math/2_Illustrated_Lessons/5_Patterns/index.html
Extend a four-element repeating pattern up to two places	• **Extending** a repeating pattern refers to continuing the core of the pattern up to two more characters. • For this skill, students should extend the pattern up to two characters. ◆ Examples: WXYZ WXYZ WXYZ (answer: WX) or 2G6F 2G6F (answer: 2G) • http://www.linkslearning.org/Kids/1_Math/2_Illustrated_Lessons/5_Patterns/index.html
Identify one missing element of a four-element repeating pattern	• Examples of a four-element repeating pattern: ABCD ABCD ABCD or !2#4 !2#4 !2#4. • For this skill, students must identify one missing element of the pattern. • **Example**: ◆ ABCD ABCD AB_D (answer: C) • http://standards.nctm.org/document/eexamples/chap4/4.1/index.htm (Site explores making patterns using computer-generated patterns; interactive figure illustrates how patterns look.)

Identify a four-element pattern that is growing in value by twos	• For this skill, students should be able to identify that the pattern is growing by a value of two each time.
	• **Examples** of a four-element pattern that is growing in value by twos:
	  ◦ 2 4 6 8
	  ◦ 5 7 9 11

Identify one missing element of a four-element pattern, growing in value by twos	• For this skill, students are given three of the elements and must identify the missing element. • **Example**: ◦ 22 __ 26 28 (answer: 24)

Identify one missing element of a four-element pattern, growing in value by fives	• For this skill, students are given three of the elements and must identify the missing element. Example: 25 30 __ 40 (answer: 35)
	• **Examples** of a four-element pattern that is growing in value by fives:
	  ◦ 5 10 15 20
	  ◦ 23 28 33 38.

Replace a variable with a given value in an addition sentence	• A **variable** refers to an unknown quantity and is represented by a letter of the alphabet, commonly ***X*** or ***Y***.
	• In algebra, a **variable** is used in place of a symbol such as a box used in earlier math levels to represent the unknown quantity.
	• A **constant** is a number on its own, or sometimes a letter such as a, b or c, to stand for a fixed number.
	• For this skill, students replace a letter (variable representing an unknown quantity) with a number or representation of a number (symbols, manipulatives) in a number addition sentence.
	• **Examples**:
	  ◦ **X**+ 2 = 6, **X** is the **variable**
	  ◦ 3 + **X** = 5, replace the **X** with the number 2; two lines (symbolic representation) or two objects.
	• **Example**:
	  ◦ **X** + 5 = 9, 5 and 9 are constants
	• The concept of **addition**: a mathematical operation that represents combining collections of objects together into a larger collection. It is signified by the plus sign (+).
	• An **addition sentence** is an equation that uses both an addition symbol and an equal sign;

	for example, 3 + X = 5. Alternately, number sentences can be in a reverse order such as 5 = 3 + X. ◆ The concept of equality: The equal sign represents quantitative sameness – in other words, the expression on the left side of the equal sign represents the same quantity as the expression on the right side of the equal sign. ◆ http://illuminations.nctm.org/LessonDetail.aspx?id=U147 (Relationships, equality) ◆ http://www.associatedcontent.com/article/177261/understanding_addition_and_subtraction.html ◆ http://www.information-entertainment.com/Math/Addition.html ("Understanding Addition") ◆ http://arb.nzcer.org.nz/supportmaterials/maths/concept_map_algebraic.php ◆ http://www.k12math.com/math-concepts/Equations.htm (Concepts of equality and addition)
Evaluate the perimeter using the formula (L + L + W + W)	◆ **Perimeter** is the sum of the distance of all the lengths of the sides of an object; it is the length of such a boundary. ◆ The formula **L+L+W+W** (L=length and W=width) is for the perimeter of a rectangle. ◆ http://www.emints.org/ethemes/resources/S00000278.shtml ◆ http://www.proteacher.org/c/321_Area_and_perimeter.html
Replace a variable with a given value in a subtraction sentence	◆ A **variable** refers to an unknown quantity and is represented by a letter of the alphabet, commonly ***X*** or ***Y***. ◆ See **Replace a variable with a given value in an addition sentence** (p. 32). ◆ A **value** is an assigned or calculated numerical quantity. ◆ For this skill, students replace a variable (letter) with a number or representation of a number (symbols, manipulatives) in a number subtraction sentence. ◆ **Example**: ▪ 5 - X = 3. Students replace the X with the number 2, two lines (symbolic representation) or two objects. ◆ **Subtraction** is to remove or reduce; especially to reduce a quantity or number. It is the arithmetic operation of finding the difference between two quantities or numbers. ◆ A subtraction sign (-) signals to "take away" objects from a group of objects. The vocabulary to be taught uses the word "minus" for the subtraction sign. ◆ Conceptual understanding should start with the use of manipulatives then move to semi-concrete objects such as pictures of objects and then lines (symbolic representations) and

