SOUTH CAROLINA SUPPORT SYSTEMS INSTRUCTIONAL GUIDE

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

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.

3-2.7 Recall basic multiplication facts through 12 x 12 and the corresponding division facts. (A1)
3-2.8 Compare the inverse relationship between multiplication and division. (B2)
3-2.9 Analyze the effect that adding, subtracting, or multiplying odd and/or even numbers has on the outcome. (This is also repeated under "Operations - Addition and Subtraction" above.) (B4)

Standard 3-3: The student will demonstrate through the mathematical processes an understanding of numeric patterns, symbols as representations of unknown quantity, and situations showing increase over time.

3-3.1 Create numeric patterns that involve whole-number operations. (B6)
3-3.2 Apply procedures to find missing numbers in numeric patterns that involve whole-number operations. (C3)
3-3.3 Use symbols to represent an unknown quantity in a simple addition, subtraction, or multiplication equation. (B3)

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.

3-5.6 Use analog and digital clocks to tell time to the nearest minute. (B6)
3-5.1 Use the fewest possible number of coins when making change. (B3)

* These indicators are covered in the following 3 Modules for this Nine Weeks Period. Teaching time should be adjusted to allow for sufficient learning experiences in each of the modules.			
Module 2-1 Multiplication and Division			
Indicator	**Recommended Resources**	**Suggested Instructional Strategies**	**Assessment Guidelines**
Module 2-1 Lesson A 3-2.7 Recall basic multiplication facts through 12 x 12 and the corresponding division facts. (A1) 3-2.8 Compare the inverse relationship between multiplication and division. (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	See Instructional Planning Guide Module 2-1 Introductory Lesson A See Instructional Planning Guide Module 2-1, Lesson A Additional Instructional Strategies	See Instructional Planning Guide Module 2-1 Lesson A Assessing the Lesson

Module 2-1 Lesson B 3-2.9 Analyze the effect that adding, subtracting, or multiplying odd and/or even numbers has on the outcome. (This is also repeated under "Operations - Addition and Subtraction" above.) (B4)	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 2-1 Introductory Lesson B	See Instructional Planning Guide Module 2-1 Lesson B Assessing the Lesson

Module 2-2 Multiplication			
Indicator	**Recommended Resources**	**Suggested Instructional Strategies**	**Assessment Guidelines**
Module 2-2 Lesson A 3-3.1 Create numeric patterns that involve whole-number operations. (B6) 3-3.2 Apply procedures to find missing numbers in numeric patterns that involve whole-number operations. (C3)	**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-	See Instructional Planning Guide Module 2-2 Introductory Lesson A	See Instructional Planning Guide Module 2-2 Lesson A Assessing the Lesson

Module 2-2 Lesson B 3-3.3 Use symbols to represent an unknown quantity in a simple addition, subtraction, or multiplication equation. (B3)	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 2-2 Introductory Lesson B	See Instructional Planning Guide Module 2-2 Lesson B Assessing the Lesson

Module 2-3 Time and Money			
Indicator	**Recommended Resources**	**Suggested Instructional Strategies**	**Assessment Guidelines**
Module 2-3 Lesson A 3-5.6 Use analog and digital clocks to tell time to the nearest minute. (B6)	**STANDARD SUPPORT DOCUMENT** http//:www.ed.sc.gov/apps/cso/standards NCTM's Online Illuminations http://illuminations.nctm.org	See Instructional Planning Guide Module 2-3 Introductory Lesson A	See Instructional Planning Guide Module 2-3 Lesson A Assessing the Lesson

Module 2-3 Lesson B 3-5.1 Use the fewest possible number of coins when making change. (B3)	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 2-3 Introductory Lesson B	See Instructional Planning Guide Module 2-3 Lesson B Assessing the Lesson

MODULE

2-1

Major Concept Addressed

Multiplication and Division

This module addresses the following indicators:

3-2.7 Recall basic multiplication facts through 12 x 12 and the corresponding division facts. (A1)

3-2.8 Compare the inverse relationship between multiplication and division. (B2)

3-2.9 Analyze the effect that adding, subtracting, or **multiplying** odd and/or even numbers has on the outcome. (Addition and Subtraction are in module 1-2) (B4)

This module contains 2 lessons. These lessons are **INTRODUCTORY ONLY**. Lessons in S3 begin to build the conceptual foundation students need. **ADDITIONAL LESSONS will be required** to fully develop the concepts.

I. Planning the Module

Continuum of Knowledge

3-2.7 and 3-2.8
In second grade, students interpreted models of equal grouping (multiplication) as repeated addition and arrays as well as interpreting models of sharing equally (division) in as repeated subtraction and arrays.

In third grade, students recall basic multiplication facts through 12 x 12 and the corresponding division facts (3-2.7) and compare the inverse relationship between multiplication and division (3-2.8). Students also generate strategies to multiply whole numbers by suing one single-digit factor and one multidigit factor (3-2.10)

In fourth grade, students apply an algorithm to multiply whole numbers fluently (4-2.3), explain the effect on the product when one of the factors is changed (4-2.4) and generate strategies to divide whole numbers by single-digit divisors (4-2.5).

3-2.9
In second grade, students explore even and odd numbers through patterns as they analyzed numeric patterns in skip counting that uses the numerals 1 through 10 (2-3.1)

In third grade, students analyze the effect that adding, subtracting, or multiplying odd and/or even numbers has on the outcome (3-2.9)

Students use these effects explore operations with whole numbers.

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.*

- *Factors
- *Product
- *quotient
- *divisor
- *dividend
- *Odd
- *Even

II. Teaching the Lesson(s)

1. Teaching Lesson A: Introduction to Multiplication

Teacher Notes:

Third grade students should be able to explain the meaning of multiplication and division, begin to recall multiplication facts through 12 x 12 and the corresponding division facts**.** Students should be given experiences that foster conceptual understanding and connect to the symbolic. Third grade students should begin with concrete and pictorial representations, such as rectangular arrays and repeated addition using one and two-digit numbers.

