SOUTH CAROLINA SUPPORT SYSTEMS INSTRUCTIONAL GUIDE

Content Area	**3rd Grade Math**
Recommended Days of Instruction	**Third Nine Weeks**

Standard 3-5: The student will demonstrate through the mathematical process an understanding of length, time, weight, and liquid volume measurements; the relationships between systems of measure; accurate, efficient, and generalizable methods of determining the perimeters of polygons; and the values and combinations of coins required to make change.

3-5.2 Use appropriate tools to measure objects to the nearest unit: measuring length in meters and half inches; measuring liquid volume in fluid ounces, pints, and liters; and measuring mass in grams. (C3)
3-5.3 Recognize the relationship between meters and yards, kilometers and miles, liters and quarts, and kilograms and pounds. (A1)
3-5.4 Use common referents to make comparisons and estimates associated with length, liquid volume, and mass and weight: meters compared to yards, kilometers to miles, liters to quarts, and kilograms to pounds. (B3)
3-5.7 Recall equivalencies associated with time and length: 60 seconds = 1 minute and 36 inches = 1 yard. (A1)

Standard 3-2: The student will demonstrate through the mathematical processes an understanding of the representation of whole numbers and fractional parts; the addition and subtraction of whole numbers; accurate, efficient, and generalizable methods of multiplying whole numbers; and the relationships among multiplication, division, and related basic facts.
3-2.5 Understand fractions as parts of a whole. (B2)
3-2.6 Represent fractions that are greater than or equal to 1. (B2)
Standard 3-4: The student will demonstrate through the mathematical processes an understanding of the connection between the identification of basic attributes and the classification of two-dimensional shapes.
3-4.1 Identify the specific attributes of circles: center, radius, circumference, and diameter. (A1)
3-4.2 Classify polygons as either triangles, quadrilaterals, pentagons, hexagons, or octagons according to the number of their sides. (A2)
3-4.5 Classify triangles by the length of their sides as either scalene, isosceles, or equilateral according and by the sizes of

their angles as either acute, obtuse, or right. (A2)
3-4.3 Classify lines and line segments as either parallel, perpendicular, or intersecting. (A2)
3-4.4 Classify angles as either right, acute, or obtuse. (A2)
3-4.6 Exemplify points, lines, line segments, rays, and angles. (B2)
3-4.7 Analyze the results of combining and subdividing circles, triangles, quadrilaterals, pentagons, hexagons, and octagons. (B4)

* These indicators are covered in the following 4 Modules for this Nine Weeks Period.
Teaching time should be adjusted to allow for sufficient learning experiences in each of the modules.

Module 3-1 Measurement

Indicator	Recommended Resources	Suggested Instructional Strategies	Assessment Guidelines

Module 3-1 Lesson A 3-5.2 Use appropriate tools to measure objects to the nearest unit: measuring length in meters and half inches; measuring liquid volume in fluid ounces, pints, and liters; and measuring mass in grams. (C3) 3-5.3 Recognize the relationship between meters and yards, kilometers and miles, liters and quarts, and kilograms and pounds. (A1) 3-5.4 Use common referents to make comparisons and estimates associated with length, liquid volume, and mass and weight: meters compared to yards, kilometers to miles, liters to quarts, and kilograms to pounds.(B3)	**STANDARD SUPPORT DOCUMENT** http//:www.ed.sc.gov/apps/cso/standards NCTM's Online Illuminations http://illuminations.nctm.org NCTM's Navigations Series Teaching Student-Centered Mathematics Grades K-3 and Teaching Elementary and Middle School Mathematics Developmentally 6th Edition, John Van de Walle NCTM's Principals and Standards for School Mathematics (PSSM)	See Instructional Planning Guide Module 3-1 Introductory Lesson A See Instructional Planning Guide Module 3-1, Lesson A Additional Instructional Strategies	See Instructional Planning Guide Module 3-1 Lesson A Assessing the Lesson

Module 3-2 Fractions			
Indicator	**Recommended Resources**	**Suggested Instructional Strategies**	**Assessment Guidelines**
Module 3-2 Lesson A 3-2.5 Understand fractions as parts of a whole. (B2) 3-2.6 Represent fractions that are greater than or equal to 1. (B2)	**STANDARD SUPPORT DOCUMENT** http//:www.ed.sc.gov/apps/cso/standards NCTM's Online Illuminations http://illuminations.nctm.org NCTM's Navigations Series Teaching Student-Centered Mathematics Grades K-3 and Teaching Elementary and Middle School Mathematics Developmentally 6th Edition, John Van de Walle NCTM's Principals and Standards for School Mathematics (PSSM)	See Instructional Planning Guide Module 3-2 Introductory Lesson A	See Instructional Planning Guide Module 3-2 Lesson A Assessing the Lesson

Module 3-3 Geometry - I			
Indicator	**Recommended Resources**	**Suggested Instructional Strategies**	**Assessment Guidelines**
Module 3-3 Lesson A 3-4.6 Exemplify points, lines, line segments, rays, and angles. (B2)	**STANDARD SUPPORT DOCUMENT** http//:www.ed.sc.gov/apps/cso/standards NCTM's Online Illuminations http://illuminations.nctm.org NCTM's Navigations Series Teaching Student-Centered Mathematics Grades K-3 and Teaching Elementary and Middle School Mathematics Developmentally 6th Edition, John Van de Walle NCTM's Principals and Standards for School Mathematics (PSSM)	See Instructional Planning Guide Module 3-3 Introductory Lesson A	See Instructional Planning Guide Module 3-3 Lesson A Assessing the Lesson
Module 3-3 Lesson B 3-4.4 Classify angles as either right, acute, or obtuse. (A2)		See Instructional Planning Guide Module 3-3 Introductory Lesson B	See Instructional Planning Guide Module 3-3 Lesson B Assessing the Lesson

Module 3-3 Lesson C 3-4.3 Classify lines and line segments as either parallel, perpendicular, or intersecting. (A2)		See Instructional Planning Guide Module 3-3 Introductory Lesson C See Instructional Planning Guide Module 3-3, Lesson C Additional Instructional Strategies	See Instructional Planning Guide Module 3-3 Lesson C Assessing the Lesson
Module 3-3 Lesson D 3-4.7 Analyze the results of combining and subdividing circles, triangles, quadrilaterals, pentagons, hexagons, and octagons. (B4)		See Instructional Planning Guide Module 3-3 Introductory Lesson D See Instructional Planning Guide Module 3-3, Lesson D Additional Instructional Strategies	See Instructional Planning Guide Module 3-3 Lesson D Assessing the Lesson
Module 3-4 Geometry - II			
Indicator	**Recommended Resources**	**Suggested Instructional Strategies**	**Assessment Guidelines**

Module 3-4 Lesson A 3-4.1 Identify the specific attributes of circles: center, radius, circumference, and diameter. (A1)	**STANDARD SUPPORT DOCUMENT** http//:www.ed.sc.gov/apps/cso/standards NCTM's Online Illuminations http://illuminations.nctm.org NCTM's Navigations Series Teaching Student-Centered Mathematics Grades K-3 and Teaching Elementary and Middle School Mathematics Developmentally 6th Edition, John Van de Walle NCTM's Principals and Standards for School Mathematics (PSSM)	See Instructional Planning Guide Module 3-4 Introductory Lesson A	See Instructional Planning Guide Module 3-4 Lesson A Assessing the Lesson
Module 3-4 Lesson B 3-4.2 Classify polygons as either triangles, quadrilaterals, pentagons, hexagons, or octagons according to the number of their sides. (A2)		See Instructional Planning Guide Module 3-4 Introductory Lesson B	See Instructional Planning Guide Module 3-4 Lesson B Assessing the Lesson

Module 3-4 Lesson C 3-4.5 Classify triangles by the length of their sides as either scalene, isosceles, or equilateral according and by the sizes of their angles as either acute, obtuse, or right. (A2)		See Instructional Planning Guide Module 3-4 Introductory Lesson C See Instructional Planning Guide Module 3-4, Lesson C Additional Instructional Strategies	See Instructional Planning Guide Module 3-4 Lesson C Assessing the Lesson

MODULE

3-1

Measurement

This module addresses the following indicators:

3-5.2 Use appropriate tools to measure objects to the nearest unit: measuring length in meters and half inches; measuring liquid volume in fluid ounces, pints, and liters; and measuring mass in grams. (C3)
3-5.3 Recognize the relationship between meters and yards, kilometers and miles, liters and quarts, and kilograms and pounds. (A1)
3-5.4 Use common referents to make comparisons and estimates associated with length, liquid volume, and mass and weight: meters compared to yards, kilometers to miles, liters to quarts, and kilograms to pounds. (B3)
3-5.7 Recall equivalencies associated with time and length: 60 seconds = 1 minute and 36 inches = 1 yard

This module contains 1 lesson. This lesson is **INTRODUCTORY ONLY.** Lessons in S^3 begin to build the conceptual foundation students need. **ADDITONAL LESSONS will be required** to fully develop the concepts.

I. Planning the Module

Continuum of Knowledge

3-5.2
In second grade, students use appropriate tools to measure objects to the nearest whole unit: measuring length in centimeters, feet, and yards; measuring liquid volume in cups, quarts, and gallons; measuring weight in ounces and pounds; and measuring temperature on Celsius and Fahrenheit thermometers (2-5.3). They also generate common measurement referents for feet, yards, and centimeters (2-5.4) and use common measurement referent to make estimates in feet, yards and centimeters (2-5.5).

In third grade, students use appropriate tools to measure objects to the nearest unit: measuring length in meters and half inches, measuring liquid volume in fluid ounces, pints and liters; and measuring mass in grams (3-5.2).

In fourth grade, students use appropriate tools to measure objects to the nearest unit; measuring length in quarter inches, centimeters and millimeters; measuring liquid volume in cups, quarts and liters; and measuring weight and mass in pounds, milligrams and kilograms (4-5.1). They also use equivalencies to convert units to measure within the US Customary System (4-5.3).

3-5.3
In third grade, students recognize the relationship between meters and yards, kilometers and miles, liters and quarts and kilograms and pounds.

3-5.4
In third grade, students use common referents to make comparisons and estimates associated with length, liquid volume, and mass and weight: meters compared to yards, kilometers to miles, liters to quarts and kilograms to pounds.

3-5.7
In second grade, students used analog and digital clocks to tell and record time to the nearest quarter hour and to the nearest five-minute interval (2-5.7). They also matched a.m. and p.m. to familiar situations (2-5.8) and recall equivalencies associated with length and time (2-5.9).

In third grade, students recall equivalencies associated with time and length: 60 seconds = 1 minute and 36 inches = 1 yard (3-5.7) and use analog and digital clocks to tell time to the nearest minute (3-5.6).

In fourth grade, students apply strategies and procedures to determine the amount of elapsed time in hours and minutes within a 12-hour period, either a.m. or p.m. (4-5.6)

Key Concepts/Key Terms

** These are vocabulary terms that are reasonable for students to know and be able to use. Terms without the * are additional terms for teacher awareness, knowledge and use in conversation with students.*

- *Meters
- *inches
- *volume
- *fluid ounces
- *pints
- *liters
- *mass
- *grams
- *yards
- *kilometers
- *miles
- *quarts
- *kilograms
- *pounds
- *Equivalent
- *Common referent
- *Estimate
- *seconds
- *minute

II. Teaching the Lesson(s)

1. Teaching Lesson A-Measure This!

Teacher Notes:
In third grade students should select and use the appropriate tool to measure length to the nearest meter and half inch; to measure liquid volume in fluid ounces, pints, and liters; and to measure mass in grams. In addition to measuring to the units just specified, third grade students should recognize that a meter is slightly more than a yard, that a kilometer is about one-half as much again as a mile, that a liter is slightly more than a quart and that a kilogram is slightly more than two pounds. It is not necessary that third grade students know the exact equivalencies. Rather it is more important

that they understand the relationship between the specified measurements. This should be accomplished through experiences not through memorization of facts.