	numbers. The use of number lines may also be beneficial. ◆ Resource: Stein, Silbert & Carnine: *Designing Effective Mathematics Instruction*.
Translate and represent a word phrase into a simple addition problem	◆ **Translate** is to move a shape, without rotating or flipping it; to slide. The shape still looks exactly the same, just in a different place. ◆ **Represent or** present, reflect, render, or reproduce a word phrase or statement into a simple addition problem. ◆ Problem solving at a basic level involves objects, pictures or drawings to illustrate the problem and its solution. ◆ On a more complex level, illustrations are replaced by using a keyword strategy, so students associate certain keywords with addition. Keywords signaling an addition problem may include: *add, altogether, finds, get more, in all, increased by, makes, perimeter, plus, sum,* and *total.* ◆ Students need to understand that keywords can be misleading, depending on how the problem is stated, so this strategy is not always reliable. They must test the problem's solution to see if it makes sense. ◆ Resource: Stein, Silbert & Carnine: *Designing Effective Mathematics Instruction*. ◆ http://math.about.com/cs/testprep/a/ps.htm (Site explains keyword strategy and offers worksheet sites.) ◆ http://illuminations.nctm.org/Lessons.aspx (See number operations strand.) ◆ http://www.purplemath.com/modules/translat2.htm (Site translates phrases into algebraic expressions.)
Translate and represent a word phrase into a simple subtraction problem	◆ See above for "**Translate and represent a word phrase into a simple addition problem**." ◆ Keywords associated with subtraction include: *breaks, buys, decreased, difference, eats, gets rid of, gives away, how many more, how much more, left, less, loses, minus, sells,* and *subtract.* ◆ http://www.purplemath.com/modules/translat2.htm (Site translates phrases into algebraic expressions.)
Solve one-step linear equations involving addition or subtraction	◆ A **linear equation** with one variable (***x***) is an equation that can be written in the form of ***x*** + a = b; a and b are real numbers and a≠0 and requires one step to solve for the quantity of ***x***. ◆ **Examples**: ◆ $x + 2 = 5$

- An equation is a mathematical statement that asserts the equality of two expressions. Equations consist of expressions that are equal on opposite sides of an equal sign.
- You will only need to perform one step in order to solve the equation. In a one-step algebra equation, combine variables and constants to make algebraic expressions. The basic operations of addition, subtraction, multiplication and division are used for combining the variables and constants.
  - Example 1: Solve for **X** in the following equation: **X** - 6 = 20
    Solution: Add 6 to both sides of the equation: **X** = 26
    Answer: **X** = 14
  - Example 2: Solve for **X** in the following equation. 3 **X** - 4 = 11
    Solution: Add 4 to both sides of the equation: **X** = 15
    Answer: **X** = 5
- For this skill, students solve an addition or subtraction number sentence that uses a variable. They figure out the solution and replace a variable with a number or representation of a number (symbols, manipulatives). The variable (solution to the problem) can be any of the number sentence elements that are missing (i.e., addend or sum, minuend, subtrahend or difference).

  Solve: **X + 5 = -17**

  Remember, the goal is to have the variable by itself on one side of the equation. In this problem, that means moving the 5 to the other side of the equation. Since the 5 is added to the variable, we move it to the other side of the equation by subtracting 5. However, if we subtract 5 from the left side of the equation, we MUST also subtract 5 from the right side.

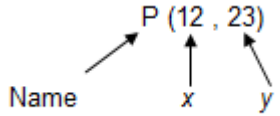
$$x + 5 = -17$$
$$\underline{-5} \quad \underline{-5}$$
$$x = -22$$

- Example of a missing sum: 3 + 5 = X. Example of missing addend: 3 + X = 8 or X + 5 = 8.
- Example of missing difference: 8 - 5 = X. Example of missing minuend: X - 5 = 3. Example of missing subtrahend: 8 - X = 3.
- A linear equation is one whose graph is a line. It is a mathematical statement that two

	expressions are equal and uses letters to represent real numbers. • http://www.beaconlearningcenter.com/Lessons/2363.htm (Lesson plan using manipulatives to solve linear equations.) • http://www.purplemath.com/modules/solvelin.htm (Explanation for solving linear equations.) • http://www.eduplace.com/math/mw/background/6/06/ (Strategies for solving linear equations.) • http://www.coolmath.com/algebra/algebra-practice-solving.html (Site provides practice problems.) • http://algebralab.org/lessons/lesson.aspx?file=Algebra_OneVariableOneStep.xml

Evaluate algebraic expressions involving sums and differences given a variable and one constant	• To **evaluate an algebraic expression** is the process of replacing the variables in an expression with the numerical values, and simplifying it is known as **evaluating an algebraic expression**.
	• An **expression** is a mathematical term, sum or difference of mathematical terms that may use numbers, variables, or both.
	• An **algebraic expression** is a number sentence; it can be made up of constants, variables and mathematical operations involving these quantities.
	• **Examples** of expressions:
	  ◦ 2
	  ◦ x
	  ◦ $3 + 7$
	  ◦ $2 \times y + 5$
	• A **variable** refers to an unknown quantity and is represented by a letter of the alphabet, commonly X or Y.
	• A **constant** refers to a known quantity, fixed value, or known number.
	• A sum is the answer to an addition problem; a difference is the answer to a subtraction problem.
	• "**Evaluate algebraic expressions**" means find the value of the expression when a number is given for the variable.
	• Example: Evaluate the algebraic expression 2 + X when X = 3 (answer: 5), or evaluate the expression 9 - Y when Y = 3 (answer: 6).