Students should be given opportunities to come to conclusion that the sum of two odd or two even numbers will be even; while the sum of one odd and one even will be odd. The same is true for subtraction. So, for example, if they are adding two even numbers and get an odd number answer, they may conclude that the answer is incorrect. It is extremely important that students be provided experiences that enable them to come to those conclusions rather than being provided facts that they must memorize.

3-2.7 Recall basic multiplication facts through 12 x 12 and the corresponding division facts. (A1)

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

- Understand that multiplication is repeated addition
- Understand that division is repeated subtraction
- Use the concept of the commutative property to understand multiplication facts
- Understand the relationship between multiplication and division

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

3-2.8 Compare the inverse relationship between multiplication and division. (B2)

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

- Apply basic multiplication and division facts
- Use concrete representations of multiplication and division facts to build conceptual understanding of the inverse relationship
- Understand that multiplication can be used to check division problems and division can be used to check multiplication

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

a. Indicators with Taxonomy

3-2.7 Recall basic multiplication facts through 12 x 12 and the corresponding division facts. (A1)

Cognitive Process Dimension: Remember
Knowledge Dimension: Factual Knowledge

3-2.8 Compare the inverse relationship between multiplication and division. (B2)

Cognitive Process Dimension: Understand
Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson

In second grade, students were introduced to the concept of multiplication and division with contextual problems that involved equal groupings. In third grade, multiplication and division should be reintroduced with contextual problems. Start with equal grouping problems that they did in second grade and then add comparison problems.

Equal grouping problem:
Debbie has 3 boxes of crayons with 12 crayons in each box. How many crayons does Debbie have?

Brock has 24 cookies he wants to share with 6 of his friends. How many cookies will each friend receive?

Brock has 24 cookies. He wants to put 6 in each bag. How many bags will he need?

Comparison Problem:
Sandra picked 8 apples. Sara picked 3 times as many. How many apples did Sara pick?

Sara picked 24 apples. She picked 3 times as many as Sandra. How many apples did Sandra pick?

Have students work in pairs to solve the problems with manipulatives. Ask: What strategy did you use to solve the problem? How do you know it is correct? What other way might you solve this problem? Have the students share their strategies. Encourage them to ask questions about the strategies if they don't understand. Keep a "Strategies" poster of all the strategies that work. Encourage them to try other strategies if they understand them.

Some may do repeated addition, some may skip count and some may add each one. Explain that these are all ways to represent multiplication problems. Show them the way to write the multiplication sentence for the problem and how it is represented as an array. Tell them that they will continue learning about multiplication all year.

The most important part of this lesson is the discussion. It is ok if your class only completes one or two problems this way.

After students have a conceptual understanding of multiplication from experiences with word problems, then they can build arrays with manipulatives and then with pictures.

Part Two of Lesson:
Materials:
Color tiles
1 inch grid paper
color pencils or crayons

Lesson:
Give each group of students (pairs or trios) a number such as 10, 12, 15, 20, etc and ask them to use that number of color tiles to build as many rectangles that they can. Then have them copy it onto the grid paper and write the corresponding multiplication and division problem. Explain to them that the numbers they multiply are the **factors** and the answer is the **product**. The answer to the division problem is the **quotient**. The number you are dividing into is the **dividend** and the number you are dividing by is the **divisor.**

Have them share their drawings. Ask: What are you noticing about the different numbers? (Some have more arrays than others) How many arrays did you find? How do you know you have all of them? What might be the reason some groups have more arrays than others?

c. *Misconceptions/Common Errors*

Students have explored inverse relationships in 2nd grade with addition and subtraction. They may confuse those operations with the inverse relationship between multiplication and division.

d. *Additional Instructional Strategies/Differentiation*

(1) Materials Needed:

- Counters
- Pre-made problem cards

"Learning About Division" is cited in the Elementary and Middle School Mathematics: Teaching Developmentally and is a wonderful activity that does promote understanding of division. (Van de Walle, p. 148) Children

use counters to make equal sets. These sets are used to make division problems, as well as multiplication problems. The student will take the total number of counters. Then place in different numbers of sets. They may have a total of 32 counters. They will experiment with placing these counters in groups of 2, 3, 4, 5, 6, 7, 8 ,etc. Then, the children will write the corresponding division and multiplication problems. Also, division problems can be placed on index cards or called out by the teacher. This also can work for missing factors.

Example: John has 12 cookies to be shared equally among three friends. How many cookies will each friend get?

$12 \div 3 = 4$ $\quad$ $4 \times 3 = 12$

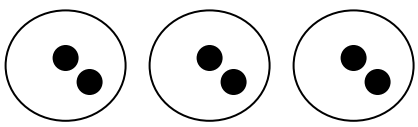
$12 \div 4 = 3$ $\quad$ $3 \times 4 = 12$

(2) Too Many Kangaroo Things To DO

1. Use Too Many Kangaroo Things To Do by Stuart J. Murphy as an interactive read aloud to introduce multiplication.
2. Before reading, the teacher will cover the answers on pages 8, 14, 18, and 26 using sticky notes.
3. The teacher will have the students either do mental math or illustrate each problem. The teacher will then reveal answers/illustrations to the students for them to check their work. * Focus on how to construct a multiplication number sentence (use the vocabulary words factor and product)
4. Look at things in the real world – shoes, tricycle wheels, and table legs – and help the students make a list of items that come in twos, threes and fours. Ask questions like, if we have three tables, how many table legs do we have? Have students construct the appropriate multiplication number sentences. See page 32 in Too Many Kangaroo Things To Do.

(3) Equal Groups

1. Give students some counters. Have the students use the counters to make groups to solve multiplication problems. For example, tell the students to make three groups of two.



Have the students solve for the product. Write the number sentence.

2. Have the students practice doing the following for different multiplication facts.
   A. Use counters to make groups.
   B. Draw a picture to represent facts.
   C. Write a multiplication sentence.