3-5.2
For this indicator, it is **essential** for students to:
- Understand which unit of measure is most appropriate for length, volume and mass
- Locate the nearest unit
- Use other words synonymous with nearest such as "closest to"
- Understand that their measurement is an approximation in some cases
- Understand half inches
- Use appropriate abbreviations for measurements (meters is m, pounds is lb, etc..)
- Measure using actual tools
- Read a measurement from a pictorial representation

For this indicator, it is **not essential** for students to:
None noted

3-5.3
For this indicator, it is **essential** for students to:
- Understand which unit of measure is most appropriate for length, volume and mass
- Locate the nearest unit
- Use other words synonymous with nearest such as "closest to"
- Understand that their measurement is an approximation in some cases
- Understand half inches
- Use appropriate abbreviations for measurements (meters is m, pounds is lb, etc..)
- Measure using actual tools
- Read a measurement from a pictorial representation

For this indicator, it is **not essential** for students to:
None noted

3-5.4
For this indicator, it is **essential** for students to:
- Understand standard and nonstandard measurements
- Understand length, liquid volume, mass and weight
- Recognize standard units such as meters, liters, pounds, etc…
- Generate a common referent

- Understand that their referent is an estimate
- Compare their referent to the actual measurement
- Develop strategies for making comparisons such as when measuring weights of object, students can hold one object in each hand, extend their arms and feel the relative downward pull of each.

For this indicator, it is **not essential** for students to:
None noted

3-5.7
For this indicator, it is **essential** for students to:
- Recall 60 seconds = 1 minute and 36 inches = 1 yard

For this indicator, it is **not essential** for students to:
- Perform unit conversions to prove these equivalencies

a. Indicators with Taxonomy

3-5.2 Use appropriate tools to measure objects to the nearest unit: measuring length in meters and half inches; measuring liquid volume in fluid ounces, pints, and liters; and measuring mass in grams. (C3)

Cognitive Process Dimension: Apply
Knowledge Dimension: Procedural Knowledge

3-5.3 Recognize the relationship between meters and yards, kilometers and miles, liters and quarts, and kilograms and pounds. (A1)

Cognitive Process Dimension: Remember
Knowledge Dimension: Factual Knowledge

3-5.4 Use common referents to make comparisons and estimates associated with length, liquid volume, and mass and weight: meters compared to yards, kilometers to miles, liters to quarts, and kilograms to pounds. (B3)

Cognitive Process Dimension: Apply
Knowledge Dimension: Understand Knowledge

3-5.7 *Recall equivalencies associated with time and length: 60 seconds = 1 minute and 36 inches = 1 yard (A1)*

Cognitive Dimension: Remember
Knowledge Dimension: Factual

b. Introductory Lesson

This lesson was prepared by Donna Coe for NCTM Illuminations http://illuminations.nctm.org/LessonDetail.aspx?id=L635

How Long? How Wide? How Tall? How Deep?

In this lesson, students use historical nonstandard units (digits, hand, cubit, yard, foot, pace, fathom) to estimate the lengths of common objects and then measure using modern standard units. They will discover the usefulness of standardized measurement units and tools.

Many students have not had enough experiences with nonstandard units and therefore have an incomplete understanding of measurement. This lesson provides more of these experiences as well as a bridge into familiar standard units of measuring length. Interested teachers could also connect this lesson to information about measurement in many ancient cultures.

Learning Objectives:
Students will:
become familiar with the language/vocabulary of measurement gain an understanding of measuring length by estimating, making comparisons, handling materials to be measured, and measuring with tools understand that all measurements are approximations understand the need for measuring with standard units

Materials:
Suggested Literature Connection:
How Big Is a Foot? by Rolf Myller
This amusing story tells of a king who wants to have a bed made just the right size for his queen. He measures her width and length with his king-size feet. The job of building the bed falls to a little apprentice who carefully uses the king's dimensions, but uses his little feet as the unit. Students enjoy explaining why the bed turns out to be too small for the queen and posing solutions to the dilemma.

String, ribbon, adding machine tape, interlocking cubes
Tools for measuring length
(rulers, yardsticks, retractable and folding measuring tapes, trundle wheels)
Construction paper
Body Parts Activity Sheet

Instructional Plan

Have each student trace around his or her shoe on construction paper and cut out about six of these paper feet. Tape them heel to toe. Let the students use this new "six-foot" measure to find and record the length of common objects around the room.
After about ten minutes, lead the class in a discussion, comparing their measurements. Chart the data to use as a visual reference. Ask questions that help students compare their findings, for example:
Who measured the height of the desk? What did you find?
Who found a different measurement for the height of the desk?
Why do you think it was different from _____'s?
Is the desk really taller for _____ than for _____?

Show the students a variety of rulers (wooden, plastic, metal). Ask, does anyone have an idea about why we use rulers instead of paper feet taped together? Enjoy the idea-sharing! Note levels of thinking, reasoning, and creativity.

Then, explain that inches began in medieval England and were based upon the width of the human thumb. Thumbs were excellent measuring tools because even the poorest individuals had them available when they went to market.

Ask students to draw, along the edge of their construction paper, a line equal to the width of their thumbs. Cut the edge off the paper (about an inch wide), and accordion-fold the strip to show 12 student "inches."

Have students compare the length of their 12 inches to the tracing of their shoes. Share observations. (Note: 12 student inches should be about the same as 1 student foot.) Explain that body measurements were probably the most convenient references for length measurement long ago.

Distribute the Body Parts activity sheet. Define, model, and have students repeat each of the body measurements on the chart. With partners, have students measure and record the lengths of their own digits, hands, cubits, yards, and fathoms.

After about ten minutes, call students together to discuss the term "cubit." The cubit was devised by the Egyptians about 3000 BC, and is generally regarded as the most important length standard in the ancient Mediterranean world. The Egyptians realized that a

standardized cubit was necessary in order for measurements to be fair, so a master "royal cubit" was made of black granite. The present system of comparing units of measure with a standard physical tool (such as a ruler or yardstick) follows directly from this Egyptian custom.

Ask for a volunteer and attempt to measure his or her height using your forearm (cubit). Ask for solutions to the difficulty and awkwardness. [One solution should be to make a model that is the length of your own cubit.] Direct students to make a model of their cubits using either string, ribbon, adding machine tape, or interlocking cubes. Have partners check for accuracy.

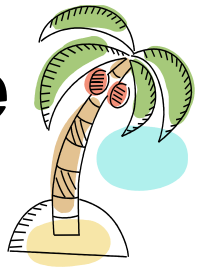
Have students duplicate their cubit models and use them to estimate, measure, and record the height of several classmates. At the end of the activity (about ten minutes), have students share ideas of which models worked best for measuring height.

Questions for Students:
What did you learn, notice, or wonder about when measuring with nonstandard units (body parts)?
[Students may note that it was tricky using one unit over and over again, or that they got different answers each time they measured. They may even say using a ruler is better because it's not as embarrassing as a cubit!]
What were some interesting words (vocabulary) you used in this lesson?
[Possible answers: cubit, apprentice, standardized, and ruler (as another name for "King").]
Why is it important to estimate before actually measuring?
[To make sure your answer is reasonable, to catch errors.]
Explain, in your own words, why standardized units and tools are important when measuring.
[So you get the same answer every time, other people will get the same answer as you, and so all projects turn out the same.]
Can you ever get an exact measurement of length? Why or why not?
[You can get closer and closer, but you'll never get an exact measurement. Tools and units can get very accurate, but things you're measuring might be floppy or squishy.]

c. *Misconceptions/Common Errors*
No typical student misconceptions noted at this time.

d. *Additional Instructional Strategies/Differentiation*
This lesson was created by Nancy Moore.

PASS on the Knowledge



Third Grade

Indicator: 3-5.4 Use common referents to make comparisons and estimates associated with length, liquid volume, and mass and weight: meters compared to yards, kilometers to miles, liters to quarts, and kilograms to pounds.

Support Document Notes:

In addition to measuring to the units just specified, third grade students should recognize that a meter is slightly more than a yard, that a kilometer is about one-half as much again as a mile, that a liter is slightly more than a quart and that a kilogram is slightly more than two pounds. It is not necessary that third grade students know the exact equivalencies. Rather it is more important that they understand the relationship between the specified measurements. This should be accomplished through experiences not through memorization of facts.

Assessment Problem:

Sara went to the doctor for her 4 year-old check up. When she got there, the nurse asked her to stand on the scale. The scale showed she weighed 25 kilograms. Sara had never heard her weight in kilograms before, and she wondered how much her weight would be in pounds. Which of the following estimates is close to 25 kilograms?

A) 25 pounds
B) 15 pounds
C) 30 pounds
D) 50 pounds

Strategies:

1) Meter and Yards: Have students brainstorm objects that require measurement in yards/meters. Record the list on the board. Inform students that they will be measuring object in those 2 units today. Bring out a meter stick and a yardstick. Ask students to compare the meter and yard. What is similar? What is different? Next, inform students they will be measuring things to the nearest meter and yard. Practice measuring to the nearest yard and meter, demonstrating when to round up/round down. Then, give student the record sheet (see sample below) and have them measure and record the distances. When the measuring is complete, bring the class back together for discussion. Ask: what did you observe when you were measuring? Did anything surprise you? Next, create on the board a double bar graph based on recorded data. Ask one student to share the measurement of the third grade hall in yards; graph the measurement. Then, ask the same student for the third grade hall measurement in meters; graph in another color the meter measurement. Continue to

graph other objects' measurements in yards and meters. Then, pose the question, what do you notice about the measurement in yards when compared to the measurement in meters? (Students should be able to see the relationship is about the same. 1 yard is very close to the size of a meter)

Object	**Length in Yards**	**Length in Meters**
Length of 3rd grade hall	25 yards	25 meters

2) Liter and Quarts: Have students brainstorm objects that require measurement in liters/quarts. Record the list on the board. Inform students that they will be working with measuring objects in quarts and liters. Bring out a quart and liter. Ask students to compare the quart and liter. What is similar? What is different? Next, bring out a ½ gallon carton filled with water. Ask students to estimate about how many quarts the container will hold. Then, have 1 student pour out the liquid and measure to the nearest quart. Record the measurement in quarts on a table on the board (See sample below)

Item being Measured	Measurement in **Quarts**	Measurement in **Liters**
½ gallon milk carton	2 quarts	

Then have students estimate the number of liters the carton can hold. Have a student measure the capacity in liters. Record the measurement on the table. Compare. What did you notice? (This can also be a good review of organizing data in various forms)

3) 3) Pounds and Kilograms: Have students brainstorm objects that require measurement in pounds/kilograms. Record the list on the board. Inform students that they will be measuring object in those 2 units today. Bring out a scale and discuss that this tool is used to measure things in pounds and kilograms. Next, inform students they will be measuring things to the nearest pound/kilogram. Ask students to think of something in the classroom that weighs about 1 pound. Have a student get the item and weigh it. Make sure the item is very close if not exactly 1 pound. Next, create a double bar graph and record the items weight in pounds. Then, ask students what the weight is in kilograms. Record the weight of the object in kilograms on the graph. Then, have students measure to weight of various objects in the classroom and record the weight in both kg and lbs. Once various objects have been weighed, ask students what they notice? How does the weight in kilograms compare to the weight in pounds? (2 lbs is about 1 kilogram)

Questions to ask:

Answer each of the following questions.

1) Sue needed to bring drinks for the class party. Which amount of punch should she bring?
   A) 1 liter

B) 2 liters
C) 2 pints
D) 1 gallon

2) Mayo's dog went to the vet for his annual check-up. His dog weighed 10 pounds. Unfortunately, there was no place on the chart to record the weight in pounds. Instead, the vet needed to record the dog's weight in kilograms. About how many kilograms does Mayo's dog weigh?
   A) 20 kilograms
   B) 10 kilograms
   C) 5 kilograms
   D) 1 kilogram

3) The length of the 3rd grade hall was about 50 meters long. Which of the following lengths is about the same length?
   A) 100 yards
   B) 50 yards
   C) 25 yards
   D) 10 yards

4) Ronnie ran a 6-K race in Charleston. About how many miles did Ronnie run in the race?
   A) 18 miles
   B) 12 miles
   C) 6 miles
   D) 3 miles

5) Ned had to water the horses after school. He knew the trough could hold 5 gallons. About how many liters of water will Ned need to fill the trough?
   A) 1 liter
   B) 5 liters
   C) 10 liters
   D) 20 liters

Another Lesson:
Materials:
All the tools used to measure length, volume and mass (rulers, yard sticks, meter sticks, centimeter rulers, measuring cups, scales)

Lesson:
Have students work in groups of 4-5. Give them a big piece of paper and ask them to list or draw all of the things that they can measure. Next, have them group the objects and label how they grouped them. Discuss whole group. Have them look at the measuring tools and pick out which tools you would use to measure the objects they listed. Practice

measuring different objects. Talk about things you want to be mindful of as you are measuring, like starting at the beginning of the object.

Ask: How long do you think the classroom is? Give one group a meter stick, one group a yard stick, one a ruler and one an inch. Have them measure with their tools.
Have them measure the length of the room and discuss what it was like measuring with the tool they used.