Model and evaluate an expression from a story problem	◆ **Model** and **evaluate** an expression is to use objects, pictures or symbols to represent the facts of a story problem to create a number sentence for the problem, and find the missing value. ◆ http://www.readwritethink.org/classroom-resources/lesson-plans/giant-story-problems-reading-146.html (Lesson plan for solving story problems by drawing pictures, creating number sentences and solving problems.) ◆ http://www.mathcats.com/storyproblems.html (Student-created story problems for practice.) ◆ http://www.mathplayground.com/wpdatabase/wpindex.html (Site with self-checking word problems.) ◆ http://www.cut-the-knot.org/arithmetic/WProblem.shtml (Site has word problems and shows the accompanying linear equations; interactive to allow changes to problems for additional practice.)
Evaluate an algebraic expression involving multiplication given a variable and a constant	◆ Students evaluate an expression such as 2X or 2 • X when X = 3, identifying the value as 6. The constant would be 2; the variable would be X. ◆ A more difficult expression would involve both multiplication of a variable (given a variable and constant) and adding or subtracting a constant. For example, evaluate 3X + 2 when X=2 (answer: 8).
Recognize placement of positive whole numbers on a number line	◆ The set of **positive whole numbers** are the numbers {0, 1, 2, 3,...}; the set of positive integers and zero. ◆ A **number line** is a horizontal line with equally-spaced increments; it is a line labeled with whole numbers in increasing order from left to right; smaller numbers are to the left, and larger numbers are to the right. ◆ Beginning with the first increment marked as zero, students will use objects, symbols or numbers to represent that the values increase positively by one for each increment to the right of the previous increment. ◆ http://www.webmath.com/k8numlinecomp.html
Recognize placement of positive whole numbers on a vertical scale	◆ A **vertical scale** is situated at a right angle to the horizon; upright. ◆ See **Recognize placement of positive whole numbers on a number line** above**.** ◆ Given a vertical line with equally-spaced increments, beginning with the bottom increment marked as zero, students will use objects, symbols or numbers to represent that the values increase positively by one for each increment above the previous increment.

Describe a trend (increasing or decreasing) given a graph of a linear equation	◆ A **trend** is the general direction in which something tends to move (increasing or decreasing). ◆ Given a graph of a line (representing a linear equation) on a coordinate plane, students can identify a trend as increasing if the line ascends (goes upward) as it moves from left to right. Similarly, students can identify a trend as decreasing if the line descends (goes down) as it moves from left to right. ◆ http://www.icoachmath.com/SiteMap/Trend.html
Identify the coordinates of a point (*x* and *y* values) on a graph	◆ **Coordinates of a point** are written as an "ordered pair" as shown below. The letter P is simply the name of the point and is used to distinguish it from others.  ◆ The two numbers in parentheses are the x and y coordinates of the point. The first number (x) specifies how far along the x (horizontal) axis the point is. The second is the y coordinate and specifies how far up or down the y axis to go. It is called an ordered pair because the order of the two numbers matters - the first is *always* the x (horizontal) coordinate. ◆ Given a grid or diagram of a coordinate plane, students will be able to identify the bottom horizontal line as the X axis and the left-side vertical line as the Y axis. ◆ To find the coordinates of a point, the student will be able to identify its location on the horizontal (X) axis as its "X value" and its location on the vertical (Y) axis as its "Y value". The point's coordinates are read or written as (X, Y) to correspond to the numerical value on each axis. ◆ http://www.mathexpression.com/coordinates.html ◆ http://www.mathopenref.com/coordpoint.html

ACADEMIC CONTENT STANDARD **5. Data Analysis and Probability**: Students collect and organize data and make predictions based on given situations.	
Concepts and Skills	**Explanation**
Identify opposites	◆ **Opposites** are as different as possible; completely different from; exactly the other way. ◆ Can be defined as inverse operations: subtraction is the opposite of addition (and vice versa); division is the opposite of multiplication. ◆ Students could identify that taking a block away from a pile of blocks is the opposite of adding a block to the pile. ◆ Students could identify a positive direction on a number line (moving from left to right) and that moving in the other direction (from right to left) is going in the opposite direction. ◆ Another mathematical interpretation of opposites is understanding negative numbers as the opposite of positive numbers. A positive integer and the same negative integer are both equidistant from the 0 point, but in different directions.
Identify the set which has more or less when given sets of data	◆ A **set** is a collection of distinct objects, considered as an object in its own right. ◆ **Data** is information in raw or unorganized form that refers to symbols, numbers, conditions, ideas, or objects. Data is limitless and present everywhere in the universe. ◆ Given sets of objects, pictures, symbols or numbers, students will indicate (write, say, point to, eye gaze or use assistive technology) which set has more or less between the two data sets being compared. ◆ http://www.readwritethink.org/classroom-resources/lesson-plans/exploring-sets-through-math-817.html (Lesson plan on making sets.) ◆ http://www.onlinemathlearning.com/describing-sets.html (Defines sets.)
Identify the set which has the most, least, or same given sets of data	◆ Given sets of objects, pictures, symbols or numbers, students will indicate (write, say, point to, eye gaze or use assistive technology) which set has the least, most, or same amount among the data sets being compared. ◆ http://www.nctm.org/resources/content.aspx?id=9310 - data analysis (Site links to resources and lesson plans for data analysis and probability.) ◆ http://prekinders.com/numbers-counting/ (Site suggests making sets on index cards.) ◆ http://www.instructorweb.com/lesson/dividingshapes.asp (Lesson plan has students practice identifying if sets are equal.)

