EDCI 405: Assignment 3
Alicia McCullough & Denee Nickel

Unit Plan: Fractions and Decimals

Introduction

The purpose of this unit plan is to review and expand students' understanding of fractions, decimals and the relation between the two. Students will focus on equivalent fractions and decimals, expanding addition and subtraction operations with decimals into the thousandths. According to the BC Curriculum, the students will be coming into grade 5 having learned the following about fractions and decimals in grade 4:

- Fractions and decimals are types of numbers that can represent quantities (Big Idea)
- Decimals to hundredths
- Ordering and comparing fractions
- Addition and subtraction of decimals to hundredths

These students will be expected to move forward and learn about the following in grade 6:

- Mixed numbers and decimal numbers represent quantities that can be decomposed into parts of a whole (Big Idea)
- Improper fractions and mixed numbers
- Percent and ratios

It is, therefore, imperative that we work off the prior knowledge of students and prepare them for what they will learn in grade 6 by covering what is required under the BC Curriculum for grade 5. This unit plan focuses on the following areas of the BC Curriculum:

***Big Idea*:**

Numbers describe quantities that can be represented by equivalent fractions

Curricular Competencies:

- Use reasoning to explore and make connections
- Use mental math strategies and abilities to make sense of quantities
- Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving
- Visualize to explore mathematical concepts
- Represent mathematical ideas in concrete, pictorial, and symbolic forms
- Reflect on mathematical thinking
- Connect mathematical concepts to each other and to other areas and personal interests
- Incorporate First Peoples worldviews and perspectives to make connections to mathematical concepts

Content:

- Ordering and comparing fractions
- Decimals to thousandths
- Equivalent fractions
- Addition and subtraction of decimals to thousandths
- Whole-number, fraction, and decimal benchmarks

***First Peoples Principle of Learning*:**

- Learning is holistic, reflexive, reflective, experiential, and relational (focused on connectedness, on reciprocal relationships, and a sense of place).

This unit follows a holistic approach by providing cross curricular ties to science, art and social studies. A strong emphasis on metacognition worked into each lesson makes the unit both reflexive and reflective. Students are encouraged to communicate about methods and strategies throughout activities. Group work allows student time to articulate and negotiate meaning, and mathematical reasoning with peers while working through problems. Students will also be keeping a math journal throughout the lesson in which they can reflect on strategies and applications that were and were not effective for them. There are also several opportunities for students to apply their learning in this unit in hands-on authentic experiences. For instance, applying the concept of equivalent fractions to beading in lesson 2, using decimals to measure and record distances and lengths in the school yard in lesson 9 and using decimal subtraction to create a budget in lesson 14. There are also opportunities for students to apply or build on their learning through interactive games. Furthermore, students are encouraged to use manipulatives such as Base Ten Blocks to provide concrete representations of the concepts being studied. Group work scattered throughout the unit provides relational social learning, allowing students to help build each other's' conceptual understanding. Students will also be learning to relate mathematical concepts and symbols, specifically focusing on representing fractional parts of numbers. Finally, by working in local examples and resources such as the School Based Weather System, students can build on their relationship to place through math.

Unit Origins and Modifications

This unit outline follows that of Unit 5 from *Math Makes Sense 5* (Appel et al., 2008) and assumes that students have the appropriate *Math Makes Sense* textbook, or the teacher has access to the textbook and is able to make photocopies when necessary. Any page numbers in the lesson outline below refer to the student textbook and any reference to the teacher's guidebook will be noted as such. Alterations made to the original unit plan are in purple text. We chose to keep the garden introduction and wrap-up activity very similar to the Math Makes Sense book because we liked the full-circle connection to a real-life example of a garden. However, we have added to the complexity and depth of the final wrap-up activity to create a summative poster project that would engage students while also requiring them to apply the skills and strategies they had acquired over the course of the unit. We chose to make alterations/adaptations/extensions where we wanted to include activities that we thought may be more engaging, as well as in an attempt to incorporate cross-curricular connections or connections to other cultures. Some specific examples include the indigenous beadwork activity in lesson 2, the outdoor playground measurement in lesson 9, as well as the inclusion of centers or stations in lessons 3 and 14.

We hope that the beadwork activity gives students the opportunity to work with concrete manipulatives for equivalent fractions, while also providing an authentic framework for how this concept can apply to everyday life. We further hoped to give students the opportunity to expand their understanding of local indigenous cultures and form relationships with community members.

In lesson 9 we chose to have students practice and apply what they learned in class by going out and measuring parts of the playground or school yard as opposed to answering practice questions in their texts. Although some students might benefit from the pencil and paper practice, we felt that the class as a whole should have as many opportunities as possible to experience math concepts. We ask students to measure areas that they frequent and that they already have connections with so that their learning experience is meaningful and can be revisited independently.

We felt that centers were an important addition to this unit for a number of reasons. First, by allowing students to work in small groups we aimed to make use of social learning. We also felt that when students were

broken up doing different tasks, they would be more comfortable to work at their own pace and focus on the skills or concepts that needed the most attention. Finally, the centers provide opportunities to review and independently apply strategies and skills in engaging hands on tasks.

Assessment Plan

Formative assessment will take place throughout the unit. The students will be keeping math journals and will be writing reflections, answering questions, or stapling in exit slips wherever necessary. Anecdotal comments based on observations can also be made during group and independent work time.

The final summative assessment will be a poster project in which students use their knowledge of fractions and decimals to design and budget for a school garden (see appendix for the student handout and assessment rubric). Students will be given three class periods to work on their posters. Assessment will come from their peers in the form of 2 stars and a wish and from the teacher based on a single-point rubric.