(4) Arrays

1. Give students some counters. Have the students use the counters to make arrays to solve multiplication problems. Introduce the vocabulary words row and column. For example, the teacher will make three rows of two and then two columns of three to model arrays. The teacher will write the multiplication sentence for each. Students will count the counters to prove the product. Have students discuss the similarities and differences between the two array illustrations. Teachers will post the formula R X C = A (Row X Column = Answer) Have students brainstorm an acronym to help them remember rows x columns. Ex: Reese Cups
2. Have the students practice doing the following for different multiplication facts.
   A. Use counters to make arrays.
   B. Draw a picture of the array.
   C. Write multiplication sentence that reflects R X C = A.

(5) Repeated Addition

1. Give students some counters. Have the students use the counters to make groups to solve multiplication problems. Have the students solve for the product. Write the multiplication number sentence.
2. Using the same multiplication fact show the students how you can use the repeated addition strategy to solve for the same fact. For example, if the students make 4 groups with 3 in each group the multiplication sentence would be 4 X 3 = 12. The repeated addition sentence would be 3 + 3 + 3 + 3 = 12.
3. Repeat the process for arrays.
4. Have the students practice doing the following for different multiplication facts.
   A. Use counters to make groups.
   B. Use counter to make arrays.
   C. Draw a picture to represent facts in groups and arrays.
   D. Write multiplication sentence in R X C = A format.
   E. Write repeated addition sentence.

(6) Skip Counting on a Number Line

1. Give students some counters. Have the students use the counters to make groups to solve multiplication problems. Have the students solve for the product. Write the multiplication number sentence.
2. Using the same multiplication fact show the students how you can use the repeated addition strategy to solve for the same fact. For example, if the students make 4 groups with 3 in each group the multiplication sentence would be 4 X 3 = 12. The repeated addition sentence would be 3 + 3 + 3 + 3 = 12.
3. Repeat the process for arrays.
4. Have the students practice doing the following for different multiplication facts.
   a. Use counters to make groups.
   b. Use counter to make arrays.
   c. Draw a picture to represent facts in groups and arrays.
   d. Write multiplication sentence in R X C = A format.
   e. Write repeated addition sentence.

e. Technology

- All About Multiplication (In this unit, students explore several meanings and representations of multiplication (number line, equal sets, arrays, and balanced equations). They also learn about the order (commutative) property of multiplication, the results of multiplying by 1 and by 0, and the inverse property of multiplication. In addition, students write story problems in which the operation of multiplication is required. Opportunities to connect with literature are presented in several of the lessons. A bibliography of children's literature with a multiplication focus is provided.) http://illuminations.nctm.org/LessonDetail.aspx?id=U109
- Arithmetic Four (Players practice multiplication and/or division facts. Choose time limits and difficulty level as well as multiplication or division.) http://www.shodor.org/interactivate/activities/ArithmeticFour/
- Multiplication Facts Practice from zero to 12 http://www.aaastudy.com/mul39ex2.htm
- http://www.bbc.co.uk/schools/ks1bitesize/numeracy/multiplication/index.shtml
- Division Mine (Students practice division facts. Choose from three levels. Facts are related to pictures with explanations about sharing.) http://www.bbc.co.uk/schools/ks1bitesize/numeracy/division/index.shtml
- Math Baseball (Practice multiplication or division facts. Choose from four different levels.) http://www.funbrain.com/math/index.html
- Soccer Shootout (Choose "easy" level for students to practice facts.) http://www.funbrain.com/fractop/index.html
- Tic Tac Toe Squares (Students practice facts. Choose the operation and level of difficulty.) http://www.funbrain.com/tictactoe/index.html
- Multiplication Grand Prix (Facts practice.)
- Meteor Multiplication (Facts practice.) http://www.arcademicskillbuilders.com/games/meteor/meteor.html
- Drag Race Division (Facts practice.) http://arcademicskillbuilders.com/games/drag_race/drag_race.html
- Demolition Division (Facts practice.) http://www.arcademicskillbuilders.com/games/demolition/demolition.html
- Lemonade Larry (Students determine how much a certain number of cups of lemonade costs.) http://www.prongo.com/lemon/game.html
- Inverse Operations (students are given a multiplication or division fact and have to enter it's inverse. Enter site as guest.) http://www.ixl.com/math/practice/grade-3-relate-multiplication-and-division
- Interactive Multiplication Table http://www.mathcats.com/explore/multiplicationtable.html
- Fun 4 The Brain Multiplication! (Review and practice multiplication facts. Choose from a variety of games.) http://www.fun4thebrain.com/mult.html

- Fun 4 The Brain Division! (Review and practice division facts. Choose from a variety of games.) http://www.fun4thebrain.com/division.html
- Fly a Kite (Multiplication and Division fact families. Help students to see the relationship among the two.) http://www.harcourtschool.com/activity/fly_a_kite/
- 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/

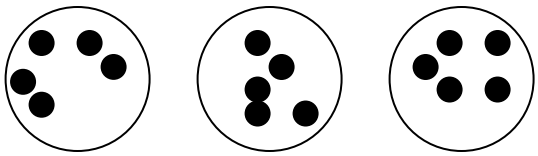
f. Assessing the Lesson

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

Which number sentence would help you decide how many cupcakes you need to buy if you have 4 friends and each friend needs 2 cupcakes?

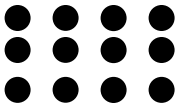
A. 4 + 2 = 6
B. 4 X 2 = 8
C. 4 – 2 = 2
D. 4 ÷ 2 =

Which number sentence correctly matches the illustration?



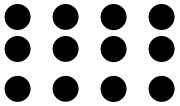
A. 3 X 4 = 12
B. 5 X 4 = 20
C. 3 X 5 = 15
D. 3 X 6 = 18

Which number sentence correctly matches the array?



A. 3 X 2 = 6
B. 4 X 3 = 12
C. 3 X 4 = 12
D. 3 X 3 = 9

Which number sentence matches the array?