Compare sets of data by identifying one similarity and one difference	• Students will compare two or more sets of data and describe one feature that is the same in both/all sets and one feature that is different. • http://www.readwritethink.org/classroom-resources/lesson-plans/introducing-venn-diagram-kindergarten-378.html (Lesson uses hula-hoops to create Venn diagram to compare balls.) • http://www.shodor.org/interactivate/activities/ShapeSorter/ (Venn diagram shape sorter.)
Identify attributes of objects	• **Attributes** are characteristics or modifiers, qualities, amounts, or features. An attribute is a fact or non-decomposable piece of information (cannot be broken down to smaller pieces) about an entity/object. • Examples of attributes are physical characteristics such as size, shape, color, thickness, texture, numerical properties, etc. • Students will identify attributes of objects, such as "the ball is round" or "the frog is green." • http://standards.nctm.org/document/chapter3/index.htm (Mathematical standards overview and links to specific strands.) • http://www.proprofs.com/quiz-school/story.php?title=Math-Attributes (Site contains a simple quiz for describing attributes of objects.)
Organize objects according to one attribute	• See above explanation of **attributes**. • Students will sort objects according to one attribute, such as size, shape, color, thickness, texture, numerical properties, etc. For example, students could find all the blue objects from a variety of colors, or all the circles from a variety of shapes. • http://www.learner.org/teacherslab/math/patterns/logic.htm (Site offers two activities, each with a different kind of logic pattern, requiring students to identify and use attributes of objects.)
Compare objects according to one attribute	• See above explanation of **attributes**. • Comparison of objects implies ranking; in mathematics, a comparison of an inequality is a statement about the relative size or order of two objects, or about whether they are the same or not. • Students will compare objects according to one attribute, such as size: "Triangle A is larger/smaller than Triangle B," "Triangle A is the same/not the same size as Triangle B" or "Jack is taller than Jill."
Compare sets of data organized by one attribute	• **Organized data** is data that has been collected, organized and represented. Common organization and representation methods are pictures, tally marks, bar graphs, pie charts, and picture graphs.

	• **Example**:
	  ◦ Given a stack of blue blocks and a stack of red blocks (organized by color), students will compare the amounts in the stacks and indicate which stack has more/less/ the same amount.
	• **Example**:
	  ◦ Given a pictograph (picture graph) of bananas eaten by a monkey on seven different days, students will compare the data and select the day on which the monkey ate the most/least/same amount of bananas.
	• **Example**:
	  ◦ Given a chart of tally marks telling in which months their classmate's birthdays occur, students compare the data sets to select the month which has the least/most/the same number of birthdays.
	• http://ethemes.missouri.edu/themes/280 (Site links to different types of graphs such as bar, line and picture graphs.)
	• http://www.beaconlearningcenter.com/weblessons/kindsofgraphs/default.htm (Definitions and examples of types of graphs.)
	• http://illuminations.nctm.org/LessonsList.aspx?grade=all&standard=5 (Site links to data analysis and probability activities.)

Make comparisons between three organized sets of data	• A **set** is a collection of distinct objects, considered as an object in its own right. • **Compare** sets using the terms and/or symbols for greater than, less than or equal. • Using three organized sets of data, students will compare data sets and answer questions such as selecting the least/most/the same number. • **Example**: ◦ Given boxes of balls organized by size into small, medium or large categories, students will compare the amounts in the boxes and indicate which box has more/less/the same amount. • http://illuminations.nctm.org/LessonDetail.aspx?id=L169 (Lesson plan for gathering data about eye color; students organize this data to answer questions.)
Organize, represent, and compare objects into two separate sets based on one attribute on a graphic representation	• See above related concepts and skills. • Students must organize raw data into two sets, use representations (such as symbols, pictures, tally marks, bar graphs, pie charts, or picture graphs), and complete a comparison between the two sets to identify least/most/the same number; or, students can make comparisons using greater than symbol (>), less than symbol (<), or equal symbol (=).