Although inspired from *Math Makes Sense 5* (Appel et al, 2008), we have altered the project to be more comprehensive, include multiple opportunities for student choice and to allow for potential links to both language and visual arts. We have added a layer of complexity to the task by asking students to work within a budget and attaching prices to the seeds that they will need to plant their garden. However, students may choose the complexity of their garden design in terms of both shape and content. This will allow students to alter the challenge of the task to suit their personal level of comfort.

As the final project will take the form of a poster, links could be made to the aesthetic aspects of art. Students are also required to include a short paragraph to explain their choices. This could link to language arts, specifically paragraphing, conventions and providing justification.

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Unit Overview

Lesson Title/Objectives	Introduction	Exploration	Practice/Closing	Resources /Materials	Assessment/ Evaluation	Modifications
1 - Unit Launch	Discuss the unit introduction picture (p. 165). Ask students how many square plots there are, how many will be planted with flowers and what fraction will be planted with vegetables.	Discuss the first question on p. 165. Have students attempt an answer. Have student volunteers share their answers and strategies. Repeat for the second and third questions. Focus on eliciting prior knowledge.	Tell students they will be learning how to write different fractions for the same amount, how to compare fractions and decimals, how to relate fractions and decimals to one another and how to add and subtract decimals.	*Math Makes Sense 5* textbook p. 164-165	**Math Journal** Students will respond to the following questions: What is the same about fractions and decimals? What is different?	This is only an introductory period. Students should not be focusing on learning new skills, but instead be prompted to share any prior knowledge of the subject.
2 - **Equivalent Fractions** *Objective:* Students will be able to understand and demonstrate that equivalent fractions name the same amount. They will also understand that patterns can be found in equivalent fractions.	Students observe the introductory picture (p. 166) and discuss. *Some questions:* Which student is correct? Can both be correct? How?	Follow the *Exploration* section of p. 166. Students find how many ways they can describe the fraction of the rectangle that is red/yellow and practice with other fractions. Share work. **Indigenous beadwork activity** (bring a	Time to journal. *Optional:* Students (alone or in pairs) work on questions in Practice section (p. 168-169).	Colour tiles/congruent squares (red & yellow) 2-cm grid paper Assortment of somewhat large beads in 4+ colours String segments (for each student)	Ask questions and observe throughout the activities. **Math Journal:** Practice qu. 9 (p.169). Students sketch out the pizza and describe the fractions and equivalent fractions that represent the missing and	**Extension:** Students explore various ways of placing colour tiles on the grid during the exploration activity and practice naming fractions that way. **Alternative:** Use objects/counters with different shapes/textures for colour-blind or

		guest speaker in for authenticity)		Guest speaker (beadwork artist)	remaining slices.	visually impaired students.
3 - **Comparing and Ordering Fractions** *Objective:* Students develop strategies to compare and order fractions and will be able to demonstrate their understanding of the concept through the use of materials such as counters, number lines, and fraction circles. They should be able to describe their understanding that one can compare and order fractions by first finding equivalent fractions.	Focus on the introductory picture on p. 170. *Questions:* Who has more money? How do you know? Discuss and write important pieces of information on the board. Ask students about their strategies.	Follow the *Exploration* section (p. 170). Show students how to use the various materials in comparing fractions. Students have choice in material use. Present a list of fractions to compare and order. Share their work/strategies with class.	Give students three 10 cm strips of paper, three 12 cm stips, and grid paper. They should also have access to the other materials. Students work alone or in pairs on the Practice questions on p. 171-172 (odd numbers).	Counters Colour tiles Fraction circles Rulers 10 cm paper strips 12 cm paper strips 1 cm grid paper	Ask questions and listen and observe throughout the activity. **Math Journal:** Students choose two fractions with different denominators. Explain how to compare them. Use words, examples, numbers and pictures in their explanation (Lineham, 2020).	**Alternative:** Use pattern blocks. Use a yellow hexagon as 1 whole. Students put fractions in order from least to greatest and explain strategies. **Extension**: Students write a problem similar to qu. 10 on p. 173 of their workbook. Trade problems with a partner and solve each other's problems.
4 - **Fraction Learning Centres**	Follow the "Before" section (p. 12 of teacher's book) to create	**Centre 1:** Pattern block station. Make a quadrilateral that	Time for reflection and journaling.	Pattern blocks 1 cm grid paper	Observe and listen as you walk through the classroom.	Students have the choice of spending more time at two of the stations, or

Objective: Students practice using various strategies to solve fraction problems and get comfortable with doing so.	hexagon shape on the doc cam. Ask students what fraction of the hexagon is the triangle. Ask them the same question for the blue and red blocks. Discuss. Present the math centres that they will be rotating through in small groups or pairs.	is ¾ red and ¼ blue. How many ways can you do this? **Centre 2:** Color tiles and grid paper station. Solve qu. 2 on p. 175 by using color tiles or drawing. **Centre 3:** Fraction circle station. Pizza pie memory match game. **Centre 4:** Create your own fraction paper strips study tool. https://static1.squarespace.com/static/54905286e4b050812345644c/t/59b95b8be03f38cd81837309/1505319822327/FractionKit.pdf		Color tiles Colored rectangular lego blocks Pizza pie memory match cards 7 colours of construction paper (cut lengthwise into strips of 3 inch width) - enough for each student to have one strip of each colour. Sharpie markers	Keep a checklist to make sure students are rotating through 2+ centres. **Math Journal:** Students will bring their journals with them through stations. *Reflection question*: what strategies worked best for them?	attempting to complete them all. In pairs or as a small group. **Optional extensions:** *Centre 1:* Build a triangle following the Explore section and questions on p. 174-175. *Centre 2:* Design with lego or tiles and record all fractions of colours involved. *Centre 3:* Match equivalent fractions to each other. *Centre 4:* Students insert extra strips between any two rows of their fraction strips and create their own new fraction strip with a different denominator (e.g. ⅓ or ⅕).
5 - **Relating Fractions to**	Study vegetable garden grid (p.	Follow *Explore* activity on p. 176	Play "Fracimal" card game -	Base Ten blocks (and rods)	Observe and listen throughout	**Extension:** Ask students to