A. 4 X 4 = 16
B. 3 + 4 = 7
C. 6 + 6 = 12
D. 3 + 3 + 3 + 3 = 12

Which one would you use to solve 2 X 5?

A. 3, 6, 9, 12, 15
B. 2, 4, 6, 8, 10
C. 6, 12, 18, 24, 30
D. 4, 8, 12, 16, 20

2. Teaching Lesson B

3-2.9 Analyze the effect that adding, subtracting, or **multiplying** odd and/or even numbers has on the outcome. (Addition and Subtraction are in module 1-2) (B4)

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

- Understand the characteristics of even numbers
- Understand the characteristics of odd numbers
- Explore the following odd-even relationships

even + even = even	even – even = even	even × even = even
odd + odd = even	odd – odd = even	odd × odd = odd
even + odd = odd	even – odd = odd	even × odd = even
odd +even = odd	odd – even = oddd	odd × even = even

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

- Recite the odd-even relationships

a. Indicators with Taxonomy

3-2.9 Analyze the effect that adding, subtracting, or **multiplying** odd and/or even numbers has on the outcome. (Addition and Subtraction are in module 1-2) (B4)

Cognitive Process Dimension: Analyze
Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson

Materials:

3 sets of multiplication problems:
all even numbers
all odd numbers
even and odd numbers mixed

Lesson:

Draw 2 big Venn diagrams on the board, one for problems with even numbers only and one for problems with odd numbers only. Do not label them. Play "Guess My Rule" with the class. Place 2 expressions in each section. Don't forget the overlap! Tell the class that they are going to guess the rule for each part of

the Venn diagram. Give them a list of expressions to choose from. Have a student pick one of the equations and guess which section it would go in. Ask: Why did you pick that section? Keep doing this until there are about 10 expressions in each section. Ask: What might be the labels for each section?

After they have correctly identified the labels, pass out the sets of problems, giving 1/3 of the class all even number problems, 1/3 of the class all odd number problems and 1/3 of the class mixed. Have them work the problems. Then have them pair up with someone who has the same type of problem. Ask them to look at their problems and see what patterns they are noticing. Give them 5-10 minutes to discuss this with their partner. Then have them share with the class. After everyone has had a chance to share, ask: What rule might we come up with as a class about multiplying odd and even numbers? Have the pairs group with another pair to make a quartet to answer this question. Discuss whole group.

c. *Misconceptions/Common Errors*

Students may be confused when exploring these even-odd relationships; therefore, students should be give sufficient opportunities to explore these relationships over time.

d. *Additional Instructional Strategies/Differentiation*

These relationships can be revisited throughout the year by asking students questions about these relationships when performing operations (multiplication, subtraction and additions). Ask question such as "Is this number even or odd? Can these two numbers result in an even (odd) answer? Does this answer make sense?"

e. Technology

- The Product Game (A series of lessons working with multiplication. While this series focuses on factors and products, bring in odd and even factors/products.) http://illuminations.nctm.org/LessonDetail.aspx?id=U100
- Euclid's Elements (See Propositions 28 and 29 for multiplying odd/even numbers.) http://aleph0.clarku.edu/~djoyce/java/elements/bookIX/bookIX.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

Assessment Guidelines

3-2.7
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 recall that equal grouping (multiplication) is repeated addition and arrays and that sharing equally (division) is repeated subtraction and arrays. Students explore multiplication and division problems in context then analyze information (3-1.1) to generate mathematical statements (3-1.4) related to multiplication and division facts. They should use correct, complete and clearly written and oral language (3-1.5) to communicate their understanding. Students use their understanding the meaning of the terms divisor, factors, product, quotient and dividend to develop multiplication and division facts and develop strategies to help them remember and retain these facts.

3-2.8
The objective of this indicator is to compare which is in the "understand conceptual" knowledge cell of the Revised Taxonomy. To compare means to determine relationship between two ideas. The learning progression to **compare** requires students to understand the meaning of multiplication and division. Students explore concrete representations and analyze information (3-1.1) to construct arguments (3-1.2) about the relationship between multiplication and division. As students explore these relationships, they explain and justify their answers (3-1.3) to their classmates and their teachers. As students make comparisons, they use correct, complete and clearly written and oral language to communicate their understanding of this relationship (3-1.5).

3-2.9
The objective of the indicator is to analyze which is in the "analyze conceptual" knowledge cell of the Revised Taxonomy. To analyze means to determine relevant features and relationships. The learning progression to **analyze** requires students to recall the characteristics of even and odd numbers. Students explore even-odd relationships by examining these relationships in contexts. They analyze information (3-1.1) from these explorations, generalize connections (3-1.6) between even and odd numbers then explain and justify their answers (3-1.3) to their classmates and their teachers. They use correct, complete and clearly written and oral language to communicate their ideas (3-1.5) and generate mathematical statements (3-1.4) about these even-odd relationships.
and division facts and develop strategies to help them remember and retain these facts.

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. 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.

Assessment item #1 adapted from Grades 3-5 Mathematics Assessment Sampler, Jane D. Gawronski, editor. 2005. Page 32.

1. Max bought 48 plants for his garden. He plans to have 8 plants in each row. How many rows will he have in his garden?

2. Write a multiplication sentence and a division sentence that relates to the array.

Assessment item #3 and #4 adapted from Grades 3-5 Mathematics Assessment Sampler, Jane D. Gawronski, editor. 2005. Page 28-29.

3. A schoolyard contains only bicycles and wagons. On Monday there were 3 bicycles and 2 wagons in the schoolyard. How many wheels were in the schoolyard?

4. On Tuesday, the total number of wheels in the schoolyard was 24. There are several ways this could happen.

   a. How many bicycles and how many wagons could there be for this to happen? Show your work.
      Number of bicycles _____
      Number of wagons _____

   b. Find another way that this could happen. Show your work.
      Number of bicycles _____
      Number of wagons _____

Assessment item #5 adapted from Grades 3-5 Mathematics Assessment Sampler, Jane D. Gawronski, editor. 2005. Page 20.