	• Example task: Given a pile of dimes, students organize them into those showing heads or those showing tails, represent the amounts in each head or tail category on a graph with tally marks or symbols, and compare the data sets to select which head or tail category has the least/most/the same number; or, student can make comparisons using greater than symbol (>,) less than symbol (<), or equal symbol (=). • http://illuminations.nctm.org/LessonDetail.aspx?id=U82 (Site has students participate in activities in which they analyze information represented graphically. In this unit, students collect data and display it with tally marks, pictographs, bar graphs, and glyphs.)
Organize, represent, and compare objects into three separate sets based on one attribute on a graphic representation	• See above related concepts. • Students must organize raw data into three sets using graphic representations (such as bar graphs, line graphs, pie charts, or picture graphs) and complete a comparison between the three sets to identify least/most/the same number; or, student can make comparisons using greater than symbol (>), less than symbol (<), or equal symbol (=). • **Example**: ◆ Given a pile of spoons, forks and knives, students organize them into separate trays, record the amounts in each tray on a bar graph using numbers, tally marks or symbols, and compare the data sets to select which tray has the least/most/the same number; or, student can make comparisons using greater than symbol (>), less than symbol (<), or equal symbol (=). • http://illuminations.nctm.org/LessonDetail.aspx?id=U186 (Links to sites for students to collect data using objects, pictures, and symbols. They organize data by sorting and classifying in different ways. Students display data using multiple representations.) • http://nlvm.usu.edu/en/nav/topic_t_5.html (Students can use virtual manipulative site to make bar graphs or pie charts.)
Identify the mode for a data set	• The **mode** is the value that occurs most often in a set of data. If no number is repeated, then there is no mode for the data set. There can be more than one mode. • http://mathforum.org/library/drmath/sets/select/dm_mean_median.html (Discussions on mean, median, mode, and range.) • http://www.edhelper.com/statistics.htm (Explains mean, median, mode.) • http://www.proteacher.org/c/336_Mean_Median_and_Mode.html (Various lesson plan ideas for teaching median and mode.) • http://gwydir.demon.co.uk/jo/numbers/pictogram/box.htm

Identify the mode for an unordered set	• An **unordered set** is just a list of numbers; order doesn't matter, so either a number is inside a set, or it isn't.
	• See **mode** above.
	• **Example**:
	  ◦ {1,2,3,4,5} is the set of natural counting numbers from 1 to 5.
	  ◦ Mathematically, it wouldn't have made any different it the set was written {3,1,5,2,4} ; instead, since this is still the same set of numbers, regardless of the order in which they are written.
	• Each number in a set is called an element. If a number is presenting a set, that number is an element of the set.
	• Organize the raw data to determine which value occurs most often, then the value that occurs most must be identified as the mode.
	• http://www.mathsisfun.com/mode.html
	• http://www.mathgoodies.com/lessons/vol8/mode.html
	(Sites give practice in organizing data and finding the mode.)

Identify the median of an ordered set	• The **median** is the middle value in a list of numbers. To find the median, the numbers have to be listed in numerical order, so the list may have to be rewritten from least to greatest or greatest to least. For this skill the students are provided a list of numbers already ordered by value. • If there are an odd number of values listed in the data set, the median is simply the value that occurs in the middle of the list. If there is an even number of values in the list, the median is the halfway point (average) between the two middle numbers. • http://www.proteacher.org/c/336_Mean_Median_and_Mode.html (Various lesson plan ideas for teaching median and mode.) • http://www.teachervision.fen.com/statistics/lesson-plan/4912.html (Lesson plan on mean, median and mode.) • http://gwydir.demon.co.uk/jo/numbers/pictogram/box.htm
Identify the median of an unordered set	• See **median** and **unordered** set above. • Students must first organize the raw data in order from least to greatest. The median is the middle value (midpoint) in a list of numbers. • If there are an odd number of values listed in the data set, the median is simply the value that occurs in the middle of the list. If there is an even number of values in the list, the median is the halfway point (average) between the two middle numbers.

	◆ http://www.ehow.com/how_2046805_find-median.html ◆ http://www.mathsisfun.com/median.html (How to find the median.)
Identify the minimum/maximum of an ordered set	◆ The **minimum** of an ordered set is the lowest value in the set, and the **maximum** is the greatest value. ◆ http://www.proteacher.org/c/336_Mean_Median_and_Mode.html (Lesson plans teaching media, mode, range, etc.) ◆ http://www.educationworld.com/a_tsl/archives/05-1/lesson028.shtml (Lesson plan with game to teach median, mode, and range.)
Identify the minimum/maximum of an unordered set	◆ The **minimum** is the smallest number and the **maximum** is the largest number. ◆ See **unordered set**, (p. 43). ◆ Students must first organize the raw data in order from least to greatest, and then identify the minimum (least) and maximum (greatest) value in the set.
Identify sets of data on a bar graph	◆ Given a bar graph, students must identify the label/category (word, picture or symbolic representation) that goes with each horizontal or vertical bar. Students must also indicate the value represented by each bar on the graph. ◆ http://illuminations.nctm.org/LessonDetail.aspx?id=L42 (Lesson on comparing columns on a bar graph.) ◆ http://nlvm.usu.edu/en/nav/topic_t_5.html (Students can make an on-line bar graph.)
Perform simple probability activities using a spinner with equally divided parts	◆ **Probabilit**y is the measure of how likely an event is. ◆ A simple probability activity could use a spinner divided into two equal parts that are labeled differently (different colors, symbols or letters). Students would spin for a certain number of turns, and observe that the spinner lands in one of the two places each time. The activity could then be repeated with spinners divided into more than two parts and observations made. ◆ Equally divided spinner:  ◆ http://www.mathgoodies.com/lessons/vol6/intro_probability.html ◆ http://www.shodor.org/interactivate/activities/BasicSpinner/ (Interactive site using an equally divided spinner (number of sections can be varied.))