Have students bring in varies sizes of liquid containers. Give them plenty of experiences comparing the amount that they will hold. Ask: Which holds more, the liter or the quart? How can you tell?

e. Technology

- Sid the Science Kid – Exploring Measurement video http://www2.totlol.com/watch/3hlkRcTmFxY/Sid-The-Science-Kid---Exploring-Measurement---Pbs-Kids/0/
- Measure It! (Choose from centimeters or inches and multiple difficulty levels.) http://www.funbrain.com/measure/
- Virtual Ruler http://www.quizville.com/measuring.php
- Artie Ounces Soda Jerk (This game gives students a selection of equivalencies to choose from to complete the customer's soda order.) http://www.mrnussbaum.com/soda.htm
- All About Measurement from Kids Konnect http://www.kidskonnect.com/content/view/293/27/
- Kid's Corner (Menu of choices includes: History of Weights and Measures, All About Metrics, Games and Activities, etc.) http://www.cdfa.ca.gov/dms/kidspage/KidsIndex.htm
- Pour and Score (Use problem solving skills to move liquid from one container to another in quarts.) http://pbskids.org/cyberchase/games/hardproblems/
- The Ruler Game (Choose whole inches or half inches.) http://www.rickyspears.com/rulergame/
- Measures (Help Jack the builder with units of measurement, mass, capacity, and length.) http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks2/maths/measures/index.htm
- Estimation of Length Video http://www.linkslearning.org/Kids/1_Math/2_Illustrated_Lessons/2_Estimation_of_Length/index.html
- Weight and Capacity Video http://www.linkslearning.org/Kids/1_Math/2_Illustrated_Lessons/6_Weight_and_Capacity/index.html

- Measurement Lessons from AAA Math (Tutorial, practice, and games) http://www.aaamath.com/mea.htm
- Virtual Measurement Manipulatives http://nlvm.usu.edu/en/nav/category_g_2_t_4.html
- Math Flash Measurement 1 (Power point relates units of measurement to real world equivalencies.) www.hcbe.net/itc/powerpoints/files/7BF37756C3DB4D0D9CB8695216170416.ppt
- Body Measurements Lessons from Illuminations http://illuminations.nctm.org/LessonDetail.aspx?id=L659
- Which customary unit is appropriate? (Enter site as guest.) http://www.ixl.com/math/practice/grade-3-which-customary-unit-is-appropriate
- Compare customary units (Enter site as guest.) http://www.ixl.com/math/practice/grade-3-compare-customary-units-by-multiplying
  Which metric unit is appropriate? (Enter site as guest.) http://www.ixl.com/math/practice/grade-3-which-metric-unit-is-appropriate

- Length Strength (Estimate length by using common referents.) http://www.harcourtschool.com/activity/length_strength3/
- Estimate Customary Length using Inch ruler http://www.harcourtschool.com/activity/elab2004/gr3/22.html
- Length Strength (Measure to the nearest inch.) http://www.harcourtschool.com/menus/math2004/math2004_gr2.html
- Measure and Measure Song http://www.harcourtschool.com/jingles/jingles_all/1measure.html
- Ounce or Pound (Sort items by weight at the grocery store.) http://www.harcourtschool.com/activity/ounces_pounds/
- Length Strength (Centimeters) http://www.harcourtschool.com/activity/length_strength2_centi/
- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.) http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm

- SMART Board Interactive Whiteboard Lessons and Resources http://www.scholastic.com/interactivewhiteboards/

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. However, other formative assessment strategies should be used.

III. Assessing the Module

At the end of this module summative assessment is necessary to determine student understanding of the connections among and between the indicators addressed in this module.

Assessment Guidelines

3-5.2
The objective of the indicator is to use which is in the "apply procedural" knowledge cell of the Revised Taxonomy. To apply procedural knowledge is to know how to do something and the criteria for determining when to use those procedures. The learning progression to **use** requires students to understand the concepts of length, volume and mass. They use their understanding of these concepts to select appropriate measuring tools and units of measure. They explore a variety of real world situations to generalize connections between new mathematical ideas and other related measurements they learned in previous grades (3-1.6). To deepen conceptual understanding, they generate descriptions and mathematical statement about the relationship between measurements (3-1.4). Students estimate the measure using appropriate units. As students measure, they explain and justify their answers (3-1.3) using correct, complete and clearly written and oral mathematical language (3-1.5)

3-5.3
The objective of this indicator is to recognize which is in the "remember factual" knowledge cell of the Revised Taxonomy. To recognize is to locate knowledge in long term memory. The learning progression to **recognize** requires students to demonstrate flexibility in the use of mathematical representations (3-1.7) by understanding that each relationship represents the same quantity using different units of measure. They engage in learning experiences that build conceptual understanding of these relationships. Students generate descriptions and mathematical statements about these relationships (3-1.4) using correct, complete and clearly written and oral language (3-1.5).

3-5.4

The objective of this indicator is to use which is in the "apply conceptual" cell of the Revised Taxonomy. Conceptual knowledge is not bound by specific examples; therefore, students should explore a variety of common referents and apply those referents to make comparisons and estimates. The learning progression to **use** requires students to understand the concepts of length, liquid volume, mass and weight. Students explore a variety of examples to find approximations of these measurements. Once their find a possible common referent, they explain and justify their answers (3-1.3) with their classmates and their teachers. As students examine their referent, they generalize connections between mathematics and the environment (3-1.6). Students verify that their common referent is reasonable using an appropriate problem strategy such as comparing to other referent, measuring using a ruler, etc… They use these referents and analyze information (3-1.1) to make comparisons and estimates.

3-5.7
The objective of this indicator is to recall which is in the "remember factual" knowledge cell of the Revised Taxonomy. Although the focus of the indicator is to recall factual knowledge, learning experience should integrate both memorization and concept building strategies to support retention. The learning progression to **recall** requires student to understand the relationship between hours, minutes and second. They also understand the relationship between feet, yards and inches. Students explore these measurements in context with concrete and/or pictorial models then analyze information (3-1.1) to generate mathematical statements (3-1.4) about the relationship between seconds and minutes and inches and yards. They should use correct, complete and clearly written and oral language (3-1.5) to communicate their understanding.

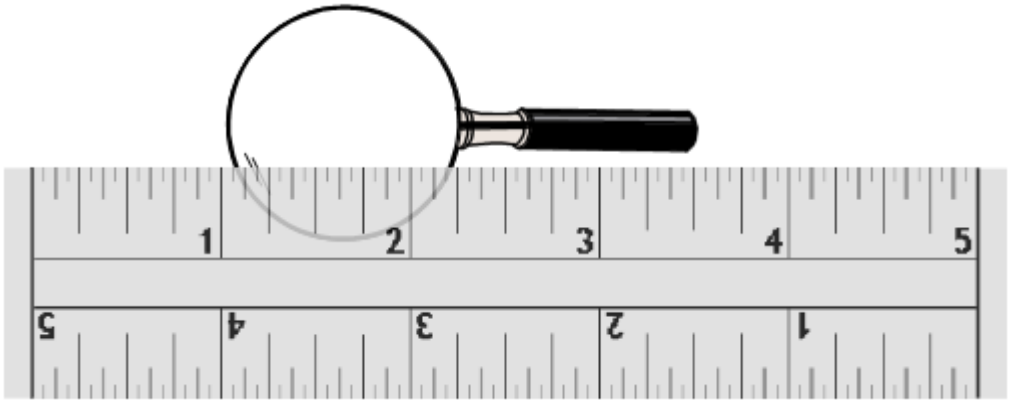
The following examples of possible assessment strategies may be modified as necessary to meet student/teacher needs. These examples are not derived from nor associated with any standardized testing.

1. Sam's board measured 4 meters. Ken's board measured 4 yards.
What do you know about the length of the boards?
Write 1-2 sentences that will explain how the length of the boards compare to one another.

2. Betsy's house is 4 miles from the school. Lisa's house is 4 kilometers from the school. Who lives closer to the school? Explain how miles and kilometers compare to one another.

3. Estimate the height of your classroom from the floor to the ceiling. What benchmark did you use to make your estimate?

4. Use a ruler to measure the length of the magnifying glass to the nearest half-inch.



5. Mrs. Brown has a lemonade recipe that asks for 2 liters of water. She only has a 2-quart container and wondered if there would be enough room in the container for 2 liters of water. Explain to Mrs. Brown why the 2-quart container will or will not work. Make sure you include what you have learned about quarts and liters as part of your explanation.

MODULE

3-2

Fractions

This module addresses the following indicators:

3-2.5 Understand fractions as parts of a whole. (B2)
3-2.6 Represent fractions that are greater than or equal to 1. (B2)

This module contains 1 lesson. This lesson is **INTRODUCTORY ONLY.** Lessons in S^3 begin to build the conceptual foundation students need. **ADDITONAL LESSONS will be required** to fully develop the concepts.

1. *Planning the Module*

Continuum of Knowledge

Third grade is the first time students are expected to develop an understanding of the meanings and uses of fractions. Students understand fractions as parts of a whole (3-2.5) and represent fractions that are greater than or equal to 1 (3-2.6).

In fourth grade, students apply strategies and procedures to find equivalent forms of fractions (4-2.8), compare the relative size of fraction to the benchmarks 0, ½ and 1 (4-2.9) and identify common fraction/decimal equivalents (4-2.10). Students also represent improper fraction, mixed numbers and decimals (4-2.11).

Key Concepts/Key Terms

** These are vocabulary terms that are reasonable for students to know and be able to use. Terms without the * are additional terms for teacher awareness, knowledge and use in conversation with students.*

- *Fraction
- *Numerator
- *Denominator
- *Equal parts
- *Part
- *Whole

II. Teaching the Lesson(s)

1. Teaching Lesson A

Using only geometric representations such as circle and rectangles limit the student's ability to develop a deep conceptual understanding; therefore, students should be given sufficient experiences with a variety of concrete and pictorial models.

Students should work with a single item (concrete and pictorial) that can be cut/divided into smaller, equal parts. This includes drawing, coloring, using tiles, number lines, etc. to show the part/whole relationship. The emphasis is on the relationship of the part to the whole. Therefore, identifying the whole before

cutting/dividing and then having an identical whole for comparison once discussion begins is critical. The notion of fractional parts being equal size portions/pieces needs to be stressed.

Given a concrete or pictorial representation of a fraction, have students express the fraction greater than one as a mixed fraction and as an improper fraction based on the set up of the representation. Students do not need to convert between forms. They only need to understand that they can describe the fraction using both forms.

For example, if the representation is given as one whole and one-half then student should write 1 ½ but if both representations are divided into halves student should write 3/2.

3-2.5

For this indicator, it is **essential** for students to:

- Understand that the denominator (bottom number) of the fraction tells into how many pieces the item has been cut/divided
- Understand that the numerator (top number) tells how many of those pieces you have.
- Understand that a whole can be a set of items such as 5 people or 8 marbles
- Understand the distinction between fraction of a set, fraction of a region (area model) and fractions on a number line (linear model)

For this indicator, it is **not essential** for students to:

- Convert fractions to improper form or mixed number form
- State that a fraction is the same as the operation of division. For example, ½ is the same as 1 divided by 2.

3-2.6

For this indicator, it is **essential** for students to:

- Understand that the denominator (bottom number) of the fraction tells into how many pieces the item has been cut/divided
- Understand that the numerator (top number) tells how many of those pieces you have.
- Recognize a fraction as being greater than one based on the a) numerator vs denominator and b) mixed + fractional part

- Understand that a whole can be a set of items such as 5 people or 8 marbles
- Understand the distinction between fraction of a set, fraction of a region (area model) and fractions on a number line (linear model)

For this indicator, it is **not essential** for students to:
- Convert fraction from improper form to mixed fraction form

a. Indicators with Taxonomy

3-2.5 Understand fractions as parts of a whole. (B2)
Cognitive Process Dimension: Understand
Knowledge Dimension: Conceptual Knowledge

3-2.6 Represent fractions that are greater than or equal to 1. (B2)
Cognitive Process Dimension: Understand
Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson

Materials:
Pattern Blocks
Sets of objects
Number line

Lesson:
Part One:
Students have learned how to tell time to the half hour and the quarter hour. Show them an analog clock and relate half an hour and quarter hour to fractions. Divide the clock in hour and show that there are 60 minutes in an hour and 30 minutes in a half hour. Divide a clock into 4 equal parts to show quarter or ¼ of an hour.

