

<p>Grade Level/Course: Grade 3</p>
<p>Lesson/Unit Plan Name: Using Decomposition in Math and Science</p>
<p>Rationale/Lesson Abstract: Students will learn elementary math decomposition strategies in relationship to a hands on science activity.</p>
<p>Timeframe: 2 days math; month-long science investigation</p>
<p>Common Core Math Standard(s): 3.NBT Use place value understanding and properties of operations to perform multi-digit arithmetic.</p> <p>3. NBT.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.</p> <p>Next Generation Science Standard(s):</p> <p>3-5-ETS1-3 (Science and Engineering Practices) Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.</p>

Instructional Resources/Materials:

For each group of 4 students:
 small container of linker cubes
 base 10 blocks,
 number line template (General Mathematics Resources)
 math journals
 pencils

Math Activity/Lesson:

Write the word “decompose” on the white board or document camera. Direct students to talk to their seat partner about what this word means. Then have students share out whole class. Take all definitions but direct to most concise: break apart, break down, pull apart, etc. Have students record this definition in their math journals.

Ask the question: **What does “decomposition” have to do with math?** Again, have students TPS (think, pair, share) and then report back to full class.

Today, we will model a whole number with linker cubes and then decompose the number.

I try:

Teacher takes 10 linker cubes and puts them together. Models counting them and records them on a sheet. Teacher does a talk aloud. Breaks linker cubes in half. Tells students that one way to decompose 10 is $5+5$. Can anyone else think of a way to “decompose” 10? Students will hopefully volunteer other ways $8+2$, $7+3$, etc. Each decomposition example should be recorded for class to see. Teacher talk should be directed as why each number was chosen.

Distribute a basket of at least 30 linker cubes to each pair of students.

We Try:

Direct students to model the number 18 with their cubes. Work with your partner to decompose the number 18 at least 6 ways and record the decomposition. Have students share out.

If students did not think to decompose using 3 numbers, then give examples. If necessary do another we try.

You Try:

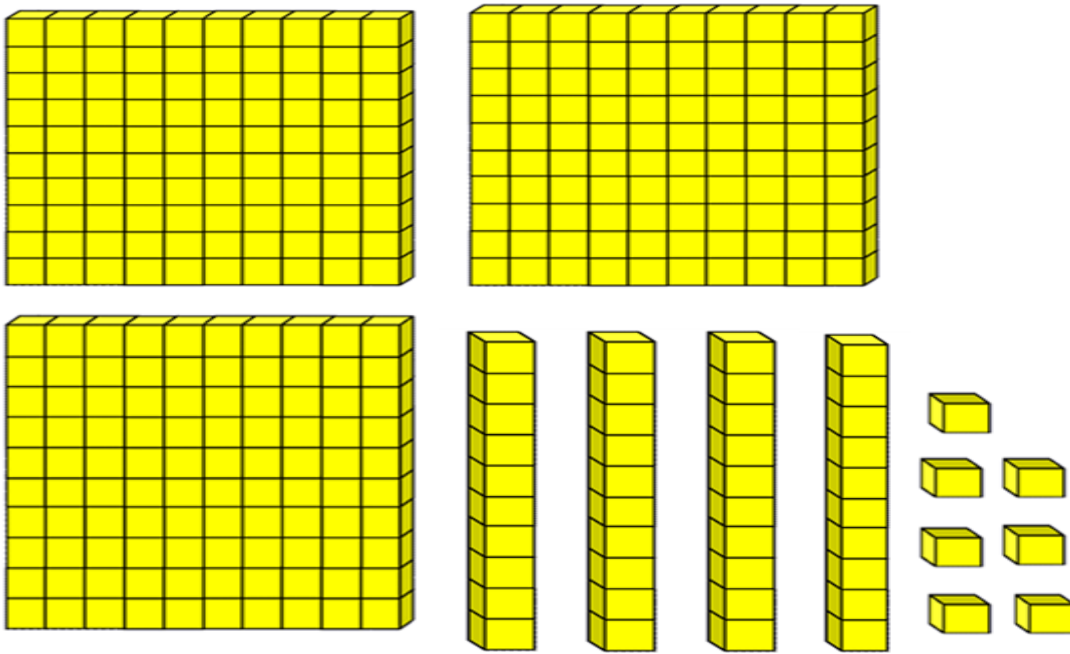
Have students work in pairs, model their own number with linker cubes and record at least 6 examples of decomposition.

Invite pairs of volunteers to the front of the class to present their numbers and explain their reasoning for two sets of decompositions.

Decomposition Using Expanded Form

Next, explain that we will use place value and expanded form to continue our exploration of math decomposition.

Write the number 347 on the whiteboard/document camera. Show students how to “decompose” this number using place value and base 10 blocks. Write out $300+40+7$ as example. Model this number with base 10 blocks.



Collect linker cubes and give pairs of students baskets of base 10 blocks. Give students examples of larger numbers to create with base 10 blocks and record with expanded notation. Continue to reinforce that expanded notation is another way of “decomposing” a number.