	◆ http://nlvm.usu.edu/en/nav/topic_t_5.html (Virtual manipulative site has interactive spinner.)
Record results of simple probability activities using an equally divided spinner	◆ A simple probability activity could use a spinner divided into two equal parts that are labeled differently (different colors, symbols or letters). Students would spin for a certain number of turns, and **record** their observations using tally marks for each of the choices. ◆ http://nlvm.usu.edu/en/nav/topic_t_5.html (Virtual manipulative site has interactive spinner and place to record results.) ◆ http://classroom.jc-schools.net/basic/math-prob.html
Record results of simple probability activities using other probability tools (i.e., coins, number cubes)	◆ A simple probability activity could be tossing a coin (two choices) or a number cube labeled with 6 different numbers (six choices) and recording the results with tally marks of what outcome occurs each time. ◆ Another simple probability test would be to pull a colored marble from a bag with two or more colors of marbles inside, again, recording results. ◆ http://www.mathgoodies.com/lessons/vol6/intro_probability.html (Site gives simple definitions and activities related to probability.) ◆ http://www.shodor.org/interactivate/activities/ (Site has interactive probability exercises (including a coin toss) and results are recorded in list or table forms.)
Predict results of probability activities using a spinner with equally divided parts	◆ Using a spinner with equally divided parts, students can guess the outcome before the spinner is spun. The spinner should then be spun and the results recorded and compared to the prediction. This needs to be repeated multiple times. ◆ Resource: Van de Walle, John (2001). Elementary and Middle School Mathematics.
Predict results of probability activities using other probability tools (i.e., coins, number cubes)	◆ Using coins or number cubes, students can guess the outcome before the coin/cube is tossed. After the toss, the results are recorded and compared to the prediction. This needs to be repeated multiple times. ◆ Resource: Van de Walle, John (2001). Elementary and Middle School Mathematics. ◆ http://www.shodor.org/interactivate/activities/ (Site has interactive probability exercises (including a coin toss) and results are recorded in list or table forms.)
Recognize the likelihood of events	◆ **Likelihood of events** is identifying if a given event will occur; describe probability as likely, unlikely, impossible, or certain ◆ Based on experience and participating multiple times in many probability trials. As experience grows, the confidence level in predicting an outcome increases because of prior experience gained from previous trials. Van de Walle, 2001.

	◆ http://www.stepspd.com/us/resources/firststepsmath.asp - First Steps in Mathematics: Chance and Data (See the sample chapters on chance, data for discussion and lesson on likelihood of events.) ◆ http://wiki.answers.com/Q/What_are_equally_likely_events_in_probability (Answers question "what are equally likely events in probability?") ◆ http://www.icoachmath.com/(S(z5gjye4523xuiy55bhfd4k55))/solvedexample/Possible-and-Impossible-Events_Probability_cstlqvXKXAXMJEHXMDGK.html ◆ http://cnx.org/content/m21844/latest/
Identify events that are impossible and certain	◆ Ask students to judge various events as certain and impossible, such as "The sun will rise in the morning" and "I can be in Salt Lake City and New York City at the same time" or "Trees will talk to us in the afternoon." ◆ Resource: Van de Walle, John (2001). Elementary and Middle School Mathematics. ◆ http://www.studyzone.org/testprep/math4/d/certainl.cfm (Certain and impossible events explained, uses illustrations.) ◆ http://www.mathgoodies.com/lessons/vol6/certain_impossible.html (Certain and impossible events explained.) ◆ http://www.firstschoolyears.com/numeracy/data/data.html (Site has PDF of certain, possible and impossible events.) ◆ http://www.tutorvista.com/answers/help-on-event-is-impossible-unlikely-likely-or-certain/210616
Identify one possible and one impossible outcome	◆ Given a number cube with the letters A, B, C, D, E, and F (one letter to a face of the cube), student will identify, as a possible outcome, that one of these letters will come up if it is tossed. An impossible outcome would be for the number 10 to come up. ◆ http://www.mathgoodies.com/lessons/vol6/intro_probability.html (Definitions and explanations of probability terms.)
Communicate reasoning to identify a presented event as likely or unlikely	◆ Given a scenario, students will identify if a presented event is likely or unlikely to happen, and reasons for identifying the likelihood of that event. ◆ Best practice would be to present scenarios that are pertinent and relevant to students' lives. ◆ Example task: "If you poke your finger hard with a sharp needle, is it likely or unlikely that your finger will bleed? How do you know?" Student will identify the event as likely because of prior experiences and observations; it has happened to him/her before (or he/she has observed it happen to others.)

