

**Teacher/School:** David Callihan

**Unit Title:** Factors and Fractions (Factors, Composites, Equivalent Fractions, Greatest Common Factor and Least Common Multiple)

**Grade Level:** 8th Grade

**Subjects/Topics:**

**What MSP content from last summer's training is incorporated in this plan?**

Alternative Tools for Assessing and Teaching Math in the Classroom in the classroom (Dr. Kersaint's Workshop)-Used to prepare and use material in the Factoring section of the lessons; Reading Literature in the Content Area (The Hershey Bar Fraction Book); Utilizing Technology in the classroom (CPS, Videos for providing the "hook," Website, etc.)

**Time Needed:** 5 classes

**Learning Objectives: What will students learn?**

What is essential for students to know or understand about the subject?

How to differentiate prime from composite numbers; How to determine equivalent fractions by using prime numbers to calculate Least Common Multiples and Greatest Common Denominators; How to practically work with fractions in real-world problems.

If students remembered one thing about this study, what would it be? Fractions don't have to be complicated and hard to work with, but if you know how to manipulate the denominator in various ways (e.g., factoring, finding multiples, simplifying factors), you can benefit from this knowledge in working with fractions.

**Sunshine State Standards:**

MA.A.1.3.1, MA.A.1.3.2, MA.A.1.3.3, MA.A.1.3.4, MA.A.2.3.1, MA.A.5.3.1, MA.B.2.3.1, MA.B.2.3.2, MA.B.3.3.1, MA.B.4.3.1, MA.B.4.3.2, MA.B.1.3. 1, MA.B. 1.3.2; MA.B.1.3.4

**Materials/Supplies:**

The Hershey Fraction Book, Hershey Bars, Laptop computer, projector, Classroom Performance System technology throughout lessons. Audio/Video presentations to provide hooks and explain concepts; CD- ROMs to provide alternative assessment for ESE/ESOL students.

**Prerequisite Skills:**

Multiplication tables, basic rules of factoring

**Instructional Procedures: What will the teacher be doing? What will the students be doing?**

See attached lesson plans. McDougall Littell Course 3 Math Textbook was also used in conjunction with this unit. CPS technology was used throughout this lesson to assess student retention and understanding of the subject materials. Students were referred to my class website to review subject matter and other tools to assist them in their learning. See attached assessment reports for review of assessments during lessons.

**Differentiated Instruction:**

How will learning be accommodated for:

- An ESE student: ESE students were accommodated through use of tutorial CD~ROM study materials on the PC in the classroom as well as audio/visual support in instruction, CPS technology with personal assessment capability during instruction.

- An ESOL/Limited English student: Audio-Visual Provisions (video), visual aids, Oral review in class; assessment using CPS with feedback during lessons.
- A gifted student: Audio-Visual Provisions (video), CPS assessments with feedback during lessons.

**Assessment:**

Continual assessment was provided during classes using the CPS system to work problems from the textbook. Students were additionally assessed with homework assignments, which were checked and gone over during class. Self-grading and student grading were included in the set of assessment tools.

Several ESE students were allowed to have alternative assessments using the e-Tutorial CD-ROM software in the classroom. This was particularly useful to students who had a difficult time staying focused in the classroom. Individualized printouts of problems covered in the PC to assess how well the students were proceeding were also available.

## Lesson 4.1

**Instructor:** David Callihan

**Title:** Factors and Prime Factorization using the Factor Game, CPS, and Traditional Textbook Assignments

**Subject:** Mathematics

**Grade Level:** 8

**Objective:** To help students to learn and write the prime factors, identify prime and composite numbers, and factor a monomial.

**Sunshine State Standard(s):** MA.A.5.3.1

**ESE/ESOL Accommodations:** Factor Game, Oral instruction and review in class; whiteboard participation

**Materials:** Matrix of numbers from 1 to 30; MLC3 Textbook, CPS review

**Time Required to Complete Lesson:** 2 periods (one period playing the Factor Game, one for textbook lesson with homework assignment.)

**Procedures:** Hook (Focus for lesson or objective) - Play the Factor Game once with students at seats. The Factor Game is based on listing the numbers from 1 to 30 in a 6 x 5 matrix on the whiteboard. The first player on the team selects any number in the matrix that is not a prime number, and records that number as their score. The next player from the other team must identify any factors that are still on the board and not yet selected. These are added up and become the score of the other team. That team then selects another number, trying to find a number that doesn't have any unselected factors still on the board, but not a prime number. If a team member selects a prime number, they lose those points and other team gains those points. (So selecting prime numbers is a penalty, forcing students to know their prime and composite numbers.) The team with the highest score at the end of the game wins (when the only numbers left are prime numbers).