Decimals *Objective:* Students will develop the understanding that fractions with denominators of 10 and 100 can be written as decimals. They will demonstrate understanding that fractions without denominators of 10 or 100 can be written as decimals by finding an equivalent fraction with a denominator of 10 or 100.	176). *Questions:* How many small squares are there? (100). How do you know? How many small squares are zucchini? How to describe this as a fraction? (e.g. 20/100 or 2/10). Follow the same line of questions for all vegetables.	in pairs. Create a garden and write the fractions of each vegetable in the garden in various ways. *Decimal thinking:* Ask students what they know about decimals and practice working through garden activity with decimals. *Question:* how many ways can you use decimals to describe the fractions for each vegetable in the garden? Encourage use of hundredths grids and blocks.	students with fraction cards find their decimal partners. https://www.cpalms.org/Public/PreviewResourceLesson/Preview/29791 Using base ten blocks and hundredths grids, have students complete the practice questions on p. 178-179 in pairs.	Hundredths Grids Fracimal cards	the class, making notes. **Exit Slip:** Present the students with two hundredths grids on a sheet of paper. Have qu. 11 (p. 179) written out for them to answer and display on the hundredths grids by shading in the appropriate squares and comparing. Students should recognize ⅗ is equal to 6/10 and 60/100. They should also recognize that 0.35 is 35/100.	explore questions like: Is it possible to have 8/10 of the garden planted with carrots and still meet all the conditions? 9/10? Explain.
6 - **Fraction and Decimal Benchmarks** *Objective:* Students will be able to show their understanding that fractions and decimals can be	Draw two number lines, one above the other, on the chalkboard. Label endpoints 0 and 1. A volunteer estimates, marks, and labels ½ on the top line. *Question:* how can we use the	Give students a copy of the number lines on p. 180 of the workbook. Students work through the *Explore* tasks (p. 180). Ask questions about	**Practice:** Print the number line on cardstock, fold the bottom and staple to create the pocket. Print the cards. The fraction cards fit into the pocket. Make enough for	Chalk/whiteboard markers Chalkboard/White board Rulers Number line pockets and	Observe, listen, make notes throughout the class.	**ESL Consideration**: Some students may not understand the term *benchmark.* Ensure you explain the word. You can demonstrate a visual benchmark

compared and ordered by using a number line labelled with benchmarks (0, 0.0; ½, 0.5; 1, 1.0)	½ mark to find the points for ¼ and ¾? Move to the bottom number line. *Question:* how might we show thirds? Discuss how number lines can help compare fractions.	their thought process throughout. Volunteers share solutions. Draw another number line on the chalkboard. Volunteers label benchmarks. Discuss the *Connect* portion (p. 180-181).	each pair of students or have students make their own. Students compare and order their fractions and place them in the number line pocket as they see fit. They then calculate the decimals and write them on the back and do the same (Nelson, 2020) http://www5.sd71.bc.ca/math/uploads/fractionbenchmarks.pdf	fraction cards		by having the students use their rulers as benchmarks and find items around the classroom that are shorter or longer than the ruler.
7 - **Exploring Thousandths** *Objective:* Students will be able to demonstrate understanding that numbers with thousandths can be written as decimals/fractions and that equivalent decimals name	Display a hundredths grid on the doc cam and follow the "Before" section on p. 21 of teacher's book. Give students a visual of the introduction on p. 183 and invite volunteers to answer the question. For each fraction have them name an equivalent	Point out that the large Base Ten cube will be used to represent one whole and they can determine the values of the other blocks. Explain that the grid in the *Explore* section represents one whole. Students work through *Explore* section (p. 183) in partners,	Follow the "After" section on p. 22 of teacher's book as students follow along in the *Connect* section (p. 184). Play place value dice game in pairs. Students take turns rolling and deciding where to place numbers in the thousandths	Base Ten blocks Thousandths grids Coloured pencils Dice Thousandths place value tables on worksheets	Ask questions throughout the activities. **Math Journal:** Focus on practice question 11 - students understand they must combine 4 digits in as many ways as they can to form decimal numbers. They should realize that	**Alternative:** Establish that each thousandths grid has 1000 small squares. Have students colour thousandths grids to show 4 fractions. Then have them write the fractions in as many ways as they can. **Optional:** Using base ten

the same amount.	decimal. Can do this with each student displaying their answers on their own plain paper or personal whiteboard.	using Base Ten blocks and colouring pencils. Share their work and discuss.	decimal place value chart - trying to create the largest number. https://betterlesson.com/lesson/resource/2865879/decimal-place-value-activity		since numbers must be greater than 1, but less than 5, the whole number part must be 2. They can use various approaches to get there, but they must show their work in the journal.	blocks and thousandths grids, have students work through practice questions on p. 185-186.
8 - **Comparing and Ordering Decimals** *Objective:* Students will develop strategies to compare and order decimals to thousandths.	Share height of Mount Logan in the Yukon Territory (5.959 km). Ask one volunteer to model the number with Base Ten Blocks and write it in a place value chart. Ask another student volunteer to find 5.959 on a number line with whole numbers and tenths and explain reasoning.	Share the table on page 187 on the projector . Students work independently to arrange the heights in order. Ask student volunteers to share their methods and include visual representations of strategies. Go over equivalent decimal strategy if not mentioned by students. Give each student a decimal card and ask students to arrange	Students work alone or in partners to complete question 1 on page 189 in math journals.	Place value (4 column) charts Blank number lines Base Ten Blocks	**Exit slip** *Reflect* question (p. 190)	**Extra Support**: Encourage the use of place value charts, Base Ten Blocks and/or blank number lines (kept available at all times). Encourage equivalent decimals method for comparisons. **Extension** Have students research batting averages of baseball players then arrange players from greatest to least.