	◆ file://localhost/Resource/ http/::standards.nctm.org:document:chapter3:data.htm (Standards require students to understand and apply basic concepts of probability.)

Terms and Definitions to Know:

Terms	Definitions
Analog clock	displays time with an hour hand, minute hand and second hand in a continuous motion
Approximation	a number value close to the actual number
Area	the amount of square units inside a figure
Array	a rectangular arrangement of objects in equal rows or columns
Capacity	the internal volume of an object or container; volume (cups, pints, quarts, gallons)
Circumference	the distance around a circle
Compare	to tell how things are similar or different (to tell how the value of a number is related
Congruent	having the same size AND same shape
Coordinate system	a method of locating points in the plane or in space by means of numbers. A point in the plane is located by its distances from both horizontal and vertical lines called the axes. The horizontal line is called the x-axis. The vertical line is called the y-axis. The pairs of numbers are called ordered pairs. The first number, called the x-coordinate, designates the distance along the horizontal axis. The second number, called the y-coordinate, designates the distance along the vertical axis. The point at which the two axes intersect has the coordinates (0,0) and is called the origin.
Coordinate plane	a plane containing two perpendicular axes (x and y) intersecting at a point (origin)
Count	use one-to-one correspondence to find the total number of objects
Cube	a polyhedron with six square faces

Cylinder	a three dimensional shape having a curved surface and parallel circular or elliptical bases that are the same size
Demonstrate	show by choosing and telling
Determine	decide to find out
Digit	symbol used to show a number. Digits are from 0 to 9.
Digital Clock	displays numbers only to tell hour and minutes (8:15)
Equivalent	having the same value
Estimate	give an approximate value
Find	make a selection or indicate the answer (write, verbalize, point to, eye gaze, or other means of communication)
Fraction	when something (group, set, number) is divided into equal parts, each part is called a fraction. Can be expressed as one number written above another (x/y).
Fraction models	objects that can be divided into equal parts (cookie, paper strips, etc.)
Graphic organizer	visual representations of knowledge, concepts or ideas; organizing information to make it easier to understand how ideas connect; Organizers create a connection between different ideas
Grid system	a rectangular array of squares or rectangles of equal size, such as in a crossword puzzle; A network of horizontal and vertical lines that intersect to form squares or rectangles.
Identify	recognize; point to and say the name of
Integers	the name for the set of positive and negative numbers, together with zero
Intersecting lines	lines that cross or meet
Length	a measure of how long something is (inch, foot, yard, mile)

Line	a straight path extending in both directions with no endpoints
Line of symmetry	SEE SYMMETRY
Manipulative	materials that allow students to explore mathematical concepts in a concrete mode
Mean	the sum of the set of numbers divided by n, the number of numbers in the set.
Measuring tools	ruler, yard stick, scale, measuring cups, measuring spoons, etc.
Median	the number that lies in the middle when a set of numbers is arranged in order. If there are two middle values, the median is the mean of these values.
Mode	the number(s) that occurs most often in a set of numbers (e.g. in the set 1,2,3,3,5,8; the mode is 3)
Non-standard units	unit of measurement expressed in terms of objects such as paper clips, sticks of gum, shoes, etc.
Number line	a line marked with numbers to show placement of numbers
Numerals	a symbol that is used to represent a number (1, 26, 114)
Numerical value	what a number is worth
Order	to arrange according to a rule (such as smallest to largest)
Parallel lines	lines that do not intersect and are always the same distance apart
Perimeter	the distance around the outside of a figure
Perpendicular	two lines or line segments that intersect at right angles; always the same distance apart

Plane figures	figures that are 2 dimensional; they have length and width but no thickness
Polygon	a union of segments connected end to end, such that each segment intersects exactly two others at its endpoints (e.g. square, triangle, octagon, hexagon, etc.)
Positive whole numbers	whole numbers: a counting number from zero to infinity that is greater than zero
Recognize	to know and remember
Rectangle	a parallelogram whose angles are all right angles
Round	the process of approximating a number by reducing the number of significant digits
Sequence	to arrange or place in ascending or descending order
Similarities	having the same shape but not the same size
Slide	a motion in which every point of a figure moves the same distance and in the same direction. Sliding a figure from one position to another without turning or flipping the figure.
Solid geometric figures	objects that are three dimensional with thickness as well as length and width
Solve	to find a solution for; to work out a problem to find the answer
Sort	to group according to a characteristic that all objects have in common
Sphere	a three dimensional shape whose curved surface is, at all points, a given distance from its center point. A sphere is hollow; it does not include the points in its interior.
Square	a rectangle whose sides are all the same length
Sum	the total or whole amount, the result of adding
Symbols	a character that is used to indicates a mathematical relation or operation (e.g., > means greater than, < means less