5. Jose created a game using two number cubes of different colors. The red cube has EVEN numbers and the green cube has ODD numbers. The players will roll the cubes and find the product of the numbers on each cube.

a. Describe the types of products that will be created with these number cubes.

b. Give some examples of number facts with the products that a player might roll.

c. Jose created another game and had odd numbers on both cubes. What types of products would these cubes produce?

MODULE

2-2

Multiplication

This module addresses the following indicators:

3-3.1 Create numeric patterns that involve whole-number operations. (B6)
3-3.2 Apply procedures to find missing numbers in numeric patterns that involve whole-number operations. (C3)
3-3.3 Use symbols to represent an unknown quantity in a simple addition, subtraction, or **multiplication** equation. (B3)

These indicators were also addressed in the first nine weeks in module 1-3. These have an emphasis on multiplication.

This module contains 2 lessons. These lessons are **INTRODUCTORY ONLY**. Lessons in S3 begin to build the conceptual foundation students need. **ADDITIONAL LESSONS will be required** to fully develop the concepts.

I. Planning the Module

Continuum of Knowledge

3-3.1 and 3-3.2
In second grade, students analyzed numeric patterns in skip counting that used the numerals 1 through 10 (2-3.1) and analyzed relationships to complete and extend growing and repeating patterns with numbers, symbols and objects (2-3.3)

Third grade is the first time students are formally introduced to patterns involving operations. They create numeric pattern involving whole number operations (3-3.1) and apply procedures to find the missing number in numeric patterns that involve whole number operations (3-3.2).

In fourth grade, students analyze numeric, nonnumeric and repeating patterns involving all operations and decimal patterns through hundredths (4-3.1). They also generalize a rule for numeric, nonnumeric and repeating patterns involving all operations.

3-3.3
In second grade, students had experiences generating strategies for addition and subtraction pairs of two-digit whole numbers with regrouping.

In third grade, students use symbols to represent unknown quantities in addition, subtraction, and multiplication equations.

In fourth grade, students translate among letters, symbols and words to represent quantities in simple mathematical expression or equations (4 - 3.4). They also apply procedures to find the value of an unknown letter or symbol in a whole number equation (4-3.5)

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.*

- Whole number operation
- *Numeric pattern
- *Term
- *Missing term
- *Numeric pattern
- *Equation

- *Balance
- *Equivalency

II. Teaching the Lesson(s)

1. Teaching Lesson A: What Comes Next?

Teacher Notes

Third grade students are expected to create patterns that involve the whole-number operations of addition and subtraction and basic multiplication. This should include situations where elements of the pattern are missing either within the sequence or at the end of the sequence.

Third graders use symbols to represent unknown quantities in simple addition, subtraction, and multiplication equations. Students use symbols to represent specific unknown quantities such as 3 x ** = 12. Students need to understand that the symbol is a placeholder for an unknown quantity and that for each equation or problem-solving situation, the symbol may represent a different value. Students should start with simple number sentences to ensure understanding. This does NOT mean that third grade student solve equations. It simply means that they begin to understand that a symbol can be used to represent a quantity in an equation and that the value of the symbol changes as the problem changes. The term "equation" is used to mean two mathematical expressions that equal (equation) each other.

3-3.1 Create numeric patterns that involve whole-number operations. (B6)

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

- Create numeric patterns involving addition and subtraction. An example is 5, 8, 7, 10, 9, _____. Students add 3 for the next term then subtract 1 for the next term then they repeat.
- Create numeric pattern involving basic multiplication (see 3-2.7)
- Communicate their pattern in written and oral form
- Use concrete and/or pictorial models to explore patterns

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

- Combine operations to get the next term. An example is 5, 11, 23, _____. The pattern is to multiply by 2 and add 1 to get to the next term then they repeat.

3-3.2 Apply procedures to find missing numbers in numeric patterns that involve whole-number operations. (C3)

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

- Create numeric patterns involving addition and subtraction. An example is 5, 8, 7, 10, 9, _____. Students add 3 for the next term then subtract 1 for the next term then they repeat.
- Create numeric pattern involving basic multiplication (see 3-2.7)
- Communicate their pattern in written and oral form
- Use concrete and/or pictorial models to explore patterns

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

- Combine operations to get the next term. An example is 5, 11, 23, _____. The pattern is to multiply by 2 and add 1 to get to the next term then they repeat.

a. Indicators with Taxonomy

3-3.1 Create numeric patterns that involve whole-number operations. (B6)
Cognitive Process Dimension: Create
Knowledge Dimension: Conceptual Knowledge

3-3.2 Apply procedures to find missing numbers in numeric patterns that involve whole-number operations. (C3)
Cognitive Process Dimension: Apply
Knowledge Dimension: Procedural Knowledge

b. Introductory Lesson

This is an introductory lesson to get the students looking at numerical patterns. Students might need to be exposed to more types of numerical patterns before they move on to the second part of this lesson and create their own patterns.

Have students create a chart with 2 rows. Label one row "side of square in cm". Label the next row "Perimeter". Have the students put 1, 2, 3, 4, and 5 in the "sides" row. Then have them complete the "perimeter" row with the correct corresponding number. Ask: What are you noticing about the two rows? (The bottom one is 4 times the top one. The top one increases by 1 and the bottom one increases by 4.) What would be the bottom number when the top number is 10? How do you know?

Have students work in pairs. Ask each student to make a numerical pattern. Then have them exchange papers and see if there partner can figure out the pattern. Then ask them to create another one with numbers missing, exchange papers again and see if they can figure out the pattern and the missing numbers.

c. *Misconceptions/Common Errors*

Students often have a common misunderstanding with regard to the concept of equivalence. Prior to third grade, students may have simply written an answer after the equal sign. Now, students must clearly understand that the equal sign does not mean "perform an operation". It means that there is a relationship of equivalence between the two expressions on either side of that equal sign.

Students may not understand that the pattern has to be consistent between adjacent numbers.

d. *Additional Instructional Strategies/Differentiation*

Having student create pictorial models not only incorporates the multiple representations but gives an additional entry point for students who may struggle with addition, subtraction and multiplication.