		themselves in order from greatest to least.				
9 - **Using Decimals to Relate Units of Measures** *Objective:* Students will be able to express linear measurements in different units and use decimal notation to record fractional parts of units.	Ask students to use their arms, hands or fingers to estimate 1m, 1cm and 1mm Ask students to identify the relationship between units - use guided questions or a meter stick if necessary	Students estimate their own height and record estimation in meters, centimeters and millimeters. Discuss estimations and strategies with the class. Students work in pairs to find actual heights using measuring tape or a meter stick marked for centimeters and millimeters. Ask students to share strategies to convert between units. Students play a matching game in pairs (match cards marked with the same length but different units)	Students work in groups to complete a task list asking them to estimate and measure various parts of the playground, convert measurements and arrange items in order of height or length.	Meters sticks 1 m measuring tape Place value charts	**Math Journal:** Students answer the following questions: *How accurate were your estimations?* *What estimation or measurement strategies did you find helpful?* *What unit was most useful when taking initial measurements? Why?*	**Extra Support** Provide a meter stick with units (mm ,cm, m) marked in different colours Have students compare the meter stick to number lines Provide place value chart
10 - **Relating Fractions and**	Draw 10 circles (pies) on the board,	Present question from “Explore” (p.	Students complete questions 1 (a,c), 4	Paper strips	**Math Journal:**	**Alternative Exploration:**

Decimals to Division *Objective:* Students will understand that all division problems can be written as a fraction and vice versa.	colour in half of each circle. Ask students how many wholes can be made. Ask students how many pies each person would get if 10 pies were shared between 2 people. Ask students what is the same about 10/2 and 10 divided by 2.	194) on the projector. Ask students to solve the problem in 2 ways. Choose volunteers to share strategies with the class. Use the "Connect" section (pp. 194 - 195) to show 3 ways to write answers (with remainders, fractions and decimals) Brainstorm situations when each form would be appropriate. Note that any division statement can also be written as a fraction.	(a,c), 5(a,c), 6 (a,c), 7 (pp.195-196).	Connecting blocks	Create a word problem that can be answered in the form of a remainder, fraction or decimal.	Have students use paper strips to answer the following question: *If it takes ⅓ m of ribbon to make a bow, how much ribbon is needed for 10 bows?* **Extra Support**: Provide paper strips and/or connecting blocks **ELL modification:** Ask students to draw a picture along with a number sentence instead of writing a word problem (assessment).
11 - **Estimating Sums and Differences** *Objective*: Students will be able to use and describe different strategies for estimating the sum and	Show students a series of fruit one at a time. Ask students to write weight estimations on individual white boards. Ask some students to explain their thinking before	Students play the estimation guessing game from "Explore" (p. 197). Ask volunteers to share their estimation strategies and compare accuracy. Address any	Students complete questions 1 (a,c,g,e,i), 2 (a, c, e), 5 (pp. 198-199)	calculators	**Exit slip** Estimate the difference in mass between any fruit shown in class today and its match in the Guiness Book of Records table. Show your work.	**Extra Support**: Allow students to become comfortable with simpler strategies (such as rounding both numbers to whole numbers) before moving on to other more precise strategies

differences of decimals.	sharing answers. Present the table from "Explore" (p. 197) on the projector. Ask students to work in pairs to order the weights from greatest to least.	strategies not discussed by drawing attention to and reviewing "Connect" (pp. 197-198).				for estimating sums and differences. Have students use calculators to check the accuracy of their estimates.
12 - **Adding Decimals** *Objective*: Students will be able to use personal strategies to add decimals to hundredths and explain that addition of decimals involves adding digits of like value.	Present the problem on page 200 over the projector. Ask students if an estimation is good enough to answer the problem and explain why or why not. Brainstorm strategies to solve the problem.	Review the question in "Explore" (p. 200). Ask students to estimate the answer and share estimations with personal white boards. Ask students to use any methods or strategies they like to solve the problem. Ask volunteers to share their answers and strategies. Use "Connect" (pp. 201-202) and model any strategies not mentioned by the students.	Students complete questions 1 (a,c), 3 (a,c,e) and 4 (p. 203).	Base Ten Blocks Place value mats	**Diamond Assessment** Students find the perimeter of the school playground using measurements taken in lesson 9. **Math Journal** "Reflection" question (p. 203).	**Alternative Exploration:** Students find 2 items in a store flyer that cost less than $100 and add to find the total cost. **Extra Support:** Base Ten Blocks and place value charts should always be available.

13 - **Subtracting Decimals** *Objective:* Students will be able to use personal strategies to subtract decimals to hundredths and explain that subtraction of decimals involves adding digits of like value.	Present a map of BC to the students along with the following problem: *The distance from Victoria to Prince Rupert is about 1011km. The distance from Victoria to Squamish is about 216km. How much further away is Prince Rupert from Victoria?* Ask students to estimate before attempting to solve. Ask student volunteers to share strategies and methods. Give students more accurate distance measurements (1011.7 and 216.3) and ask them to solve.	On the projector, present a table with the amount of rainfall in cm measured in the day from five locations around BC, taken from the School-Based Weather Station Network. Ask students to choose two locations, estimate how much more rain one location has than the other and then find the difference. Invite volunteers to share their answers and strategies.Use "Connect" (page 205) and model any strategies not used by students.	Students complete questions 2 (a,c,e), 4, 13 (pp. 208-209)	Base Ten Blocks Blank number lines hundredth grids Crayons 1 cm grid paper	**Math Journals** "Reflect" question (p. 209)	**Extra Support:** Provide 1 cm grid paper to help students align digits. Students can colour hundredths grids to show the greater number in the question and cross out coloured portions to model taking away. Have students practice with decimals with less digits (e.g. question 1 on page 208) Base Ten Blocks, place value charts and blank number lines should be available for use. **Extension:** Link to science class by asking students to explore, compare and graphically represent data on the School-Based