	than, = means equal to)
Symmetry	a line of symmetry separates a figure into two congruent halves, each of which is a reflection of the other
Temperature	the degree of hotness or coldness measured on a definite scale
Transformation	an operation on a geometric figure by which each point gives rise to a unique image; a change in position or size
Triangle	a three sided polygon
Two digit number	a numeral containing a digit in the ones place and a digit in the tens place
Two dimensional figure	circle, square, triangle, rectangle
Unit fraction	a fraction whose numerator (top number) is one – e.g ½, ¼, etc.
Value	numerical worth or amount
Variable	a quantity that can change or vary, taking on different values – a letter or symbol representing a varying quantity, for example *n* in *10 + n*
Visual representation	pictures, diagrams, drawings, sketches
Volume	capacity; the maximum amount that can be contained
Weight	a measure of how heavy something is (ounces, pounds, tons)
Whole Number	a counting number from zero to infinity

RESOURCES

#1 – Mathematics A Good Beginning, Strategies for Teaching Children by Andria P. Troutman and Betty K. Lichtenberg

#2 – Teaching Math to People with Down Syndrome and other Hands-On Learners by Deanna Horstmeier, PhD

#3 – Teaching Language Arts, Math and Science to Students with Significant Cognitive Disabilities by Diane Browder and Fred Spooner

#4 – Elementary and Middle School Mathematics – Teaching Developmentally by John A. Van De Walle www.ablongman.com/vandewalle5e

Math Websites

Apples 4 the Teacher (http://www.apples4theteacher.com/)

BA - Balanced Assessment in Mathematics

Cool Math (www.coolmath.com)

Cyberchase . Games Central PBS Kids

Data Deb files (http://datadeb.wordpress.com/)

Do2Learn

Educational Math Activities for Kids

Educator's Reference Desk (http://www.eduref.org/)

Figure This! Math Challenges for Families - Challenge Index

Fun Mathematics Lessons by Cynthia Lanius

FunBrain.com - The Internet's #1 Education Site for K-8 Kids and Teachers

Gallon Guy directions (http://www.learningresources.com/text/pdf/1209INS.pdf) , (http://www.theteacherwebsite.com/mrgallonmanproject-tools.pdf)

Helping with math (http://www.helpingwithmath.com/by_subject/geometry/geo_shapes.htm)

Illuminations (http://illuminations.nctm.org/) a great resource within the NCTM site

Computer practice for pre-k – grade 8 http://www.ixl.com/

Kaboose-Funschool.com (http://funschool.kaboose.com/)

K-2 Number and Operation-lessons

KidPort (http://www.kidport.com/)

Kids Online Resources (http://www.kidsolr.com/)

Learning Planet (http://www.learningplanet.com/)

Lesson Snips (http://www.lessonsnips.com/) click on mathematics on the left and then explore away!

Math is Fun http://www.mathsisfun.com/definitions/value.html

Math Glossary: www.amathsdictionaryforkids.com

Math Playground (http://www.mathplayground.com/)

Math Words (and other words of interest) (http://www.pballew.net/etyindex.html) This is kind of like a math dictionary – very wordy but informational.

My Schoolhouse (http://www.myschoolhouse.com/)

National Council of Teacher of Mathematics (http://www.nctm.org/)

National Library of Virtual Manipulatives (http://nlvm.usu.edu/en/nav/vlibrary.html) awesome

New Zealand maths (http://nzmaths.co.nz/) Click on a 'topic' at the top and it will take you to specific learning outcomes along with various activities.

Oswego City School District (http://www.studyzone.org/) Click on Elementary Test Prep, click on math and explore

Practical Money Skills for Life has sped lessons

Teacher Tube (www.teachertube.com) similar to You Tube but educational topics, may be blocked through some school districts

University of North Carolina-Chapel Hill (http://www.learnnc.org/) K-12 teaching and learning resource website

Visual Fractions An On-Line Fraction Tutorial

Poems and Songs to Teach the Values of Coins

Penny, penny
Easily spent.
Copper brown
And worth one cent.

Nickel, nickel
Thick and fat.
You're worth five cents,
I know that.

Dime, dime
Little and thin.
I remember
You're worth ten.

Quarter, quarter
Big and bold.
You're worth 25,
I am told.

The Nickel Song (to the tune of "Bingo")
There was a girl who had a bank
And filled it full of nickels
1, 2, 3, 4, 5 … 1, 2, 3, 4, 5
1, 2, 3, 4, 5
There's 5 cents in a nickel.

The Quarter Song (to the tune of "The Farmer in the Dell")
A quarter's 25
A quarter's 25
Hi, ho, the derry-o
A quarter's 25.

The Dime Song (to the tune of "My Darling Clementine")
One, two, three, four
Five, six, sev-en
Eight, nine, ten cents in a dime.
One, two, three, four
Five, six, sev-en
Eight, nine, ten cents in a dime.