Students may not understand that the pattern has to be consistent between adjacent numbers.

e. Technology

- Chairs Around the Table (Identify and extend a pattern involving the number of chairs that can be placed around a series of square tables. Describe patterns using words or symbols.) http://illuminations.nctm.org/LessonDetail.aspx?id=L627
- Function Machine (Students can be given the function rule and find the input or output or the level can be set to find the function.) http://teams.lacoe.edu/documentation/classrooms/amy/algebra/3-4/activities/functionmachine/functionmachine3_4.html
- Function Machine from National Library of Virtual Manipulatives http://nlvm.usu.edu/en/NAV/frames_asid_191_g_3_t_1.html
- Stop that Creature! (Students figure out the rule that runs the machine.) http://pbskids.org/cyberchase/games/functions/functions.html
- Missing Addend (Use a procedure to find the missing addend.) http://www.harcourtschool.com/activity/show_me/e453.htm

- Finding a Missing Number in a Sequence (Tutorial, practice, and game) http://www.aaastudy.com/pat_by4.htm
- 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: Creating Equations

3-3.3 Use symbols to represent an unknown quantity in a simple addition, subtraction, or **multiplication** equation. (B3)

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

- Understand that the symbol is a placeholder for an unknown quantity
- Understand that the symbol represents a different number each equation or problem situation
- Understand that the equation sign represent balance between the two sides of the equation
- Explore these symbols in the context of story problems.
- Write number sentences
- Use the symbol to represent the unknown quantity in different positions. For example,
  - ↑ x 3 = 6
  - 3 +↑ = 5
  - 7 – 2 =↑

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

- Use inverse operations to solve for the unknown quantity

a. Indicators with Taxonomy

3-3.3 Use symbols to represent an unknown quantity in a simple addition, subtraction, or **multiplication** equation. (B3)

Cognitive Process Dimension: Apply
Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson

Use statements like these:

- Eddie has 5 times as many runs as Tom.
- Darren ate twice as many oysters as Bobby.
- Bobby made 4 times as many points as Darren.

Show one of the statements to the class. Tell them that mathematicians like to represent statements like this in mathematical terms. Sometimes, they use letters (also known as variables) to represent different people or objects. Ask: How might mathematicians write this statement? Pick answers that make sense and write them next to the statement.

Ex: Eddie has 5 times as many runs as Tom.
E = 5 X T or E = T X 5
Then ask: If Tom has 2 runs, how many does Eddie have? How do you know? What strategy did you use to find your answer? Make a T chart with E on one side and T on the other. Put numbers under each side and have them figure out the corresponding number on the other side.

Repeat this activity with several more statements. Then have the students work in pairs or trios to create some of their own statements and mathematical equations that match.

c. *Misconceptions/Common Errors*

Students often have a common misunderstanding with regard to the concept of equivalence. Prior to the third grade, students may have simply written an answer after the equal sign. Now, students must clearly understand that the equal sign does not mean "perform an operation". It means that there is a relationship of equivalence between the two expressions on either side of that equal sign.

Students typically view the equals sign as a symbol that separates the problem from the answer. It is important that students see and understand that there is a relationship between the expressions on each side of an equals sign. Instead of viewing = as meaning an answer is coming, help students view the equals sign as meaning "is the same as." A good starting point to develop this

understanding is to explore equations as true or false. Example: 4 + 1 = 6 8 = 10 – 1 5 + 4 = 9

d. *Additional Instructional Strategies/Differentiation*

Students should start with simple story problems and number sentences to ensure understanding.

e. Technology

- Write variable equations from word problems (enter site as guest) http://www.ixl.com/math/practice/grade-3-write-variable-equations-to-represent-word-problems
- 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

Assessment Guidelines

3-3.1

The objective of this indicator is to create which is in the "create conceptual" knowledge cell of the Revised Taxonomy. To create means to put ideas together into a new structure; therefore, students use prior knowledge to create new numeric patterns. The learning progression to **create** requires students to recall basic addition, subtraction and multiplication facts and understand what a pattern is. Where appropriate, students use concrete and/or pictorial models to explore number relationships in order to develop a pattern. As students analyze information (3-1.1) from these experiences,

they generate mathematical statements (3-1.4) about the relationships they observe then explain and justify their pattern (3-1.3) to their classmates and their teachers. Students recognize the limitations of various strategies and representations (3-1.8) and use correct, complete and clearly written and oral language to communicate their ideas (3-1.5).

3-3.2
The focus of the indicator is for students apply which is in the "apply procedural" knowledge cell of the Revised Taxonomy. Although, the focus of the indicator is procedural, the learning progression should integrate strategies that encourage students to balance procedural knowledge with their conceptual knowledge. The learning progression to **apply** requires student to recall and understand the meaning of pattern. Students analyze information (3-1.1) from the pattern and use their understanding of whole number operations to determine the relationship between numbers. They should use correct, complete and clearly spoken or written language (3-1.5) to explain and justify their answers to their classmates and teacher on the basis of properties and relationships (3-1.3).

3-3.3
The objective of the indicator is to use which is in the "apply conceptual" knowledge cell of the Revised Taxonomy. Applying conceptual goes beyond replacing a missing number with a symbol. Conceptual knowledge is not bound by specific examples; therefore, students should apply their understanding of unknown quantity in a variety of situations. The learning progression to **use** requires students to explore real world problems and analyze information (3-1.1) from the problem to determine known and unknown quantities in the problem. Students generate descriptions or mathematical statements (3-1.4) about the relationship between the known and unknown quantities. They explain and justify their answers (3-1.3) to their classmates and their teacher. Students explore the use of the same symbols in different problems to build a foundational understanding of the concept of variables.

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. 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.

The following assessment item #1 is adapted from Grades 3-5 Mathematics Assessment Sampler. Jane D. Gawronski, editor. National Council of Teachers of Mathematics, 2005. Page 51.