						Weather Network.
14 - **Math center decimal review day** *Objective:* Students will apply and practice various personal strategies while completing a variety of activities related to decimals.	Present students with the following problem: *Yesterday I decided to walk to school. After school, I walked 0.62 kilometers more to get to the mall. When I got to the mall, my pedometer told me that I had walked a total of 1.83 kilometers. What is the distance from my house to school in kilometers? In meters?* Have students solve using any method or tool. Have volunteers share their strategies and answers.	Students work through math centers in small groups. Center #1: Triangle puzzles Center# 2: Measurement and estimation task cards Center#3: Decimal addition bump game Center #4: Create a budget	Time for reflection and journaling.	Base Ten Blocks Place value charts Blank number lines Hundredths grids 1 cm grid paper Triangle puzzle pieces 1 meter measuring tape Ruler Meter stick Task cards Bump! Game sheets Counters Dice Budget planning sheets Catalog	Teacher observations and anecdotal comments. **Math Journal:** Students will reflect on strategies that were effective as well as tasks they find difficult and easy.	**Consideration:** This lesson may be most effective split over two math periods, with students completing 2 centers per period. **Extra Support:** Provide Base Ten Blocks, place value charts, blank number lines, hundredth grids and/or 1 cm grid paper. Pair or group students with a range of abilities so they can help each other.
15 - Summative Introduction	Direct students attention to the	Give students the "Design the	Allow students time to look	Design the School Garden Handout	**N/A**	**Extra Support**

	picture on p. 165 and remind them about the questions covered during the unit launch. Tell students their summative project will be to create their own garden and will require them to use all the skills covered during the unit. Ask students to name effective skills and strategies they learned in the unit.	School Garden" poster handout. Review the instructions, clarifying where necessary. Tell the students they will present their posters to their peers in lesson 18. Review the checklist and rubric provided in the student handout.	through the handout and begin designs.	Square paper cut outs		Provide students with ten square cut outs to physically arrange while considering the design layout of their garden.
16- Summative work day 17 - Summative work day	Allow students time to work on their garden designs and posters. Circle and clarify any misconceptions with the instructions. Make sure students are using the checklist and referring to the single point rubric in their handout.			Poster paper Markers Loose leaf paper (for calculations) Square paper cut outs	**N/A** **Math Journal** What is the same about fractions and decimals? What is different?	**Extra Support** Provide students with ten square cut outs to physically arrange while considering the design layout of their garden. Have Base Ten Blocks, place value charts, blank number lines and grid

						paper available. Encourage struggling students to stick to simple garden designs.
18 - Wrap Up	Have students split into two groups and assign one group to present first and the other to circulate and assess first. Tell students they will switch roles half way through the class. Hand out 2 stars and a wish sheets and elicit helpful comments they could write. Write some examples on the board.	Students present their garden design posters to their peers in a gallery walk style, one group at a time.	Ask student volunteers to share one thing they really liked or one thing that surprised them about their peers' posters.	2 stars and a wish sheets	Students complete a 2 stars and a wish peer assessment form for at least 3 peers. Collect Posters and assess based on a single point rubric.	

Lesson 2: Equivalent Fractions (*~1 hr.*)

Big Idea
Numbers describe quantities that can be represented by equivalent fractions.

Curricular Competencies
- Develop mental math strategies and abilities to make sense of quantities
- Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving
- Visualize to explore mathematical concepts
- Engage in problem-solving experiences that are connected to place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures
- Represent mathematical ideas in concrete, pictorial, and symbolic forms
- Explain and justify mathematical ideas and decisions
- Reflect on mathematical thinking

Content
- Equivalent fractions
- (recognizing *patterns* in equivalent fractions)

Objective
Students will be able to understand and demonstrate that equivalent fractions name the same amount. They will also understand that patterns can be found in equivalent fractions (Appel et al., 2008).

Materials/Resources
- Colour tiles or congruent squares (red & yellow)
- 2-cm grid paper
- *Math Makes Sense* workbook p. 166-169
- Somewhat large beads in 4+ colours (enough for each pair of students to get a small assortment)
- Strings cut into small portions (necklace or bracelet length), with a knot tied at the end (enough for 1 for each student)
- Guest speaker (beadwork artist) from local first nation and some of their beadwork

Key Terms
- Equivalent fractions
- Proportion
- Numerator
- Denominator

Timeline
1. Introductory Activity (*5 min.*)
2. Exploration Activity (*10-15 min.*)
3. Indigenous Beadwork Activity (*20-30 min.*)
4. Closing Activity (*10 min.*)

Introductory Activity (*5-10 minutes*)
(Appel et al., 2008, *Math Makes Sense:* Unit 5)

This activity builds off of the knowledge of fractions the students should have obtained in grade 4. It involves reviewing fractions and introduces the concept of equivalent fractions.

1. Students observe the introductory picture (*Math Makes Sense* workbook, p. 166) - two students are looking at a sheet of stickers that is missing half of the stickers. One student thinks "6/12 stickers are left," whereas the other student thinks "½ of the stickers are left."
2. Discuss with the students:
    a. *Who is correct?*
    b. *Who thinks the boy is correct? How do you know?*
    c. *Does anyone think the girl is correct?*
    d. *Is either one of them wrong? How could they both be correct?*
3. Introduce the Exploration activity

Exploration Activity (*10-15 minutes*)
(Appel et al., 2008, *Math Makes Sense:* Unit 5)

1. Outline a 4x6 rectangle on grid paper, ⅙ of rectangle is red, the rest is yellow.
2. Have students (in pairs) find how many ways they can describe the fraction of the rectangle that is red or yellow.
3. Have extra fractions available for them to practice finding equivalent fractions (⅓, 8/10, ⅝, 6/12).
4. In the end, have them share their work with another pair of students.
5. As a class, invite volunteers to name fractions they used in the activity and why. Discuss.