This lesson works well with students working in groups of 2-4. Give each group a set of pattern blocks. Let them explore with the pattern blocks for about 3 minutes. Ask: What are you noticing about the pattern blocks? (color, shape, size, some can be put together to make another one) Review the names of the shapes- hexagon-yellow, trapezoid-red, square-orange, triangle-green, parallelogram- blue. Ask them to find a hexagon. Ask: what shapes can you find that will cover the hexagon? (2 trapezoids, 3 parallelograms, and 6 triangles) Tell them that if we think of the hexagon as one whole, then these other shapes divide the hexagon into equal parts. When we have equal parts that make up a whole,

those equal parts are called a fraction of the whole. If there are 2 trapezoids that make a hexagon, then each trapezoid is ½ of the whole (hexagon). Then ask: What part of the hexagon would the parallelogram be? 1/3 The triangle? 1/6 Explain that the bottom number of the fraction is called the denominator and tells how many equal parts make up the fraction. The top number is called the numerator. It tells how many parts we are talking about. So, if we ask: What part of the hexagon is represented by 2 parallelograms? They should answer 2/3

Ask: If the trapezoid represents one, one fractional part would a triangle represent? 1/3 Two triangles? 2/3 Have the students work in groups to come up with some of their own fractional representations.

Part Two:
Ask: If the students in the class represent one, what would ½ of the class be? After a class discussion on this question, have the students model ½ of the class by dividing into 2 equal groups. Give each group a set of objects (cookie crisp cereal, counters, color tiles, crayons, cm cubes, etc). Ask them to count out 12 objects. If this is one, divide the set into halves, then thirds and then fourths. Check to make sure each group makes equal groups of the objects.

Part Three:
Explain that fractions represent parts of whole objects, whole sets, and length. Draw a large number line on the board, with 0 at one end and 1 at the other end. Ask: If we divide this number line into 2 equal parts, where would we draw the line? Explain that that would be where ½ would be on the number line. Have students work in their groups to draw a number line like the one on the board. Have them work together to divide the number line into 4 equal parts and label each section. Have them do this again for thirds.

Part four:
When students understand the concept of fractions with each of these parts and they have had multiple experiences with each kind, then show them 2 hexagons covered with trapezoids (2 on each one) and ask: If the hexagon is one, what fraction would be represented by the trapezoids? Let the students talk in pairs or trios to come up with an answer. Then hold a whole group discussion about this question. Ask the students to explain why they think that way. If they don't come up with the correct answer on their own (4/2), ask: How many trapezoids cover one hexagon? What fractional part is that? How many trapezoids are covering both hexagons? So, the fraction represented here is? 4/2

Extend part two and part three to include improper fractions.

c. *Misconceptions/Common Errors*

Students may believe that when dividing into parting that the parts do not have to be equal i.e. that parts should have equal area. However, when dividing a set of objects like toys or pattern blocks, equal division depends on the number of items in the set, not the area of each item. When working with linear models, equal division depends on the distance from one point to another. Students need experiences with all three forms.

d. ***Additional Instructional Strategies/Differentiation***
While additional learning opportunities are needed, no suggestions are included at this time.

e. Technology

- Fractions: Parts of a Whole (From National Library of Virtual Manipulatives: only use when students have had multiple opportunities with concrete and pictorial.) http://nlvm.usu.edu/en/nav/frames_asid_102_g_1_t_1.html?from=category_g_1_t_1.html
- Naming Fractions (From National Library of Virtual Manipulatives: only use when students have had multiple opportunities with concrete and pictorial.) http://nlvm.usu.edu/en/nav/frames_asid_104_g_1_t_1.html?from=category_g_1_t_1.html
- Visualizing Fractions (From National Library of Virtual Manipulatives: only use when students have had multiple opportunities with concrete and pictorial.) http://nlvm.usu.edu/en/nav/frames_asid_103_g_1_t_1.html?from=category_g_1_t_1.html
- "Eggsactly with a Dozen Eggs" (Students are given the opportunity to examine fractions as part of a set. This lesson helps students develop skill in problem solving and reasoning as they examine relationships among the fractions used to describe part of a set of 12.) http://illuminations.nctm.org/LessonDetail.aspx?ID=L336
- "Eggsactly with Eighteen Eggs" (This lesson is an extension of "Eggsactly with a Dozen Eggs.) http://illuminations.nctm.org/LessonDetail.aspx?ID=L337
- "Investigating Fractions with Pattern Blocks" (In this lesson, students will demonstrate that a fraction is part of a region and identify fractional relationships among pattern blocks.) http://illuminations.nctm.org/LessonDetail.aspx?ID=L343
- "Fun with Fractions" (This lesson is an extension from "Investigating Fractions with Pattern Blocks." Students will demonstrate understanding that a fraction is part of a whole and identify fraction relationships.) http://illuminations.nctm.org/LessonDetail.aspx?ID=L344
- "Pattern Block Fractions" (This lesson is an extension from "Investigating Fractions with Pattern Blocks" and "Fun with Fractions." Students will: identify fractions when the whole (region) and a part of the region are given, represent the fractional relationship between the pattern block shapes using a standard form of the written notation [for example, the green triangle is *x* of the blue rhombus], identify the numerator in a fraction and understand that the numerator is the top number in a fraction and indicates the number of parts of the whole, and identify the denominator in a fraction and understand that the

denominator is the bottom number in a fraction and indicates the number of parts into which the whole is divided.) http://illuminations.nctm.org/LessonDetail.aspx?ID=L345

- Fraction Fun (Name the fraction by typing in the number of colored pie pieces over the total number of pieces altogether.) http://www.vectorkids.com/vkfractions.htm
- Melvin's Make a Match (In this game, students match a fraction to the pictorial version of the fraction. Level of difficulty increases as students complete each round correctly.) http://pbskids.org/cyberchase/games/equivalentfractions/index.html
- Pizza Party (Use the picture to determine how much pizza is left.) http://www.primarygames.com/fractions/question1.htm
- Crossing the River (Help the little man cross the river by identifying the correct fraction.) http://www.harcourtschool.com/activity/cross_the_river/
- Understand Fractions (Concentration game where students match the fraction with the model in as few moves as possible.) http://www.harcourtschool.com/activity/con_math/g03c21.html
- Fraction Race (Choose the fraction that names the part of the group that is yellow.) http://www.harcourtschool.com/activity/fraction_race_b/
- Kids and Cookies (Students choose the number of friends and cookies to share. Move the cookies to the friends and use cutting board if necessary to share equally.) http://www.teacherlink.org/content/math/interactive/flash/kidsandcookies/kidcookie.php
- Identify the Fraction (Enter site as guest.) http://www.ixl.com/math/practice/grade-2-identify-the-fraction
- Which shape matches the fraction? (Enter site as guest.) http://www.ixl.com/math/practice/grade-2-which-shape-illustrates-the-fraction
- Parts of a group (Enter site as a guest.) http://www.ixl.com/math/practice/grade-2-fractions-parts-of-a-group
- Word problems with fractions (Enter site as guest.) http://www.ixl.com/math/practice/grade-2-fractions-word-problems
- Thirteen Ways of Looking at a Half (Find all of the ways to make this square show ½.) http://pbskids.org/cyberchase/games/fractions/index.html

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. However, other formative assessment strategies should be used.

III. Assessing the Module

At the end of this module summative assessment is necessary to determine student understanding of the connections among and between the indicators addressed in this module.

Assessment Guidelines

3-2.5
The objective of this indicator is to understand which is in the "understand conceptual" knowledge cell of the Revised Taxonomy. To understand means to construct meaning; therefore, students construct the meaning of the concept of fractions through a variety of learning experiences. The learning progression to **understand** requires students to identify the numerator and denominator of a fraction and explain what each means in the context of a variety of examples. Students then explore the part-whole relationship in the form pictorial, concrete materials, fraction of a set, fraction of a region (area model) and fractions on a number line (linear model). Students analyze information (3-1.1) to construct arguments about part-whole relationships (3-1.2) and generalize connections (3-1.6) between the various forms (set, region and number line). Student use correct, complete and clearly written and oral language to communicate their ideas to their classmates and their teacher (3-1.5).

3-2.6
The objective of this indicator is represent which is in the "understand conceptual" knowledge cell of the Revised Taxonomy. To understand means to construct meaning; therefore, students build conceptual understand through discovery. The learning progression to **represent** requires students to recall the meaning of the numerator and denominator of a fraction and explain what each means in the context of a variety of examples. Students identify the whole and/or fractional part component of each representation. Students understand how to count in fractional increments such as ¼, 2/4, ¾, 4/4. Students then explore the fractions in pictorial form, concrete materials, fraction of a set, fraction of a region (area model) and fractions on a number line (linear model). Students analyze information (3-1.1) to construct arguments (3-1.2) about what are the characteristics of fractions that are greater than one and generalize connections (3-1.6) between the various forms (set, region and number line). Student use correct, complete and clearly written and oral language to communicate their ideas to their classmates and their teacher (3-1.5).

The following examples of possible assessment strategies may be modified as necessary to meet student/teacher needs. These examples are not derived from nor associated with any standardized testing.

1. Myra made a necklace with 12 beads. The model below shows the different beads that she used.

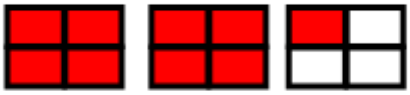
Blue	Blue	Red	Yellow	Yellow	Green	Blue	Blue	Red	Yellow	Yellow	Green

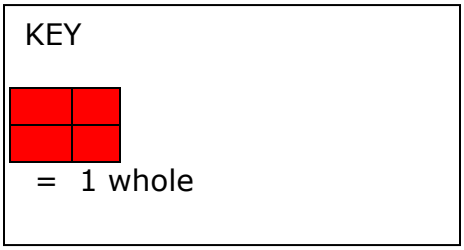
What fraction of necklace is…
blue? _____ red? _____ yellow? _____ green? _____

2. Maliyah had a candy bar that was divided into 8 equal sections. She gave 2 sections to each of her three friends. Color the model below to show how much she gave to her friends. Write a fraction for the part of the candy bar that she has left.

Maliyah still has _____ of the candy bar left to eat.

3. Write the fraction for the shaded part of the model?





MODULE

3-3

Geometry - I

This module addresses the following indicators:

3-4.3 Classify lines and line segments as either parallel, perpendicular, or intersecting. (A2)
3-4.4 Classify angles as either right, acute, or obtuse. (A2)
3-4.6 Exemplify points, lines, line segments, rays, and angles. (B2)
3-4.7 Analyze the results of combining and subdividing circles, triangles, quadrilaterals, pentagons, hexagons, and octagons. (B4)

This module contains 4 lessons. These lessons are **INTRODUCTORY ONLY.** Lessons in S^3 begin to build the conceptual foundation students need. **ADDITONAL LESSONS will be required** to fully develop the concepts.

I. Planning the Module

Continuum of Knowledge

3-4.3
Third grade is the first time students classify lines and line segments as either parallel, perpendicular, or intersecting (3-4.3). Students in third grade also exemplify points, lines, line segments, rays, and angles (3-4.6)

In fourth grade, students represent points, lines, line segments, rays, angles, and polygons (4-4.6)

3-4.4
Third grade is the first time students classify angles as either right, acute, or obtuse (3-4.4). Students in third grade also exemplify points, lines, line segments, rays, and angles (3-4.6)

In fourth grade, students represent points, lines, line segments, rays, angles, and polygons (4-4.6). In fifth grade, the students compare the angles, side lengths, and perimeters of congruent shapes (5-4.2)

3-4.6
Third grade is the first time students exemplify points, lines, line segments, rays, and angles (3-4.6). Students are asked to classify lines and line segments as parallel, perpendicular, or intersecting (3-4.3) . They are also asked to classify angles as right, acute, or obtuse (3-4.4).

In fourth grade, students represent points, lines, line segments, rays, angles, and polygons (4-4.6). In fifth grade, the students compare the angles, side lengths, and perimeters of congruent shapes (5-4.2)

3-4.7
In second grade, the students predicted the results of combining and subdividing polygons and circles (2-4.3).

In third grade, students analyze the results of combining and subdividing circles, triangles, quadrilaterals, pentagons, hexagons, and octagons (3-4.7)

In fourth grade, students analyze the relationship between three-dimensional
geometric shapes in the form of cubes, rectangular prisms, and cylinders and their two-dimensional nets (4-4.2).