1. The table shows how much money Harold's Produce Store can make by selling boxes of fruit.

Number of Boxes Sold	**Money Made**
1	$4
3	$12
5	$20
7	$28

If the pattern in the table continues, how much can the store make by selling 9 boxes? _____ By selling 12 boxes? _____

2. Consider the following pattern: 1, 2, 4, 8, 16, 32…
What situation could be represented by this pattern?

3. Mrs. Jones is 4 times as old as Kelly. Which expression would you use to find Mrs. Jones's age, if ☐ = Kelly's age? Explain your reason in words or drawings.

☐ - 4 ☐ x 4 4 ÷ ☐ 4 + ☐

MODULE

2-3

Time and Money

This module addresses the following indicators:

3-5.6 Use analog and digital clocks to tell time to the nearest minute. (B6)
3-5.1 Use the fewest possible number of coins when making change. (B3)
3-5.7 Recall equivalencies associated with time and length**: 60 seconds = 1 minute** and 36 inches = 1 yard.

This module contains 2 lessons. These lessons are **INTRODUCTORY ONLY**. Lessons in S3 begin to build the conceptual foundation students need. **ADDITIONAL LESSONS will be required** to fully develop the concepts.

I. Planning the Module

Continuum of Knowledge

3-5.1
In second grade, students used counting procedure s to determine the value of a collection of coins and bills (2-5.1) used coins to make change up to one dollar (2-5.2).

In third grade, students use the fewest possible number of coins when making change (3-5.1).

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

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.*

- *Fewest possible
- *Changes
- *Analog
- *Digital
- *Nearest Minute (closest, almost)
- *Second
- *Minute

II. Teaching the Lesson(s)

1. Teaching Lesson A

Teacher Notes:

Digital and analog timepieces are part of the children's world, and they should learn to read time with both. For both digital and analog devices, the underlying concept is the constant passing of seconds, minutes, and hours. The digital clock shows the current time only. It permits students to read times easily but does not relate times very well. To know that a digital reading of 7:58 is nearly 8 o'clock, the child must know that there are 60 minutes in an hour, that 58 is close to 60, and that 2 minutes is not a very long time. An analog clock shows current time but also does more. The 12 numerals and moving hands enable children to note the beginning and ending times for an event. When a parent says "It is 2:00; we have 16 minutes before the movie begins at 2:16," a clock face makes it easy to see 2:00 and the distance the minute hand must move to reach 2:16. It shows "close to" times without the need for understanding big numbers or even how many minutes in an hour.

Students benefit when asked to predict the reading on a digital clock when shown an analog clock, and vice versa; set an analog clock when shown a digital clock. This can be done with both one-handed and two-handed clocks.

Use two real clocks, one with only an hour hand and one with two hands. (Break off the minute hand from an old clock.) Cover the two-handed clock. Throughout the day, direct attention to the one-handed clock. Discuss the time in approximate language. Have students predict where the minute hand should be. Uncover the other clock and check.

3-5.6 Use analog and digital clocks to tell time to the nearest minute. (B6)

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

- Understand that a digital clock shows the current time only
- Understand that a analog clock shows past, present and future times
- Understand that five minutes intervals contain five individual marks – each representing one minute
- Understand the meaning of "closest to" or "nearest to"
- Match a time given on a digital clock with the time on an analog clock and vice-versa

For this indicator, it is **not essential** for students to:
- Determine elapsed time

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

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

3-5.7 Recall equivalencies associated with time and length: 60 seconds = 1 minute and 36 inches = 1 yard
Cognitive Dimension: Remember
Knowledge Dimension: Factual

3-5.6 Use analog and digital clocks to tell time to the nearest minute. (B6)
Cognitive Process Dimension: Create
Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson
Materials:
- 2 analog clocks- one with both hands and one with the minute hand missing
- 1 digital clock

Lesson:
Ask: What do you know about telling time? (Check at this time to see where they are about understanding the concept of time.)
Ask: Have you ever heard the expression: "Just a minute!" or has your mom ever said: "We'll be leaving in a minute!" How long do you think a minute really is?
Ask the students to stand up. Then tell them that you want them to stand for one minute. When you say go, have them stand until they think one minute has passed and then sit down. Make a mental note of who sits down closest to one minute. After everyone has sat down, tell them who was the closest. Try this one or two more times.

Show them an analog clock with a second hand on it. Have them watch the second hand go all the way around for one minute. Watch it several times but starting at different spots. Ask: What

happens to the minute hand every time the second hand goes around one time? Show them the minute lines between the numbers and explain what each one stands for.

Ask: What happens to the hour hand as the minute hand moves around the clock? Let them experiment with clocks to check their answer.

Use the analog clock with only the hour hand. Place it at different spots and ask them to guess what time it is. They should say things like "a little after 4" or " close to 6 o'clock".
Have three clocks in the room, one analog with only the hour hand, one with both hands and one digital. Keep the analog with both hands and the digital one covered. Periodically during the day, ask them to look at the uncovered clock and guess what time it is. Then lift the covers on the other two clocks and see how close they are.

c. *Misconceptions/Common Errors*

Students may struggle with the idea of nearest to when using a digital clock because it only shows current time. For example, it may be difficult for them to know that 7:58 is almost 8:00. This requires them to know that there are 60 minutes in an hour, 58 is close to 60 and that 2 minutes isn't a long time.

d. *Additional Instructional Strategies/Differentiation*

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

e. Technology

Virtual manipulatives should NOT take the place of concrete manipulation of objects/materials. Once conceptual understanding has been reached, you may move to pictorial representations and then virtual manipulatives. Concrete manipulatives should be the focus of learning to build conceptual understanding. Real life situations/representations are critical for conceptual understanding.