**APK (Access Prior Knowledge):** Ask students to recall their multiplication tables and division tables as they try the game; review the definitions of prime and composite numbers, and variables.

### **Steps and Activities Used - Main Activity:**

**Day 1:** Play the Factor Game three times, first time loosely with students against the teacher, second time with each team (of 6 students) rotating to try to beat the teacher as a class, and third time with each student on each team rotating until all answer. In the second and third games, the students who play explain why they chose the factors that they selected. This forces each of the students to clarify and reason why they selected the answers that they chose. Student assessment during the game was based upon participation with immediate correction by the scoring criteria as well as teacher correction if they incorrectly responded with reasons for selecting specific numbers. Fellow team members were also able to respond after each round to correct and/or praise the student's answers. This provided immediate positive feedback and learning to each student.

**Day 2:** Read and Instruct from the Lesson in the Math Textbook: MLC3 p. 168.169; Explain Prime and Composite Numbers and Monomials. Homework/Classwork: MLC3 4.1 pp. 171-172 #14-18, 21-49, 52-62. Students worked problems with me in class to clarify, using my computer-based Classroom Performance System (CPS) and on-screen projection system. The CPS provided immediate response and feedback, with me being able to make immediate corrections for the entire class on the electronic whiteboard. Homework was assigned to be turned in and corrected for a homework grade the next day.

**Check:** Factor Game provides instant checking; CPS provides a second level of immediate feedback and assessment; Homework provides another assessment of student's understanding.

**ISS (Independent Student Success to check for comprehension of content):** Students showed their knowledge of factors, prime, and composite number in the Factor Game; I was also able to correct immediately using CPS system and homework with traditional problem solving and scoring assessments.

**Assessment/Evaluation:** The Factor Game provided several learning opportunities. First, the rules forced the students to assess their own responses and receive immediate feedback by the score that they gained (or lost) on each turn in the game. When students were happy with the score that the student received in the

round, immediate positive feedback occurred. In the second and third rounds, the students gained an additional assessment opportunity when they had to justify their selections of numbers in the game. The CPS questions on day 2 were assessed when input into the PC during my instructional lesson using the textbook and classwork; confirmation by students during class using their CPS pads provided additional feedback and immediate assessment response. Homework also was corrected and graded as a second set of assessment results for the homework (following the CPS responses from class).

**Special Information:** Class participation grade on day 1; students gain a "self-assessment" as their team won or lost the Factor Game in competition against the teacher; CPS and individual assessments with grades (traditional assessments) on day 2 were graded by the teacher as homework.

**Notes regarding implementation of lesson:** Students loved the Factor Game. During the first game, the students were excited as they played because allowed them to keep the score close and win as a class (it always keeps students excited when they are able to "beat the teacher.") In the second game, I added a rule that the student had to explain *their* answers (why they chose certain factors and not others, as appropriate). In this game, team members could collaborate with one another before answering. Again, the opportunity for teams to compete against the teacher was motivating to the class. The challenge of making sure that they could articulate their reasons for selecting certain numbers and not others stimulated higher level critical thinking skills and problem solving. In the third game, students were forced to think individually, providing another level of challenge and critical thinking for the individual students. The game provided for both individual and group interaction in the study of prime and composite numbers.