Key questions to get students thinking:

- How can you make ⅙ of the rectangle red? *(Grid has 6 columns of 4 small squares, so you can cover one column with red tiles)*
- Are there other ways of showing ⅙? How do you know? *(You could cover 4 squares in one of the rows, or cover a 2x2 square. Any 4 squares on the rectangle would be ⅙)*

Discussion points:

- Equal regions do not have to be *congruent*. They simply have to cover the same *area*.
- Encourage students to find the *pattern* in the numerators and denominators of the fractions

Extension:
Have students explore various ways of placing colour tiles on the grid during the exploration activity and practice naming fractions that way.

Alternatives*:*
Use objects/counters with different shapes or textures for colour-blind or visually impaired students.

Introduce the term ***equivalent fractions*** and explain that it is a term we will be using to describe fractions that name the same amount. *Optional:* Use the examples in the *Connect* section (p. 167) to explain that the value of a fraction does not change if the numerator and denominator are multiplied or divided by the same non-zero number (Appel et al., 2008).

Indigenous Beadwork Activity (20-30 min.)

This activity incorporates local Indigenous ways of knowing as well as integrates with the subjects of art and social studies. The purpose of this activity is to get students practicing equivalent fractions as well as foreshadowing the concept of ***proportions***, while incorporating Indigenous history and knowledge, and showing students how math can be relevant to real lives and art.

Invite a member of the local First Nation who is familiar with beading and has done some beadwork. Have them display some of their work and talk to the students about the historical and present-day practice of beading in local indigenous communities. The activity then proceeds as follows:

1. As a class, students are presented with a simple string of beads (made by the guest speaker). This string includes beads of a few different colours in a pattern (e.g. 20 beads total; pattern: 5 black-3 red-4 white-3 red-5 black). They are told how many total beads fit on the string (20).
2. Work together as a class to figure out what fractions of each colour of bead are on the string (10/20 black, 6/20 red, 4/20 white).
3. Have the students discuss with a partner to figure out other (equivalent) ways to write those fractions. Question: *could we make the same pattern but on a shorter string that only fits 10 beads? What about a longer string?*
4. Have students pair up and give them each a small assortment of 4 different colours of beads, as well as two strings with knots tied at the end.
5. **Task**: students work together to make a pattern and record the fractions of each colour on the string on a piece of paper. They then find and record any equivalent fractions and write those down.
6. **Exploration challenge**: can the students make a pattern that can be replicated on a smaller string (like in the demonstration)? Can they expand their pattern to a longer string? Students will gain experience working with equivalent fractions, as well as discover important concepts such as the fact that their patterns can not be shrunk down if the numerators are odd numbers.
7. If time, have some students share their patterns with the class and describe their thought process.

Discussion points:

- The value of a fraction is not altered if the numerator and denominator are multiplied or divided by the same non-zero number.
- You may want to discuss *proportion* in terms of equivalent fractions. It is not necessary to dive into ratios yet because they will learn this in grade 6.

Closing Activity (*10 minutes*)

- Allow time for journaling (assessment).
- *Optional if you have time, for further practice:* Have students work alone or in pairs to complete the questions in the Practice section of the workbook (Appel et al., 2008, p. 168-169).

Assessment

- *Formative assessment*: ask questions and observe throughout the activities. Make notes and anecdotal comments on students as you see necessary.
- ***Math Journal Entry*** (focus on qu. 9 of the Practice section of workbook (Appel et al., 2008))
    1. Have students sketch a round or rectangular pizza
    2. Divide the pizza into 8 equal sections
    3. Shade 2 sections (removing them)
    4. Prompt them to figure out the fractions and equivalent fractions for both the missing and remaining pieces of pizza

Students should understand and record the following in their journals on their own:

- Students should be able to describe that 2 of 8 slices of pizza are 2/8 of the pizza
- They should also realize that 2/8 is equal to ¼
- They should do the same for the amount of slices left on the pizza (6/8 and ¾)

Lesson 14: Math Center Decimal Review *(~1 hr. 30 min.)*

Big Idea:

- Numbers describe quantities that can be represented by equivalent fractions
- Computational fluency and flexibility with numbers extend to operations with larger (multi-digit) numbers.

Competencies:

- Estimate reasonably
- Model mathematics in contextualized experiences
- Develop, demonstrate, and apply mathematical understanding through play, inquiry and problem solving
- Use mathematical vocabulary and language to contribute to mathematical discussions
- Explain and justify ideas and decisions

Content:

- Whole-number, fraction, and decimal benchmarks
- Decimals to thousandths
- Addition and subtraction of decimals to thousandths
- Financial literacy – monetary calculations, including making change with amounts to 1000 dollars and developing simple financial plans

Objective:

This lesson is meant to provide an opportunity for students to review and apply strategies and concepts related to decimals before moving on to the summative task. This lesson would be most effective spit over two math periods, with students completing two centers per lesson.

Materials:

- *Whole lesson:* Base Ten Blocks, place value charts, blank number lines, hundredths grids, 1 cm grid paper
- *Center #1:* Triangle puzzle pieces
- *Center #2:* 1-meter measuring tape, ruler**,** meter stick**,** task cards
- *Center #3:* Bump! Game sheets, counters**,** dice
- *Center #4:* budget planning sheets**,** catalog

Key Terms:

- Fraction
- Decimal
- Tenths
- Hundredths
- Thousandths
- Estimate
- Equivalent
- Sum
- difference

Timeline

1. Introductory Activity (*~15 min.*)
2. Main Activity (*~50 min.*)
3. Closing Activity (*~ 10 min.*)

Introductory Activity: (~ *10 to 15 min.***)**

To review the last two lessons as well as points from lesson 9 (measurement), start the lesson by sharing the following story problem verbally and on the board:
Yesterday I decided to walk to school. After school, I walked 0.62 kilometers more to get to the mall. When I got to the mall, my pedometer told me that I had walked a total of 1.83 kilometers. What is the distance from my house to school in kilometers? In meters?