Key Concepts/Key Terms

** These are vocabulary terms that are reasonable for students to know and be able to use. Terms without the * are additional terms for teacher awareness, knowledge and use in conversation with students.*

- *Lines
- *Line segments
- *Intersecting lines
- *Parallel lines
- *Perpendicular lines
- *Acute Angle
- *Obtuse Angle
- *Right Angle
- *Angle
- *Point
- *Ray
- *Circles
- *Combine
- *Hexagons
- *Octagons
- *Pentagons
- *Quadrilaterals
- *Subdivide
- *Triangles

II. Teaching the Lesson(s)

1. Teaching Lesson A

In order for students to exemplify points, lines, line segments, rays, and angles, they should be able to give an example or illustration that shows their understanding of each. Again, many examples/models must be provided for the students to gain this knowledge. Guiding the students to explain the differences between this terminology such as a line segment and a ray will help solidify their understanding.

3-4.6

For this indicator, it is **essential** for students to:

- Understand that an angle is where two rays meet with a common endpoint.
- Understand that a line goes on forever in both directions

- Understand that a line segment is part of a line and has two endpoints
- Understand that a ray is part of a line that has one endpoint and continues without end in the other direction
- Understand that a point is a location in space

For this indicator, it is **not essential** for students to:
- Students are **not** expected to use symbolic notation at this level.

a. Indicators with Taxonomy

3-4.6 Exemplify points, lines, line segments, rays, and angles. (B2)

Cognitive Process Dimension: Understand
Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson

In this lesson, students should learn the definition of points, lines, line segments, rays, and angles. Then there should be connections made to real life examples.

Draw a point on the board. Give the definition of a point-a dot that represents a space. Ask: When might we use points? What are your hunches as to why we have points? Draw another point. Connect the two points. Explain that this is a line segment. Ask: Where have you seen line segments? Explain that polygons are made of line segments. Draw another point on the board. Connect it to ae endpoint of the line segment. Explain that when two line segments come together they make an angle. The space between the two line segments is the angle. Explain to them that if the line segment was to extend on and on in one direction it would be a ray. The sun's ray is an example. It starts at the sun and goes on and on in one direction. Explain that if the line segment goes on and on in both directions, then it is a line.

Have the students work in pairs to find examples of points, line segments and angles around the school. They can look for rays and lines, but those are hard to find, because you can't see them going on and on. They can take a picture, draw a picture or write a description of the examples they find. Make a poster or bulletin board of all of the examples.

c. *Misconceptions/Common Errors*

Students may think that angles are made up of two lines. Using concrete materials to illustrate the joining of rays may help with this misconception.

d. ***Additional Instructional Strategies/Differentiation***

While additional learning opportunities are needed, no suggestions are included at this time.

e. Technology

- Parallel, Perpendicular, and Intersecting Lines (Practice) http://www.ixl.com/math/practice/grade-4-parallel-perpendicular-intersecting
- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.) http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm
- SMART Board Interactive Whiteboard Lessons and Resources http://www.scholastic.com/interactivewhiteboards/

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. However, other formative assessment strategies should be used.

2. Teaching Lesson B

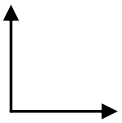
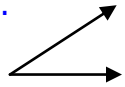
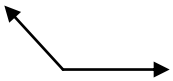
An in-depth understanding will require many examples/models of each type of angle along with emphasis placed on explanations and vocabulary. It is important to show right, acute, and obtuse angles in a variety of ways so the students do not memorize one type of example.

3-4.4

For this indicator, it is **essential** for students to:

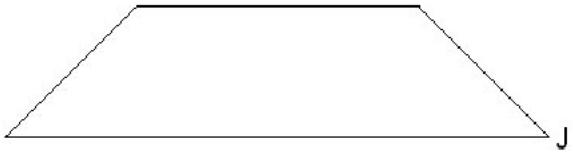
- Recall that an angle is where two rays meet with a common endpoint.
- Recall that a right angle measures 90º and is shaped like an L.
- Recall that an acute angle is smaller than a right angle
- Understand that an obtuse angle is larger a right angle
- Classify angles as either right, acute, or obtuse such as:

  Which angle is a right angle? A. 

A.  B.  C.  D. 

- Analyze angles to solve increasingly more sophisticated problems such as:

  Which type of angle best describes angle J?

  A right
  B obtuse
  C acute
  D parallel

For this indicator, it is **not essential** for students to:
- Use a protractor to find the measures of acute and obtuse angles.

a. Indicators with Taxonomy

3-4.4 Classify angles as either right, acute, or obtuse. (A2)
Cognitive Process Dimension: Understand
Knowledge Dimension: Factual Knowledge

b. Introductory Lesson

Materials:
1 inch strips of paper
Brads
Hole punch

Lesson:
Give each student 2 strips of paper and 1 brad. Connect the two strips of paper together with a brad to make a movable angle. Have each child take their angle and put it on the corner of a piece of paper or a book, then look at it. Tell them that this is a right angle. The space between the two segments is 90 degrees. All right angles are 90 degrees. Now ask the students to move the line segments (strips of paper) in some and hold them up. Tell them to look around at everybody's angles. These are all acute angles because they are less than a right angle. Now, tell them to make right angles again. Ask them to

move the line segments out and hold them up. Tell them they now have obtuse angles because they are bigger than a right angle.

Ask them to identify angles around the school and at home.

c. Misconceptions/Common Errors

No typical student misconceptions noted at this time.

d. Additional Instructional Strategies/Differentiation

- The teacher will provide a poster showing the three different types of angles, their definitions and examples of each.
- Using a pipe cleaner and two coffee straws (slide straws onto each end of the pipe cleaner until the meet in the center), the students will create the three types of angles.
- Students will create a poster similar to the teacher's using cotton swabs, toothpicks, pretzels, etc. to demonstrate the angles.
- Students will use their body to create each angle and explain using correct vocabulary. This activity can be done in teams of two.
- Go on an angle hunt looking for each type of angle. Students will draw and write a description of each angle in their math journal.
- Throughout the day, notice the angles made by the clock hands. The students will record their observations in their math journal. Ex. 12:15 – right angle, 1:15 – acute angle, 9:10 – acute angle

e. Technology

- Naming Angles (Students determine whether angles are acute, obtuse, or right.) http://www.toonuniversity.com/6m_angle_d.html
- Is this angle greater than, less than or equal to a right angle? http://www.ixl.com/math/practice/grade-3-angles-greater-less-or-equal-to-right-angle
- Ladybug Leaf (Direct the ladybug by using direction and 45 or 90 degree angles to hide it under the leaf.) http://nlvm.usu.edu/en/nav/frames_asid_287_g_2_t_3.html
- Ladybug Maze (Direct the ladybug through the maze by using direction and 45 or 90 degree angles.) http://nlvm.usu.edu/en/nav/frames_asid_141_g_2_t_3.html
- Turtle Pond (Guide the turtle to the pond by determining length in units and angle turns. Obstacles can be added!) http://illuminations.nctm.org/ActivityDetail.aspx?ID=83
- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations.

Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.) http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm

- SMART Board Interactive Whiteboard Lessons and Resources http://www.scholastic.com/interactivewhiteboards/

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. However, other formative assessment strategies should be used.

As an exit ticket: On an index card, have students either draw or find examples of a right angle, acute angle and an obtuse angle.

3. Teaching Lesson C

An in-depth understanding will require many examples/models of each type of parallel, perpendicular, and intersecting lines and/or line segments along with emphasis placed on explanations and vocabulary. It is important to show parallel, perpendicular, and intersecting lines and/or line segments, in a variety of ways so the students do not memorize one type of example.

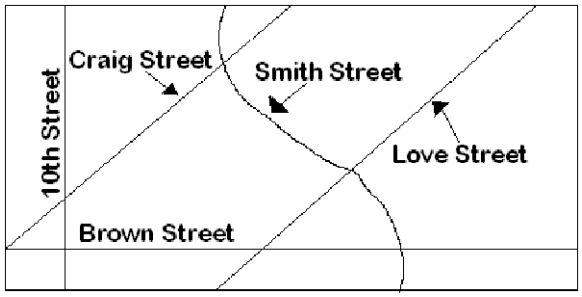
3-4.3

For this indicator, it is **essential** for students to:

- Understand that a line goes on forever in both directions.
- Understand that a line segment is part of a line and has two endpoints
- Understand that parallel lines or parallel line segments never cross each other
- Understand that intersecting lines or intersecting line segments meet or cross each other at one point
- Understand that perpendicular lines cross or meet to form right angles
- Explore these concepts using real world examples

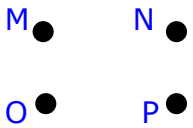
- Analyze parallel, perpendicular, and/or intersecting lines or line segments to solve increasingly more sophisticated problems such as:

  a) Look at the map. Which streets are parallel?



A 10th Street and Brown Street
B Craig Street and Love Street
C 10th Street and Smith Street
D Brown Street and Love Street

b) Use this diagram to answer the question.



If points M and N were connected and points O and P were connected, what would they be?

A intersecting lines
B parallel lines
C a line segment
D perpendicular lines

For this indicator, it is **not essential** for students to:

- Use symbolic notation at this level.

a. Indicators with Taxonomy

3-4.3 Classify lines and line segments as either parallel, perpendicular, or intersecting. (A2)

Cognitive Process Dimension: Understand
Knowledge Dimension: Factual Knowledge

b. Introductory Lesson

Materials:

On a piece of paper, have examples of:

- Parallel lines and not parallel lines
- Intersecting lines and not intersecting lines
- Perpendicular lines and not perpendicular lines

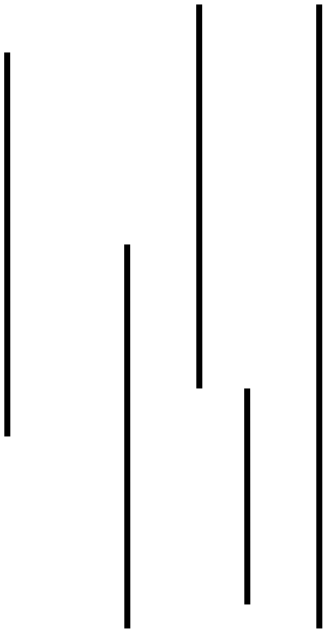
Have enough copies of this for every student. Having a copy on the interactive white board will help with discussion.
Handout following lesson.

Lesson:

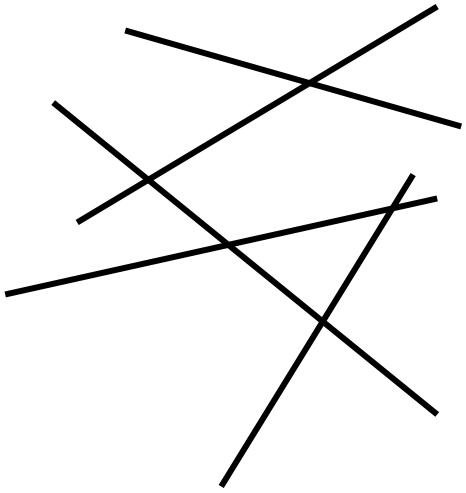
Give each child the examples of different kinds of lines and non examples.
Have them identify characteristics of each type of lines. Ask "What are some similarities and differences between the types of lines?" Have the students pair up and talk about what they have discovered. Then have the pairs get with another pair and make a square (4 people group). Give each square a sheet of poster paper and ask them to illustrate and define each type of line. Report out.

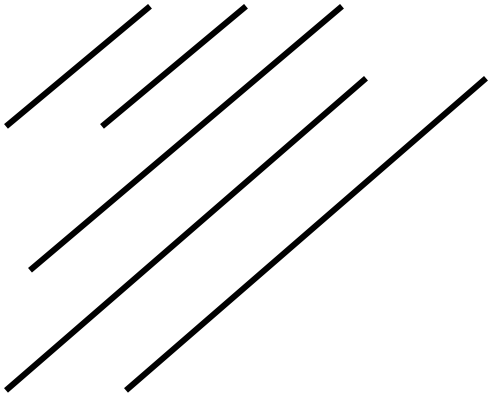
The discussion in this activity is the heart of their learning. Make sure their explanations are clear and understood by all.