On the second day, the more traditional approach to the subject reinforced learning of the subject. Students were more familiar with the subject of composite and prime numbers as a result of the Factor Game from the previous day. Students were very confident in knowing what prime and composite numbers are as a result of the prior day's game. As a result, going through the textbook material was a clarifying activity. The learning objectives from the game were reinforced in the follow-up instruction. Questions clarified any outstanding issues. The game (the alternate assessment strategy) made the instruction session easier to grasp because students had an experiential knowledge of prime and composite numbers from the game. Limitations of the game included the fact that specific students may not have participated as much in the game as others, however, this was countered by the third round rule that individual students had to participate on their own. But, if they scored lowly for their team, it might have been a less positive experience as well. Students were very engaged and excited during the Factor Game class. They all wanted to "win" and "beat the teacher." Several students who were normally less participatory in class were involved and eager to play the game. This alternative assessment strategy (game) was a very positive class experience overall. The second day of "normal" lecture and classwork was much more moderated. Students were still participatory, probably because they still had the memory of the Factor Game in their minds. They enjoyed the learning experience of grasping the concept of prime and composite numbers from the previous day. However, homework was a much more bland experience, so students were not as excited and engaged as on the first day. But, I observed that the students were more eager to do their homework than normally. This is probably related to their grasp of the subject. The students are always interested in knowing how well they are doing when I assess them using the CPS response pads on the projector screen. The immediate feedback is something they want to know, whether they "got the right answer" or not. On several occasions when there are only a few students who input the wrong answer, the students wanted to know who answered incorrectly. This shows that they are interested in getting the right answer and making sure their fellow students do likewise. Monomial factoring was not covered in the Factor Game, so the second day of instruction on this concept was imperative; CPS feedback was helpful for me to know if they had grasped this concept. The assessment of the homework was the most accurate numerical assessment for grading purposes. But, the CPS and Factor Game assessments displayed the most positive feedback in terms of student involvement and excitement about the subject. Behavior was positive during this 2-day lesson. All students participated eagerly and positively. This set of lessons also reinforced the students' knowledge of prime and composite numbers and the importance of knowing the difference. This will be valuable as they move into future factoring problems in algebra and other higher level math in higher grades.

## Lesson 4.2

**Instructor:** David Callihan

**Title:** Measurement of fractional lengths in English and Metric forms; conversion between units

**Subject:** Mathematics

**Grade Level:** 8

**Objective:** To explain the concept of length to prepare students for study of measurement and fractions, followed by practice using common measuring instruments.

**Sunshine State Standard(s):** MA.B.2.3.1, MA.B.2.3.2, MA.B.3.3.1, MA.B.4.3.1, MA.B.4.3.2

**ESE/ESOL Accommodations:** Audio-Visual Provisions (video), visual aids, assessment using CPS

**Materials:** 9.26.2005 Length Video; MLC3 p.720 (Using a Ruler exercise)

**Time Required to Complete Lesson:** 1 period

### **Procedures:**

**Hook (Focus for Lesson or objective):** Watch video on "Length" (9.26.2005 Length Video)

**APK (Access Prior Knowledge):** Have students use hands to estimate lengths; write in marble notebook (Think, Pair, Share) (inch (knuckle length?), centimeter (width of a finger tip?), foot (wrist to elbow?), yard (length of arm?), meter (length of hip to foot?); length of football field (convert yards to feet using factor label method unit conversion-see below)

**Steps and Activities Used - Main Activity:** Find surface area of desks using 12 inch ruler, convert to Metric

Guided Practice: Teams work together to measure desk length and width in inches and centimeters

Check: CPS:  $A = LW$ : using students' measurements of Length  $W$  ( $A=2 \text{ ft} \times 1.5 \text{ ft} = 3 \text{ sq. ft.}$ )

Independent Practice: MLC3 pg. 720 Practice #1-8 (measurement of lines in inches and cm's) – turn in

**ISS (Independent Student Success to check for comprehension of content):** Students convert English to metric using factor label method\* ( $1" = 2.54 \text{ cm}$ ), Check drawings of measured questions turned in as classwork.

\*Factor label method is used to convert one unit to another. Three factors must be identified in this process. To start, one must identify both the units given and the desired units. Then a relationship between the given and desired units must be determined to allow for the conversion. The relationship or conversion factor is expressed as a fraction and is always equal to one. For example, the conversion factor for changing hours to minutes is  $60 \text{ minutes}/1 \text{ hour}$ . Notice that the numerator (top) and denominator (bottom) are equal in value. Once the conversion factor is determined, you can multiply it by the given unit. This will not change the value of the given, since the conversion factor is equal to one. However, it will change the given units to the equivalent desired units.

**Assessment/Evaluation:** CPS Questions (On the Fly, as needed); check classwork for accuracy of lines from pg. 720 #1-8. Make sure students understand fractional divisions on rulers using CPS and inquiry.

**Extension Activities:** Homework: Simplifying Fractions: MLC3 (math textbook) 4.3 pp. 179-183 #17-20, 23, 24, 31-52, 57-65

**Special Information:** Conversion:  $1" = 2.54 \text{ cm}$

**Notes regarding implementation of lesson:** Needed to work into a second class day because of student's lack of knowledge of basic fractions involved in English divisions on ruler.