Ask one or two students to re-state the story in their own words and identify what we need to solve for.

Ask the following guiding questions:
How might we find the distance from my home to school? (Students may be able to identify that they can use subtraction to find the distance)
What strategies will be helpful?
Do you think the distance will be greater or less than 2 kilometers? Why or why not? (Students should be able to see that the answer would be less than 2 meters as the total distance is less than 2 meters)
What is a good estimate for the distance between my house and school in kilometers?
What is the relationship between kilometers and meters? (Students should remember that 1km -1000km)

Allow students some time to apply their own strategies and come up with an answer. Tell students to record their work and be ready to explain their methods. Make sure to have Base Ten Blocks, place value charts, blank number lines, hundredth grids and 1 cm grid paper available for students to use.

While students are working, circulate and observe strategy applications and ask the following guiding questions:

What strategy did you/are you using?
How did you decide on this strategy?
How did you estimate the answer?
Is your answer close to your estimate? Could you have made a more accurate estimate?

Watch for students who are not using any materials to make sure they are subtracting digits of like value and getting an answer close to their estimate. Make note of students applying different strategies in an appropriate way. Before coming back to the group, ask these students if they would mind sharing their strategies and answers with the group.

Encourage student volunteers to model their strategies for the class. If necessary, help students create a visual representation of their strategy on the board.

Main Activity: (*5 to 10 min introduction; 10 to 15 minutes per center***)**

Remind students of all that was covered in relation to decimals and walk them through the four centers.

*Over the last couple weeks we have learned a lot about decimal numbers and how they are another way to communicate and work with fractions of a whole. First, we compared and ordered decimals. Which way should we read decimals when we compare them? (*students should remember to read left to right so that they are comparing the biggest values first)
Then we reviewed units of measurement and how we can use decimals to represent fractions of a unit.
We looked at the relationship between fractions, decimals and division.

Can anyone explain how those three things are related? (Students should remember that all fractions can be written as a division problem and the answer to the problem can be written as a decimal. Students may find it easier to give an example)
We practiced estimating the sums and differences of decimal numbers. Which strategy did you like best? (Ask one or two students to share their favorite strategies and why)

Finally, we practiced doing addition and subtraction with decimals. Can anyone think of a time when estimating would not be appropriate and we would have to add or subtract decimals? (One example may be when we need to make sure we have enough money for something)
So today you are going to complete four centers to practice all the new skills and strategies you have been working on. You are welcome to use whatever strategies and tools are helpful to you at any center, including Base Ten Blocks, place value charts, number lines, hundredth grids, grid paper or pictures.

Identify where these resources can be found.

Briefly walk students through the instructions of each center. Instructions and supplies should be set up with each center at different places around the room (see center outline below).

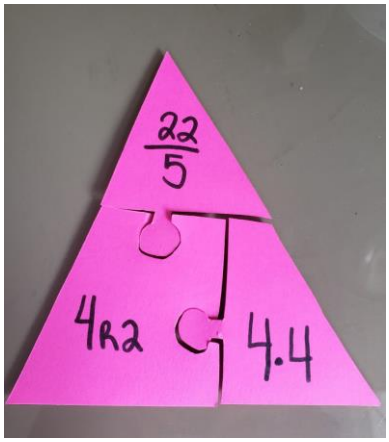
Divide students evenly between centers as a starting point. Tell students that they should work with partners or in small groups. Students can work at their own pace but should spend no more than 15 minutes at a given center.

Center#1: Triangle Puzzles

This station is a review of the idea that all fractions can be written as a division problem and that the answers to division problems can be written as fractions, whole numbers with remainders or decimal numbers. Students will arrange triangle puzzles according to the numbers written on the pieces. Numbers that are equal in value belong to the same puzzle.

At this station, there should be three to four Ziplock bags, each containing nine puzzle pieces (See below). These 9 puzzle pieces fit together to make three separate triangles. One completed triangle should be set up at the station for students to use as a reference.

Triangle Puzzle Examples:



Instructions at center:

In this center you will be putting puzzles together using what you know about representing fractional numbers in different ways!
Think about the division problem 17÷7
The answer could be written as $\frac{17}{10}$ *,* ***1R7*** *or* ***1.7***
To form a complete triangle puzzle you need to find pieces that have equivalent numbers written in these three different ways. Use the example as a reference.

1) *Please choose ONE of the Ziplock bags. This bag should have 9 pieces inside.*
2) *Put together 3 triangles. Remember that all pieces in each triangle should have equivalent numbers.*
3) *Check with your teacher when you think you have solved all three puzzles.*
4) *Choose 1 of the puzzles you constructed and write a word problem that would result in that answer. Write your word problem in your math journal.*
5) *Put all the puzzle pieces back into the correct bag.*

Center #2: Measurement Task Cards

This center is a review of estimating, ordering decimals, measuring and representing fractional parts of measurement units with decimals. Students choose three task cards to complete. Tasks include estimating measurements, measuring items or dimensions around the class, converting units and ordering measurements from greatest to least (see below for task card examples).

At this center, there should be a stack of task cards ready for students, rulers, 1-meter measuring tape marked in centimeters and millimetres and meter sticks.