After students have decomposed numbers into expanded notation and recorded them, challenge them to take these same numbers and decompose them differently. Have students record their decomposed numbers.

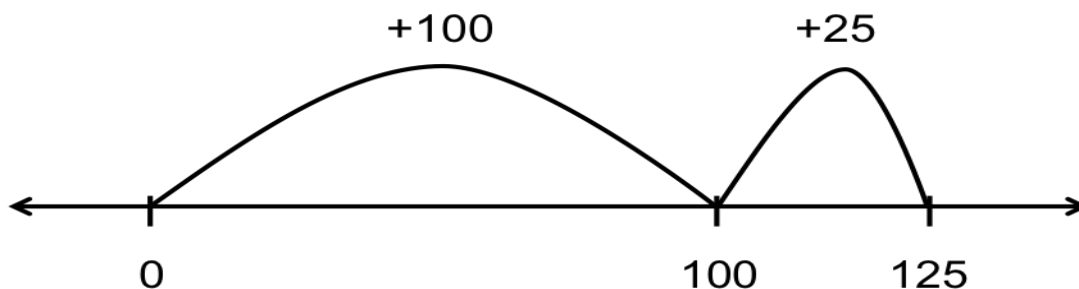
For example: 142
 Expanded form: $100 + 40 + 2$
 Decomposition: $99 + 1 + 40 + 2$
 $50 + 50 + 20 + 20 + 2$

You Try: Give several you tries and have pairs model either in front of their class or in their table groups (depending on classroom configuration).

Day 2: Using a number line to explore decomposition.

Today, students will learn how a number line can help us decompose and better understand numbers. This lesson presumes some prior knowledge with number lines. Make a number line with the number 100 or use number line template. Show students how to start with 0, make 10 notches -- all the way to 100. Now discuss with students how can we decompose 100. $50+50$, $70+30$, etc. Each time, show the beginning number on the number line and then skip count to 100.

How could we show 125 on a number line? How should we decompose 125? Let's try $100 + 25$. Put this number on a number line.



After several we tries, give them a couple of you tries. Have student first work in pairs and then individually.

455

$400 + 50 + 5$

$200 + 200 + 25 + 25 + 5$

$100 + 50 + 50 + 50 + 5$

Assessment:

Teacher will use formative assessment and exit slip.

Science Activity/Lesson: Decomposing Matter

Materials needed:

For each pair of students:

Two clear plastic cups or small glass jars

Set of inorganic materials such as bits of plastic bags, paper, rubber bands, tin foil

Set of organic materials such as apple cores or peels, leaves, bread, cut up vegetables

Two cups of soil (preferably outdoor soil)

A water source or containers of water for each table group.

Magnifying glass

a thermometer

Ruler

Pencils and paper

Recording sheet

Decomposition in the Natural World

We are going to explore decomposition in the natural world. How long does it take for organic and inorganic matter to decompose in soil? Which material decomposes the fastest? Conduct a discussion about what is organic and inorganic matter. Give examples. Record answers on chart paper or document camera. Introduce concept of decomposers in nature -- organisms such as fungi, bacteria, worms, etc. that make

decomposition happen. These decomposers make the decomposition process occur in nature.

Identify with students which materials are organic and inorganic so that they can choose them appropriately for their experiments.

Students should be in table groups of four students and will work in pairs. Each pair of students will choose one scrap of organic material and one scrap of inorganic material. Students should sketch their materials, as well as measure them with a ruler and record them. Each pair of students will have two cups: one for the organic and one for the inorganic material. Place material against the side of the cup for visibility if possible. The cups should then be filled with soil, leaving one inch at the top. Then put a couple of tablespoons of water in the cup to keep it moist. Students should label cups and place them in a safe place in the room. Keep lid or cover off the cups.

Weekly Observations

Allow time for students to make weekly observations of their cups. They should keep soil moist with tablespoons of water. They should draw weekly observations of what they see. The math can be extended by having students monitor temperature of the soil with a thermometer and record it. Students should take notes on visible decomposition of their organic materials (obviously inorganic material will show little sign of decomposition.)

At the end of seven weeks, students should record final results and then discuss which materials decomposed the fastest. This experiment can serve as a springboard for future discussions about the usefulness of decomposition both in math and science.

Assessment:

Students will complete an exit slip and fill out decomposition recording sheet. Students will be asked to write two sentences -- explaining decomposition in math, and one explaining decomposition in science. Students will present their explanations either full class or in table groups.

Name: _____ Date: _____

Exit Slip:

Write two simple statements explaining what decomposition is in mathematics and science. Use examples from what you have learned.

1. When I decompose numbers in math, I

2. When matter decomposes in science, it _____

3. Decompose the number 53 at least 5 ways.

4. Decompose the number 392 at least five ways. Show it on a number line.

Student Names: _____

Decomposition Observation Sheet

Time Line	Temperature	Organic Matter Measurement	Inorganic Matter Measurement	Sketch of Cups (label each one)
Week One Date:				
Week Two Date:				
Week Three Date:				
Week Four Date:				