## Lesson 4.3

**Instructor:** David Callihan

**Title:** Galaxy Song - To Infinity and Beyond: Length Measurement involving Large Numbers and Scientific Notation

**Subject:** Mathematics

**Grade Level:** 8

**Objective:** To explain the concept of length when observing very large distances to prepare students for study of measurement and fractions, followed by practice doing scientific notation of very large amounts

**Sunshine State Standard(s):** MA.A.1.3.1, MA.A.1.3.2; MA.A.1.3.3; MA.A.1.3.4; MA.A.2.3.1

**ESE/ESOL Accommodations:** Audio-Visual Provisions (video), visual aids, assessment using CPS

**Materials:** Galaxy Song PowerPoint - CLINT BLACK Video; Galaxy Song CORRECTED handout

**Time Required to Complete Lesson:** 1 period

### **Procedures:**

**Hook** (Focus for lesson or objective): Watch "Galaxy Song" video (Galaxy Song.ppt)

**APK (Access Prior Knowledge):** Ask students to

**Steps and Activities Used:** Main Activity: Find surface area of desks using 12 inch ruler; convert to Metric Guided Practice: Teams work together to measure desk length and width in inches and centimeters.

Check: CPS: A = LW: using students' measurements of Land W

Independent Practice: MLC3 p. 720 Practice #1-8

**ISS (Independent Student Success to check for comprehension of content):** Students convert English to metric ( $1" = 2.54 \text{ cm}$ ); Check drawings of IP questions turned in as classwork

**Assessment/Evaluation:** CPS Questions (On the Fly, as needed); check classwork for accuracy of lines from p. 720 #1-8. Make sure students understand fractional divisions on rulers.

**Extension Activities:** Homework: Simplifying Fractions: MLC3 4.3 pp. 179-183 #17-20, 23, 24, 31-52, 57-65

**Special Information:** Conversion:  $1" = 2.54 \text{ cm}$ ;  $1 \text{ foot} = 12 \text{ inches}$ ;  $3 \text{ feet} = 1 \text{ yard}$

### **Notes regarding implementation of lesson:**

1. Show Video first
2. Teams of 2 at each table of 4 work together to estimate lengths and measure them; measure a desk at each table
3. Calculate conversion from English to metric units.
4. Compare results of each team to confirm results.

Class Goal: 20 points (each correct team is 4 points).

## Lesson 4.4

**Instructor:** David Callihan

**Title:** Hershey Bar Fractions Book

**Subject:** Mathematics

**Grade Level:** 8

**Objective:** To explain the concept of fractions using the book The Hershey Bar Book to teach students how to simplify and convert fractions from one from to another

**Sunshine State Standard(s):** MA.A.1.3.3, MA.A.2.3.1

**ESE/ESOL Accommodations:** Visual aids, assessment using CPS

**Materials:** The Hershey Bar Book, Hershey bars, CPS review

**Time Required to Complete Lesson:** 1 period

### **Procedures:**

**Hook** (Focus for lesson or objective): Hand out Hershey bars; "Do not open until told to do so; this is a math problem."

**APK (Access Prior Knowledge):** Ask students to give examples of equivalent fractions to see what their level of prior knowledge is.

**Steps and Activities Used:** Main Activity: Read and follow the steps in the book to study fractions.

**Check:** Have students work the "Equivalent Fractions" exercise in Lesson 4.3 p. 178 after finishing The Hershey Bar Book in class.

**ISS (Independent Student Success to check for comprehension of content):** Students work through the steps in the lesson before consuming the Hershey bar.

**Assessment/Evaluation:** CPS Questions Tomorrow (Student review); Student assessment of fellow student's work during class discussion.

**Extension Activities:** Homework: Simplifying Fractions: MLC3 4.3 pp. 179-183 #17-20, 23, 24, 31-62, 57-65

**Special Information:** Appeals to Spatial, Logical Mathematical, Linguistic, Bodily Kinesthetic, Interpersonal and Intrapersonal Intelligences.

### **Notes regarding implementation of lesson:**

1. Read The Hershey Bar Book to class after distributing Hershey bars to each student
2. Students work through all steps in the reading before consuming the Hershey bars.

Reward: Students can eat their Hershey Bar upon successful completion of the assignment.