- Time Concentration (Match the digital and analog times to the nearest minute.) http://www.harcourtschool.com/activity/con_math/g03c05.dcr
- Telling Time with the Grouchy Ladybug (Online lesson for telling time. Adjust directions so that students read clocks to the nearest minute.) http://askeric.org/cgi-bin/printlessons.cgi/Virtual/Lessons/Mathematics/Measurement/MEA0200.html

- Telling Time Game http://www.harcourtschool.com/activity/telling_time_gr3/
- Time to the Minute (Use the recording sheet to keep track of time.) http://www.harcourtschool.com/activity/elab2004/gr3/17.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/
- Clockworks (Choose level of difficulty. Place hands on the clock in the correct position to match the given time.) http://www.mrnussbaum.com/clockworks/index.html
- Module on Time (Includes a pretest. Not all pieces of this series matches SC 3rd grade indicators.) http://eisenhowermathematics.truman.edu/pdfs/Northeast%20Module%20Completed.pdf
- Clockwork: The Time Telling Game (Click on the clock that shows the correct time.) http://www.kidsnumbers.com/clock-work.php

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

Teacher Notes:

The focus in third grade is to make change using the fewest number of coins possible. Students should be provided experiences with realistic-looking models of coins and bills as well as real coins. Making change and then keeping track of the coins used can be used as a tool to challenge students to determine whether or not there are

other combinations that require fewer coins to achieve the same results. This should be related to real world situations where clerks need to give a customer the fewest number of coins when making change – both from the clerk's efficiency perspective and for the customer's convenience.

3-5.1 Use the fewest possible number of coins when making change. (B3)

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

- Understand that a digital clock shows the current time only
- Understand that a analog clock shows past, present and future times
- Understand that five minutes intervals contain five individual marks – each representing one minute
- Understand the meaning of "closest to" or "nearest to"
- Match a time given on a digital clock with the time on an analog clock and vice-versa

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

- Determine elapsed time

a. Indicators with Taxonomy

3-5.1 Use the fewest possible number of coins when making change. (B3)

Cognitive Process Dimension: Apply
Knowledge Dimension: Conceptual Knowledge

b. Introductory Lesson

Materials:
A "drawer" of coins
Dollar bills

Lesson:
Ask: Who has ever paid for something at the store? What happened if you didn't give them the exact amount?
Ask: How might you figure out how much change to give back if the cash register broke? They should talk about counting up from the price or decomposing the dollar into two parts, the purchase price and the change.

Set up little "Mini-Marts" in the classroom. Have students take turns being the salesperson and the customer. Tell the customer that they need to check to make sure the salesperson gives them the correct change. The customers should have only dollar bills to pay with. If the salesperson gives the correct change but coins that equal another coin, then the customer says "Presto Change-O" and exchanges the coins for another one. Ex. 2 dimes and a nickel for a quarter

c. *Misconceptions/Common Errors*

Students may struggle with the idea of nearest to when using a digital clock because it only shows current time. For example, it may be difficult for them to know that 7:58 is almost 8:00. This requires them to know that there are 60 minutes in an hour, 58 is close to 60 and that 2 minutes isn't a long time.

d. *Additional Instructional Strategies/Differentiation*

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

e. Technology

- Making Change (Students determine the amount of change due and the fewest number of possible bills and coins for change.) http://www.mathplayground.com/making_change.html
- Change Maker (Choose from 4 levels and different currencies.) http://www.funbrain.com/cashreg/index.html
- Scottie Nickel's Change Maker (Help Scotty give the fewest coins in change to his customers.) http://www.mrnussbaum.com/coins/
- Make Change (Sing along to this jingle!) http://www.harcourtschool.com/jingles/jingles_all/3make_change.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.

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

3-5.1
The objective of the indicator is to use which is in the apply conceptual knowledge cell of the Revised Taxonomy. To apply conceptual is to understand how the interrelationships among basic elements (coins) within a larger structure enable them to function together (making change). The learning progression to **use** requires students to recall coins and their value. Students explore real world situations to generalize connections between these concepts and their real life. As students create different combinations of coins, they explain and justify their answers (3-1.3). They analyze their combinations to solve increasingly more difficult problems (3-1.1) and use correct, complete and clearly written and oral language to communicate their understanding (3-1.5).

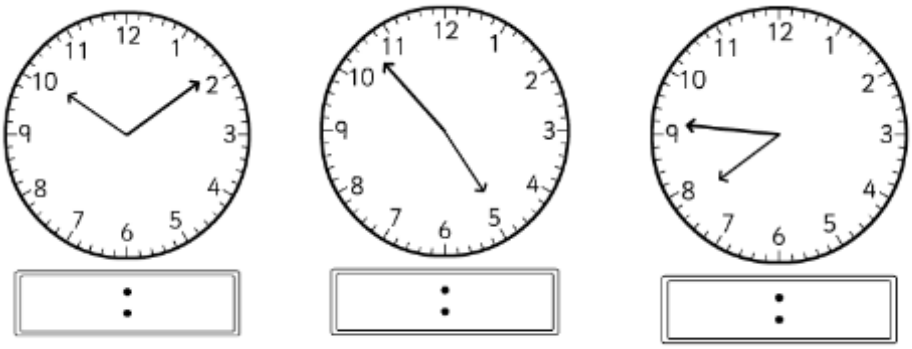
3-5.6
The objective of this indicator is to use which is in the "apply conceptual" knowledge cell of the Revised Taxonomy. To apply conceptual knowledge is use your knowledge of the relationship between analog and digital clocks to tell time. The learning progression to **use** requires students to understand the difference between digital and analog time. Students understand what each type of clock reveals about time and they recognize the limitations of each (3-1.8). They understand the meaning of nearest, closest and almost. When telling time, students show flexibility in mathematical representation (3-1.7) by changing from analog to digital time and vice-versa. They explain and justify their answers (3-1.3) using correct, complete and clearly written and oral language (3-1.5).

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. Write the time shown on each clock.



2. You have $10.00 and want to buy a new calculator for $7.28.

   a. How much change will the clerk give back to you?

   b. Draw your change using the fewest bills and coins possible.

3. You buy a pack of pencils for $3.35. If you give the clerk $5.00, what would be your change using the fewest bills and coins possible?
Draw a picture showing your change.