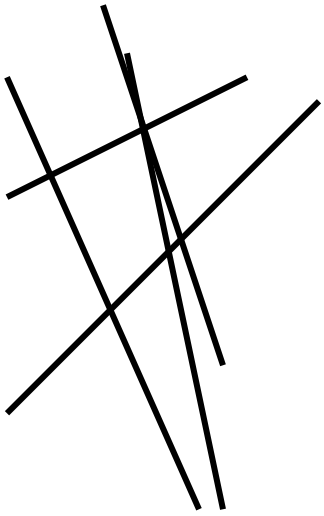
Parallel Lines



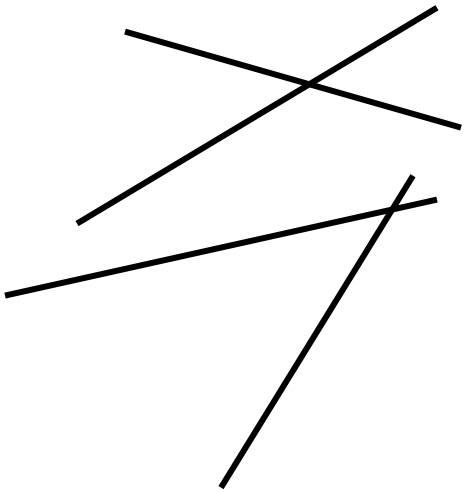
Not Parallel



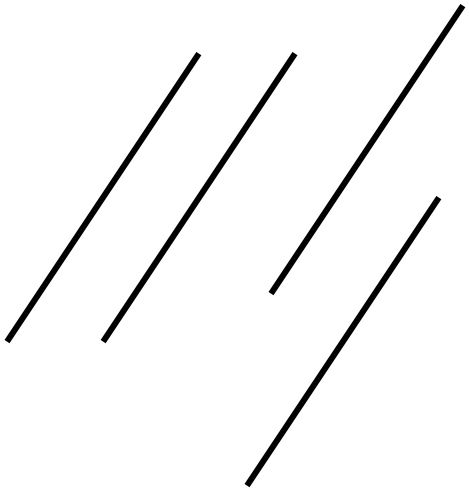




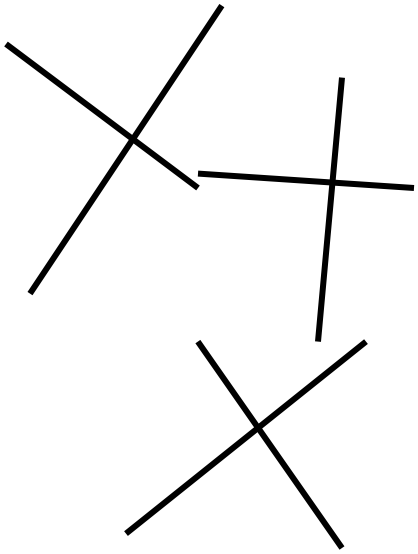
Intersecting Lines



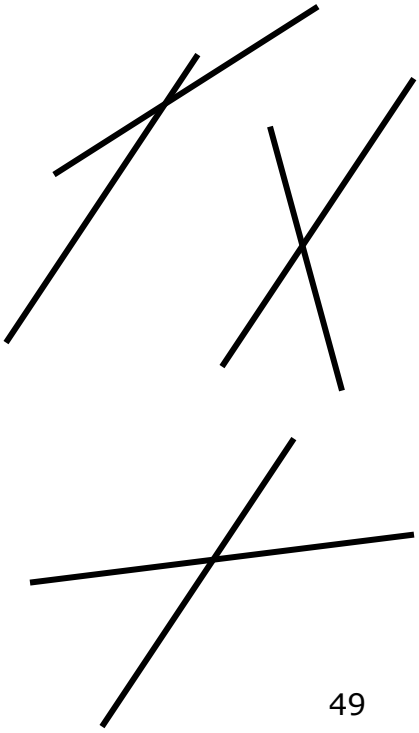
Not Intersecting Lines



Perpendicular lines



Not Perpendicular Lines



c. *Misconceptions/Common Errors*

Students might look at line segments that are not touching but would intersect if they continued, and think they are parallel. They need to continue the lines to see that they would intersect, therefore making them intersecting lines.

Student may think that all intersecting lines are perpendicular. Emphasize that the lines must form a right angle.

d. *Additional Instructional Strategies/Differentiation*

Have students make examples of different kinds of lines on geoboards.

Ask students to find examples of parallel, intersecting and perpendicular lines in letters of the alphabet.

Give each student a sheet of drawing paper. Give them these instructions verbally:

Place your paper landscape style on your desk.
Draw 3 horizontal lines across the paper.
Draw 2 vertical lines down the paper.
Draw 1 diagonal line.

Then have the students identify the different kinds of lines in their pictures by either talking about it or tracing them a specific color- parallel with a blue marker, perpendicular with a red marker and intersecting with a green marker.

e. Technology

- Lines, Rays, Line Segments, and Planes http://www.shodor.org/interactivate/lessons/LinesRaysLineSegment/
- Lines, Rays, and Angles (Online lesson plan) http://www.homeschoolmath.net/teaching/g/angles.php
- Lines, Line Segments, and Rays (SMART lesson) http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+activities/Browse+Notebook/United+States/Elementary/4-6/Math/Lines+Line+Segments+and+Rays.htm
- Line, Ray, Segment (Activity from Illuminations) http://illuminations.nctm.org/ActivityDetail.aspx?ID=53
- Lines, Line Segments, and Rays (Promethean introductory lesson) http://www.prometheanplanet.com/server.php?show=ConResource.7871

- Line, Line Segment, Ray (Recognition) http://www.ixl.com/math/practice/grade-3-lines-line-segments-and-rays
- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.) http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm
    - SMART Board Interactive Whiteboard Lessons and Resources http://www.scholastic.com/interactivewhiteboards/

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. However, other formative assessment strategies should be used.

Ask students to pair up and discuss this statement: All perpendicular lines are also intersecting lines, but not all intersecting lines are parallel.

4. Teaching Lesson D

In order to analyze the results, the students will need experiences in combining and subdividing these shapes. Using manipulatives, such as Geoboards, can help students see these results. The emphasis in third grade is on students seeing the relationship between various two-dimensional shapes. By analyzing the results of combining and subdividing the specified shapes in third grade, students will have the foundational knowledge for fourth grade when they analyze the relationship between three-dimensional shapes and two-dimensional nets.

Resource:
http://www.mathmammoth.com/preview/Grade_3_Divide_Polygons.pdf

3-4.7
For this indicator, it is **essential** for students to:

- Understand that an angle is where two rays meet with a common endpoint.

- Understand that a line goes on forever in both directions
- Understand that a line segment is part of a line and has two endpoints
- Understand that a ray is part of a line that has one endpoint and continues without end in the other direction
- Understand that a point is a location in space

For this indicator, it is **not essential** for students to:

- Students are **not** expected to use symbolic notation at this level.

a. Indicators with Taxonomy

3-4.7Analyze the results of combining and subdividing circles, triangles, quadrilaterals, pentagons, hexagons, and octagons. (B4)

Cognitive Process Dimension: Analyze
Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson

Materials:
Pattern blocks or cut outs of circles, triangles, quadrilaterals, pentagons, hexagons, and octagons.
A sheet of paper divided into 4 equal parts

Lesson:
Students work in pairs for this lesson. Give each pair of students, 3-5 identical shapes. Students sit back to back. One student places his shapes on his paper without the other student seeing where he places them. Then he describes his picture or placement of shapes to the other student. The other student has to recreate the picture on his paper. He may ask only yes or no questions to his/her partner. When they think they have it correct, they compare their shapes. Have the students talk to each other about the process. Ask: What types of directions helped you the most? What was the most difficult part of this task? What would have made it easier?

c. *Misconceptions/Common Errors*
No typical student misconceptions noted at this time.

d. *Additional Instructional Strategies/Differentiation*

Materials:
White Paper without lines
Straight edge
Circular shape that can be traced or compass
Colored pencils or crayons

Lesson:
Give each student a sheet of paper, a straight edge and something to draw circles with.
Have the students listen and draw what you describe to them. Give them these directions:
Draw 3 horizontal lines all the way across your paper.
Draw 2 vertical lines all the way down your paper.
Draw one diagonal across your paper.
Draw a circle anywhere on your paper.

Now have them identify the different shapes they see on their paper. Have them color the shapes. Ask: What shapes did you identify in your picture? What shapes do you see in most pictures? Why do you think that might be so?

e. Technology

- National Library of Virtual manipulatives (use geoboards to make two shapes and combine them. What new shape was formed? Make a shape and divide it…what new shapes were created?) http://nlvm.usu.edu/en/nav/frames_asid_172_g_2_t_3.html?open=activities&from=category_g_2_t_3.html

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. However, other formative assessment strategies should be used.

III. Assessing the Module

At the end of this module summative assessment is necessary to determine student understanding of the connections among and between the indicators addressed in this module.

Assessment Guidelines

3-4.3
The objective of this indicator is classify, which is in the "understand factual" knowledge cell of the Revised Taxonomy. To understand factual goes beyond rote memorization of definition and extends to applying that fact to a variety of examples. The learning progression to **classify** requires students to sort examples of lines into categories. Students generate descriptions (3-1.4) about the relationships among examples in each category. They explain and justify how they sorted their examples on the basis of mathematical

properties, structures and relationships (3-3.3). Students relate the examples in each category to the term parallel, perpendicular and intersecting generate mathematical statements (3-1.4) to describe each category. Students use that understanding to classify other examples as and use correct, complete, and clearly written and oral mathematical language to pose questions and communicate ideas (3-1.5) with their classmates and teacher. Students explore real world examples of these relationships to gain a deeper understanding of this factual knowledge.

3-4.4

The objective of this indicator is classify, which is in the "understand factual" knowledge cell of the Revised Taxonomy. To understand factual goes beyond rote memorization of definition and extends to applying that fact to a variety of examples. The learning progression to **classify** requires students to sort examples of angles into categories. Students generate descriptions (3-1.4) about the relationships among examples in each category. They explain and justify how they sorted their examples on the basis of mathematical properties, structures and relationships (3-3.3). Students relate the examples in each category to the term acute, right and obtuse and generate mathematical statements (3-1.4) to describe each category. Students use that understanding to classify other examples as and use correct, complete, and clearly written and oral mathematical language to pose questions and communicate ideas (3-1.5) with their classmates and teacher. Students explore real world examples of these relationships to gain a deeper understanding of this factual knowledge.

3-4.6

The objective of this indicator is to illustrate which is in the "understand conceptual" knowledge cell of the Revised Taxonomy. To illustrate means to find specific examples of a concept; therefore, students should explore a variety of examples to build understanding of these concepts. The learning progression to **illustrate** requires students to recall the characteristics of points, lines, line segments and rays. Students analyze and compare these characteristics to generalize connections between these related concepts (3-1.6). Students explore teacher generated problems and explain and justify their answer on the basis of mathematical relationships (3-1.3) and share their understanding with their classmates and their teacher. Student use this understanding to find other examples of these concepts.

3-4.7

The objective of this indicator is analyze, which is in the "analyze conceptual" knowledge cell of the Revised Taxonomy. Conceptual knowledge is not bound by specific examples; therefore, the student's conceptual knowledge of analyzing the results of combining and subdividing circles, triangles, quadrilaterals, pentagons, hexagons, and octagons should be explored using a variety of examples. The learning progression to **analyze** requires students to recall the characteristics of circles, triangles, quadrilaterals, pentagons, hexagons, and octagons and the number of sides of these

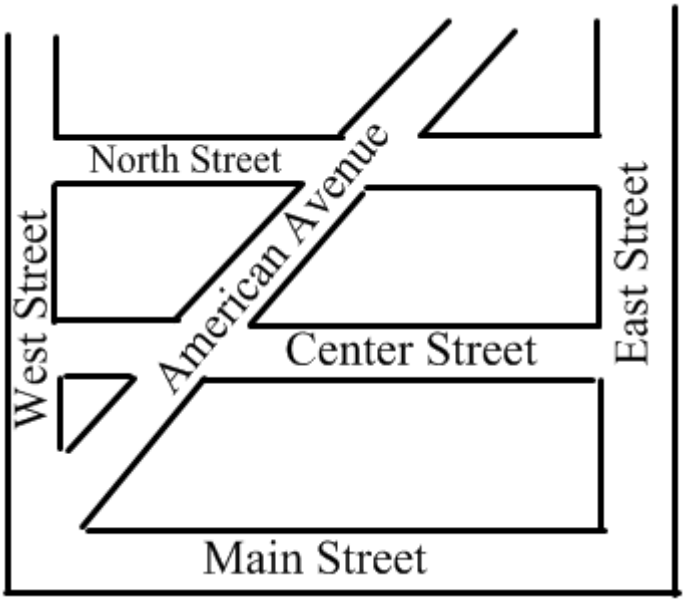
figures. Students use manipulatives to investigate combining and subdividing various shapes. Students analyze the results and generate descriptions about the relationships they observe. They explain and justify answers to their classmates and teacher on the basis of mathematical properties, structures, and relationships (3-3.3). Students then use these descriptions to analyze other problems without the use of concrete models.

The following examples of possible assessment strategies may be modified as necessary to meet student/teacher needs. These examples are not derived from nor associated with any standardized testing.

1. Draw an example for each of the following:

   a. Line
   b. Ray
   c. Line segment
   d. Point

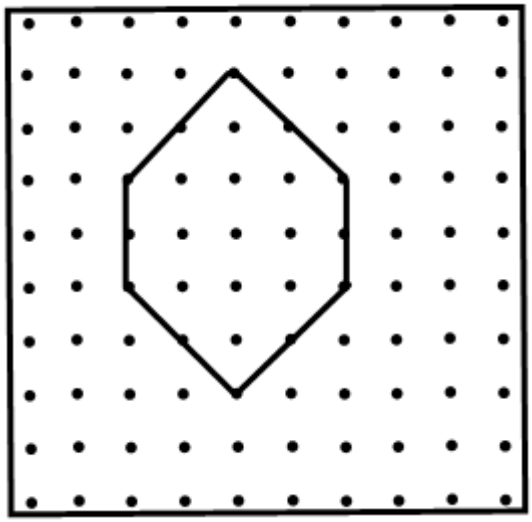
2. Use the diagram to answer the following questions.



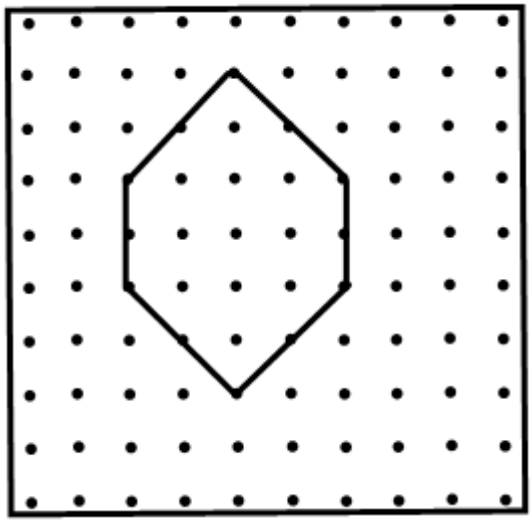
a. Name 2 streets that are parallel to each other.
b. What type of angle appears to be formed at the corner of Main Street and East Street?
c. What street appears to form an obtuse angle with North Street? Show that obtuse angle on the diagram with a "*".

3. Use the hexagons to answer the following questions.

a. Draw 2 lines to divide the first hexagon shown below into 3 polygons. Name the 3 polygons that were formed when you divided the hexagon.



b. Draw 2 lines to divide the hexagon into 3 polygons that are different from those in the first hexagon. Name the 3 polygons that were formed.



MODULE

3-4

Geometry - II

This module addresses the following indicators:

3-4.1 Identify the specific attributes of circles: center, radius, circumference, and diameter. (A1)
3-4.2 Classify polygons as either triangles, quadrilaterals, pentagons, hexagons, or octagons according to the number of their sides. (A2)
3-4.5 Classify triangles by the length of their sides as either scalene, isosceles, or equilateral according and by the sizes of their angles as either acute, obtuse, or right. (A2)

This module contains 3 lessons. These lessons are **INTRODUCTORY ONLY.** Lessons in S^3 begin to build the conceptual foundation students need. **ADDITONAL LESSONS will be required** to fully develop the concepts.

I. Planning the Module

Continuum of Knowledge

3-4.1
In first grade, students analyzed the two-dimensional shapes circle, square, triangle, and rectangle (1-4.2).

In third grade, students identify the specific attributes of a circle: center, radius, circumference, and diameter (3-4.1).

In sixth grade, students explain the relationships among the circumference, diameter, and radius of a circle (6-5.1) and apply strategies and formulas with an approximation of pi (3.14, or 22/7) to find the circumference and area of a circle (6-5.2).

3-4.2
In first grade, students analyzed the two-dimensional shapes circle, square, triangle, and rectangle (1-4.2).
In third grade, students identify the specific attributes of a circle: center, radius, circumference, and diameter (3-4.1).

In sixth grade, students explain the relationships among the circumference, diameter, and radius of a circle (6-5.1) and apply strategies and formulas with an approximation of pi (3.14, or 22/7) to find the circumference and area of a circle (6-5.2).

3-4.5
In third grade, students classify triangles by the length of their sides as either scalene, isosceles, or equilateral according and by the sizes of their angles as either acute, right, or obtuse (3-4.5). This is their first encounter with this vocabulary so ample practice and review may be needed for mastery of these terms.

Key Concepts/Key Terms

** These are vocabulary terms that are reasonable for students to know and be able to use. Terms without the * are additional terms for teacher awareness, knowledge and use in conversation with students.*

- *Center
- *Circle
- *Circumference
- *Diameter

- *Radius
- *Hexagons
- *Octagons
- *Pentagons
- *Polygons
- *Quadrilaterals
- *Triangles
- *Equilateral Triangle
- *Isosceles Triangle
- *Scalene Triangle
- *Acute Angle
- *Obtuse Angle
- *Right Angle

II. Teaching the Lesson(s)

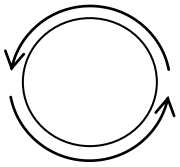
1. Teaching Lesson A

Circumference is defined as the distance around a closed curve such as a circle. The diameter of a circle is a straight line which passes through the center of the circle and ends at the circle's edge. The radius is the distance from the center of the circle to one of its edges.

3-4.1
For this indicator, it is **essential** for students to:

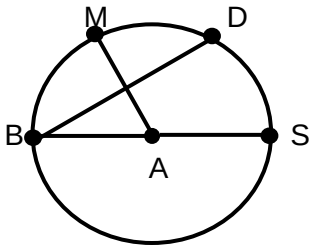
- Understand that the diameter of a circle is a straight line which passes through the center of the circle and ends at the circle's edge.
- Understand that the radius is the distance from the center of the circle to one of its edges.
- Understand that the center is the middle of the circle
- Understand that circumference is defined as the distance around a closed curve such as a circle.
- Recognize the center, diameter, radius, and circumference of the circle such as:

  What would you call the distance if you walked along the edge of a circle one time? The circumference



- Recognize the center, diameter, radius, and circumference of the circle to solve to solve increasingly more sophisticated problems such as:

  Name the diameter in the circle. $\overline{BS}$



For this indicator, it is **not essential** for students to:

- Calculate the circumference of a circle. However, they are expected to understand that circumference is the distance around a circle.

a. Indicators with Taxonomy

3-4.1 Identify the specific attributes of circles: center, radius, circumference, and diameter. (A1)

Cognitive Process Dimension: Remember
Knowledge Dimension: Factual Knowledge

b. Introductory Lesson

Suggested Literature Connection:
"Sir Cumference and the First Round Table: A Math Adventure" by Cindy Neuschwander, Scholastic Inc.,1997

Lesson:
Give each child a precut circle at least 5 inches in diameter.
Have them fold it in half and open it back up.
Trace the line made by the fold and label it 'diameter'.
Have them fold it in half again and then fold it again so when they open it, they have divided the circle into fourths. Trace the new lines made by the fold with another color and label them 'radius-singular or radii-plural'
Draw a dot on the center of the circle where all lines meet. Label this the 'center'
Trace the outside of the circle. Label this 'circumference'

Ask:

- How many radii do you think a circle can have? (infinite)
- How many diameters do you think a circle can have? (infinite)
- What might be the relationship between the radii and the diameter?
- How many centers does a circle have?

- What fractional parts does a diameter divide the circle into?
- Draw two diameters. What kind of angles did your diameters make?

c. Misconceptions/Common Errors

- Students may think that polygons with the same number of sides must look exactly the same but the polygons may look quite different, but are still classified the same way.
- Students may sometimes identify the radius as the diameter and the diameter as the radius. Ample opportunities for students to explore each attribute should be provided as well as definitions/explanations.

d. *Additional Instructional Strategies/Differentiation*

While additional learning opportunities are needed, no suggestions are included at this time.

e. *Technology*

- Circles (A flip chart lesson for circles and identifying parts of a circle for promethean boards. Register for site. It's free!) http://www.prometheanplanet.com/server.php?show=ConResource.11370

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. However, other formative assessment strategies should be used.

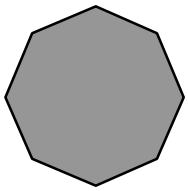
2. Teaching Lesson B

3-4.2
For this indicator, it is **essential** for students to:

- Recall the characteristics of a polygons
- Understand that polygons are named based on its number of sides
- Understand the meaning of the prefixes: tri, quad, penta, hexa and octa.
- Understand that polygons with the same number of sides may look quite different, but are still classified the same way. For example, all four sided polygons are quadrilaterals regardless of their side lengths.

- Classify polygons as either triangles, quadrilaterals, pentagons, hexagons, or octagons according to the number of their sides such as:

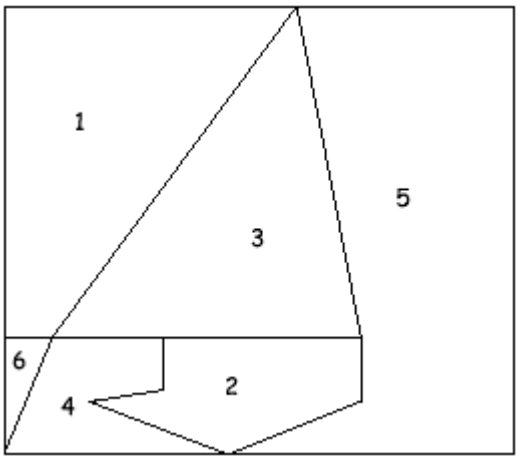
  What is the name of the figure below?

  A. Triangle
  B. Pentagon
  C. Hexagon
  D. Octagon

- Analyze polygons to solve increasingly more sophisticated problems such as:

  The pieces of a puzzle are shown below. Which piece is a hexagon?

For this indicator, it is **not essential** for students to:
- Classify heptagons, decagons, and nonagons.

a. Indicators with Taxonomy

3-4.2 Classify polygons as either triangles, quadrilaterals, pentagons, hexagons, or octagons according to the number of their sides. (A2)
Cognitive Process Dimension: Understand
Knowledge Dimension: Factual Knowledge

b. Introductory Lesson

Materials:
Construction paper
Scissors
Glue
Digital camera (optional)

Lesson:
Have students create "polygon" pictures. Here are some suggestions for these pictures:

- One with just triangles, quadrilaterals, pentagons, hexagons or octagons
- One with a prescribed number of shapes such as: 2 triangles, 4 quadrilaterals and 5 pentagons
- One with different shapes and the students identify how many of each

Ask: What shapes did you use? How many sides does the shape have? Where might you find these shapes in our school? Have students work in pairs to find examples of polygons around the school. They can take a picture or it or draw a picture or write a description of it. Ask them: How do you know it is a triangle? Quadrilateral? Etc. Ask them to find as many examples of that polygon as they can. Then have them make a picture book of polygons.

c. *Misconceptions/Common Errors*

Students may think that polygons with the same number of sides must look exactly the same but the polygons may look quite different, but are still classified the same way

d. *Additional Instructional Strategies/Differentiation*

Suggested Literature Connection
Read the Greedy Triangle by Marilyn Burns.
Stop on pages 5, 11, 15, 19, and 23. Allow students to predict what shape he will become.
Have students draw and label polygons as he changes shape.

e. Technology

- Activities in which students classify a set of objects by the number of sides would be good practice for this indicator: http://www.math-play.com/Polygon-Game.html

- Polygons (A flip chart lesson for promethean boards that introduces students to polygons and how to classify them. Register for this site for free.) http://www.prometheanplanet.com/server.php?show=ConResource.9366
- Polygons and Quadrilaterals (A flip chart lesson for promethean boards. Register for this site for free.)

http://www.prometheanplanet.com/server.php?show=ConResource.8261

- Classifying shapes ((A flip chart lesson for promethean boards where students will learn how to classify two-dimensional shapes and discuss the attributes of polygons. Register for this site for free.) http://www.prometheanplanet.com/server.php?show=ConResource.514
- Sorting Polygons (Students identify and classify polygons according to various attributes. They then sort the polygons in Venn Diagrams, according to these attributes. Extensions to fundamental ideas about probability and statistics are also included.) http://illuminations.nctm.org/LessonDetail.aspx?ID=L277
- Name the Polygon (An interactive math lesson about identifying polygons based on their number of sides.) http://www.aaamath.com/geo318-polygons-numbers.html
- Baseball Geometry http://www.factmonster.com/math/knowledgebox/player.html?movie=sfw50646
- Online Geoboard http://standards.nctm.org/document/eexamples/chap4/4.2/part2.htm
- Polygon Capture (Students classify polygons according to more than one property at a time.) http://illuminations.nctm.org/LessonDetail.aspx?ID=L270
- Polygon Game (Students choose which polygon is correct according to their attributes.) http://www.math-play.com/Polygon-Game.html
- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.) http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm
  - SMART Board Interactive Whiteboard Lessons and Resources http://www.scholastic.com/interactivewhiteboards/

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. However, other formative assessment strategies should be used.

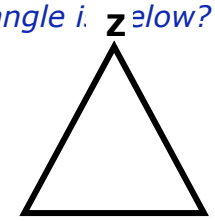
3. Teaching Lesson C

Once the students have an understanding that all three sided polygons are classified as triangles, they can begin classifying triangles by their side lengths and angle measures. Again, the students will need many different visual examples/models for this indicator. The vocabulary is new for 3rd grade students, so ample practice and review will be needed for mastery of these terms. Activities that require students to sort a set of triangles by the length of the sides (scalene, isosceles, equilateral) or by sizes of the angles (acute, obtuse, right) will help students master this indicator.

3-4.5
For this indicator, it is **essential** for students to:

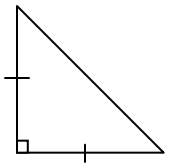
- Understand that an equilateral triangle is a triangle with three equal sides and three equal angles
- Understand that an isosceles triangle has two equal sides and opposite angles are equal
- Understand that a scalene triangle has no equal sides and no equal angles
- Recall that an acute angle is smaller than a right angle
- Recall that a right angle measures 90º and can be shaped like an L.
- Recall that an obtuse angle is larger than a right angle
- Classify triangles by the length of their sides as either scalene, isosceles, or equilateral according and by the sizes of their angles as either acute, right, or obtuse such as:

What type of triangle i[illegible]elow? Acute



- Classify triangles by the length of their sides as either scalene, isosceles, or equilateral according and by the sizes of their angles as either acute, right, or obtuse to solve increasingly more sophisticated problems such as:

Mrs. Jackson asked that John pick two names to describe this triangle.



What two names should he use?

A acute and scalene
B obtuse equilateral
C right scalene
D right and isosceles

a. Indicators with Taxonomy

3-4.5 Classify triangles by the length of their sides as either scalene, isosceles, or equilateral according and by the sizes of their angles as either acute, obtuse, or right. (A2)

Cognitive Process Dimension: Understand
Knowledge Dimension: Factual Knowledge

b. Introductory Lesson

Materials:
Paper triangles- various sizes and shapes-There should be several of each kind, scalene, equilateral isosceles, acute, obtuse and right.

Lesson:
Ask students to identify triangles in the room. Ask: What do they all have in common? Where do you think the word ***triangle*** comes from? What other words do you know that start with ***tri***? What do they have in common with triangles? How do they differ?

Have students work in pairs or trios. Give each group a set of various kinds of triangles. Ask them to sort them any way they want. Ask them what their criteria was for sorting them. Now ask them to sort them another way. Now what is your criteria for sorting them? Have them sort the triangles 3 or for time, asking each time for their rule for sorting them. Write these rules down. Now, tell them that triangles can be classified 6 different ways. Give them the definitions of:

Equilateral triangles- all sides are congruent
Isosceles triangles-exactly 2 sides congruent
Equilateral triangles-no sides are congruent
Acute triangle-all acute angles
Obtuse triangle-has an obtuse angle
Right triangle-has a right angle

Then ask the students to sort the triangles by the length of the sides and label them. Then sort by angles and label them. Ask: Will a triangle ever have 2 obtuse angles? How might you prove it? Will a triangle ever have 2 right angles? How might you prove it?

c. *Misconceptions/Common Errors*

Students often confuse scalene and isosceles triangles.

d. *Additional Instructional Strategies/Differentiation*

Give each student a geoboard. Have them make a triangle on the board. Have them find someone in the room who has a triangle like theirs in one way. Ask: How are they alike? How are they different? Encourage them to use the terms used in the previous lesson. (equilateral, isosceles, scalene, acute, obtuse, and right) Repeat this process several times. Then ask: How many different triangles can you make on your geoboard? Let them experiment with this question. Have them pair up and describe the different triangles they made.

Review the definition of a triangle taught in the first lesson (all triangles have three sides). Have the students add to the definition after what they learned about angles (all triangles have three angles). The teacher will provide a poster labeled with four different types of triangles and their definitions.

A. Equilateral – all sides have equal lengths
B. Isosceles – only two sides have equal lengths
C. Scalene – all three sides have different lengths
D. Right – one angle is a right angle (can be Isosceles or Scalene)

Give each student a cutout of one of the types of triangles (equilateral, isosceles, scalene only). The students will then classify themselves into groups based on the triangle that they have. All isosceles will form one group, etc.
Each student will share the name of their triangle and its attributes (sides and angles). Students can place their triangle in the appropriate category on the poster (#2).

Students go on a triangle hunt in the classroom, around the school, or on the playground. Students should draw the triangles they see, write where they were found it, name the triangle, record number of equal sides and record the types of angles the triangle has. The students will use the Triangle Hunt Classification Chart to record this information.

Give each student an assortment of paper triangles. Students will sort by sides and angles and glue to a class chart in the appropriate

category. The categories in the chart should include: Equilateral, Isosceles, Right Isosceles, Scalene, and Right Scalene.

Students will play "Triangle War". Give each student a stack of cards that include equilateral, isosceles, and scalene triangles. Students pair up to play "Triangle War" where an equilateral triangle beats an isosceles triangle and an isosceles triangle beats a scalene triangle. Each student turns over the top card on their stack. The person who wins the round gets to keep all of the cards. The person who collects all the cards wins.

Go to the web site http://www.origami-instructions.com. Click on Origami for Kids to see instructions for making simple origami structures (dog, boat, butterfly and cup). All of these origami structures involve folding triangles.

e. Technology

- Building with Triangles (Students explore the properties of triangles.) http://illuminations.nctm.org/LessonDetail.aspx?id=U191
- Working with Shapes (Students review basic geometric terms related to triangles. They explore these terms and other geometric concepts by modeling them on the geoboard.) http://illuminations.nctm.org/LessonDetail.aspx?ID=L554
- Ladybug Adventures: Making Triangles (In this activity, students use 45 and 90 degree angles to create triangles, and develop an understanding of the relationship between angles and the shape of a triangle.) http://illuminations.nctm.org/LessonDetail.aspx?ID=L159
- Investigating Shapes (Students identify and recognize triangles using multiple representations, locate triangles in their environment, and construct triangles.) http://illuminations.nctm.org/LessonDetail.aspx?id=U52
- Identify triangles by types of angles http://www.aaamath.com/geo318-triangle-angles.html
- Identify triangles by length of sides http://www.aaamath.com/geo318-triangle-sides.html
- Online Geoboard http://standards.nctm.org/document/eexamples/chap4/4.2/part2.htm
- Geometric Matching (Match names of triangles according to their properties.) http://www.vectorkids.com/vkgeomatching.htm
- What type of triangle? (Students choose from equilateral, isosceles, scalene) http://www.ixl.com/math/practice/grade-3-triangles-equilateral-isosceles-scalene
- What type of triangle? (Students choose from acute, right, obtuse) http://www.ixl.com/math/practice/grade-3-triangles-acute-right-obtuse

- SMART Notebook Lessons/Activities (This site offers choices of grade levels, subject, and teachers can choose state standard correlations. Browse Educator Resources, Lesson Activities for more than Notebook Lessons. This site also offers SMART Response question sets, teacher-created lessons and activities, SMART sync collaboration activities, and SMART Ideas Software activities. Browse by curriculum standards and the website will find correlated activities for the standard you choose.) http://education.smarttech.com/ste/en-US/Ed+Resource/Lesson+activities/Notebook+Activities/Correlated+Search+us.htm

  SMART Board Interactive Whiteboard Lessons and Resources http://www.scholastic.com/interactivewhiteboards/

f. Assessing the Lesson

Formative assessment is embedded within the lesson through questions and observation. However, other formative assessment strategies should be used.

III. Assessing the Module

At the end of this module summative assessment is necessary to determine student understanding of the connections among and between the indicators addressed in this module.

Assessment Guidelines

3-4.1
The objective of this indicator is identify, which is in the "remember conceptual" knowledge cell of the Revised Taxonomy. Conceptual knowledge is not bound by specific examples. Therefore, the student's conceptual knowledge of identifying the radius, diameter, center, and the circumference of a circle should be assessed using a variety of examples. The learning progression to **identify** requires students to recall what the radius, diameter, center, and the circumference of a circle are, and use that understanding to label those parts correctly on a circle. Students generate descriptions and mathematical statements about relationships between and among classes of these properties of a circle (3-1.4). They explain and justify their understanding on the basis of mathematical properties, structures, and relationships (3-3.3). Students use correct, complete, and clearly written and oral mathematical language to pose questions, communicate ideas, and extend problem situations (3-1.5) with their classmates and teacher. Students also analyze information to solve increasingly more difficult

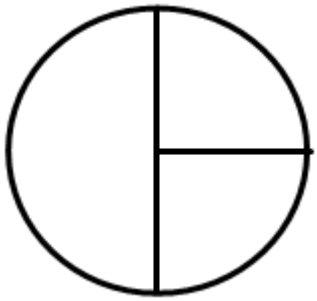
problems (3-3.1) to build a deeper conceptual understanding of these properties.

3-4.2
The objective of this indicator is classify, which is in the "understand conceptual" knowledge cell of the Revised Taxonomy. Conceptual knowledge is not bound by specific examples. Therefore, the student's conceptual knowledge of classifying triangles, quadrilaterals, pentagons, hexagons, and octagons should be assessed using a variety of examples. The learning progression to **classify** requires students to sort polygons based on their number of sides. Students generate descriptions and mathematical statements about relationships between and among classes of polygons. Based on these descriptions, students relate the number of sides to the prefix (quad, penta, hexa and octa) to form the names for group of polygons generate mathematical statements (3-1.4) to describe each category. Students explain and justify answers on the basis of mathematical properties, structures, and relationships (3-3.3) they observe, and use correct, complete, and clearly written and oral mathematical language to pose questions and communicate ideas (3-1.5) with their classmates and teacher. Students then classify other examples of polygons.

3-4.5
The objective of this indicator is classify, which is in the "understand factual" knowledge cell of the Revised Taxonomy. To understand factual goes beyond rote memorization of definition and extends to applying that fact to a variety of examples. The learning progression to **classify** requires students to sort examples of triangles into categories. Students generate descriptions (3-1.4) about the relationships among examples in each category. They explain and justify how they sorted their examples on the basis of mathematical properties, structures and relationships (3-3.3). Students relate the examples in each category to the term scalene, isosceles or equilateral. They continue to examine these categories based on their angles. Students generate mathematical statements (3-1.4) to describe each category. Students use that understanding to classify other examples and use correct, complete, and clearly written and oral mathematical language to pose questions and communicate ideas (3-1.5) with their classmates and teacher. Students explore real world examples of these relationships to gain a deeper understanding of this factual knowledge.

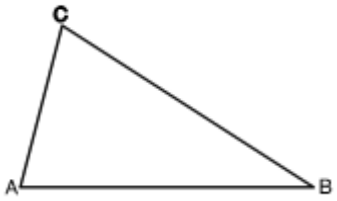
The following examples of possible assessment strategies may be modified as necessary to meet student/teacher needs. These examples are not derived from nor associated with any standardized testing.

1. Use the circle to identify the parts of a circle.



a. Place a red X on the center of the circle.
b. Use a orange crayon or colored pencil to trace the line segment that shows a radius.
c. Use a blue crayon or colored pencil to trace the diameter of the circle.
d. Use a green crayon or colored pencil to trace the circumference of the circle.

2. How would you classify this triangle:



a. scalene, isosceles or equilateral?
b. acute, obtuse or right?

Explain your choices.

3. Use the table to classify each of the polygons according to their number of sides. Write the letter for each shape in the correct place in the table.

Type of Polygon	**Letter inside shape**
Hexagon	
Octagon	
Quadrilateral	
Pentagon	
Triangle