Task Card Examples:

TASK CARD Measure three things in the room using centimeters. Convert your measurements into meters.	**TASK CARD** Measure the distance from your desk to the door. Record your measurement in three different units.	**TASK CARD** Find and measure something that is SMALLER than 15.3 centimeters.
TASK CARD Find and measure something that is BIGGER than 1.56 meters.	**TASK CARD** Arrange the following measurements from greatest to least. 0.050km 70 m 9000 cm	**TASK CARD** Estimate the perimeter of the room. Measure the actual distance, how accurate was your estimation?

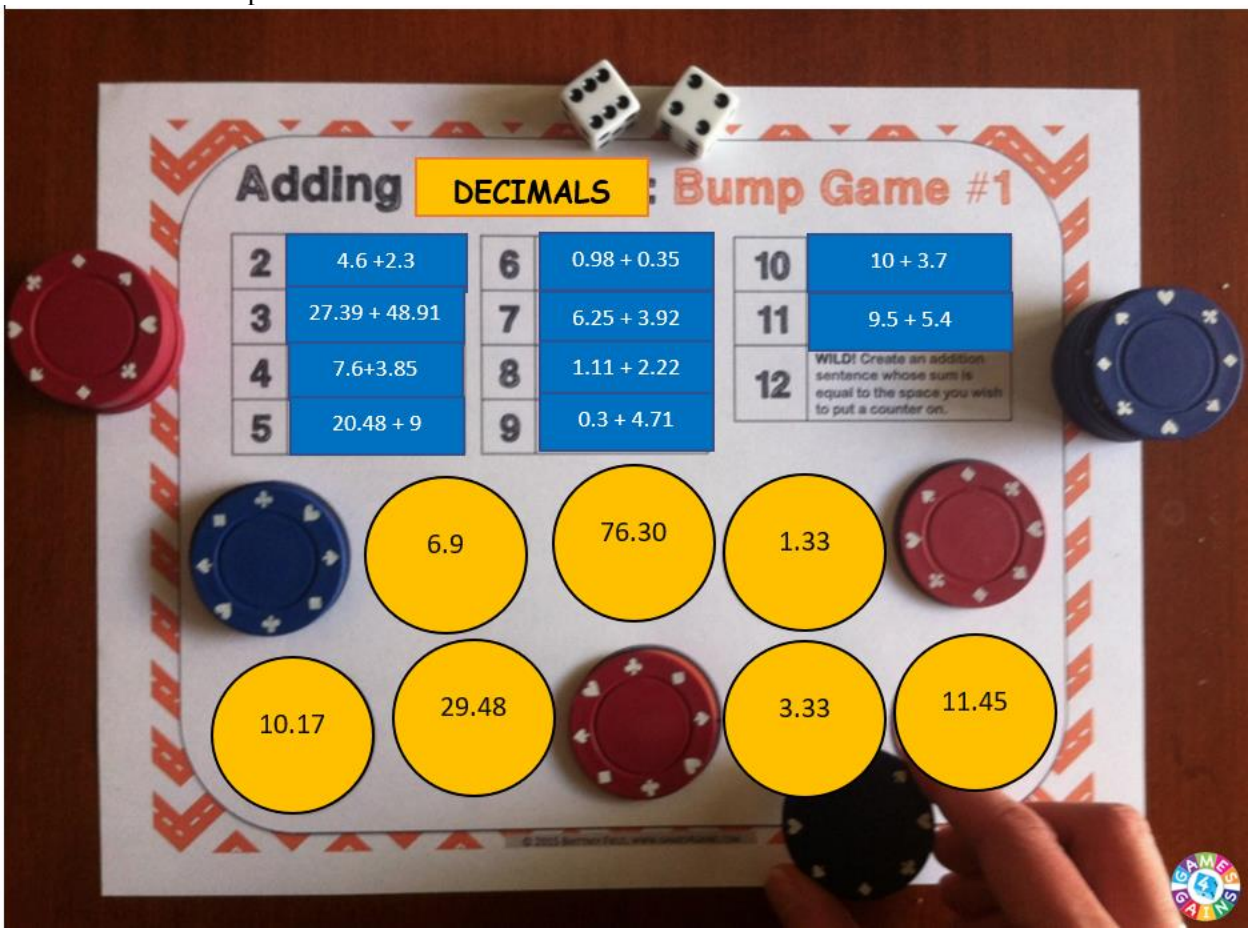
Instructions at center:
Choose any three task cards to complete. Record your work in your math journal.

Center #3: BUMP! Decimal Addition

Students will play a game of BUMP! with a partner to review decimal addition. The pair will share one Bump! Game board with addition equations matched to numbers 2-12 at the top and a series of answers at the bottom (see below for an example). Students roll the die, answer the corresponding addition question and put a counter over the answer. If there is already a counter over that answer, the player can bump the counter off and replace it with their own counter. The winner is the player with the most counters on the completed game board.

At this center, there should be around ten BUMP! game cards, counters and at least five sets of dice.

BUMP! Board Example:



Original image from: https://games4gains.com/blogs/teaching-ideas/41499396-bump-up-the-fun-with-fractions

Instructions at center:

For this game, you need to work with a partner.

1) *Get 1 game board, 2 dice and 10 counters (5 for each player)*
2) *Assign a counter colour to each player*
3) *Player 1 rolls the dice and answers the decimal addition question labeled with that number on the game board.*
4) *If the player can answer correctly, they put one of their counters over the answer at the bottom of the game board. If the player cannot answer the question or answers incorrectly, they skip their turn and the game continues with the other player.*
5) *Player 2 then rolls the dice and follows step 4.*

6) *If a player arrives at an answer that already has the other player's counter on it, that player can BUMP off the counter and replace it with their own. However, if a player arrives at an answer that is covered by their own counter, they should roll again.*
7) *The winner is the player with the most counters on the game board once all answers are covered.*

Center #4: Create a Budget

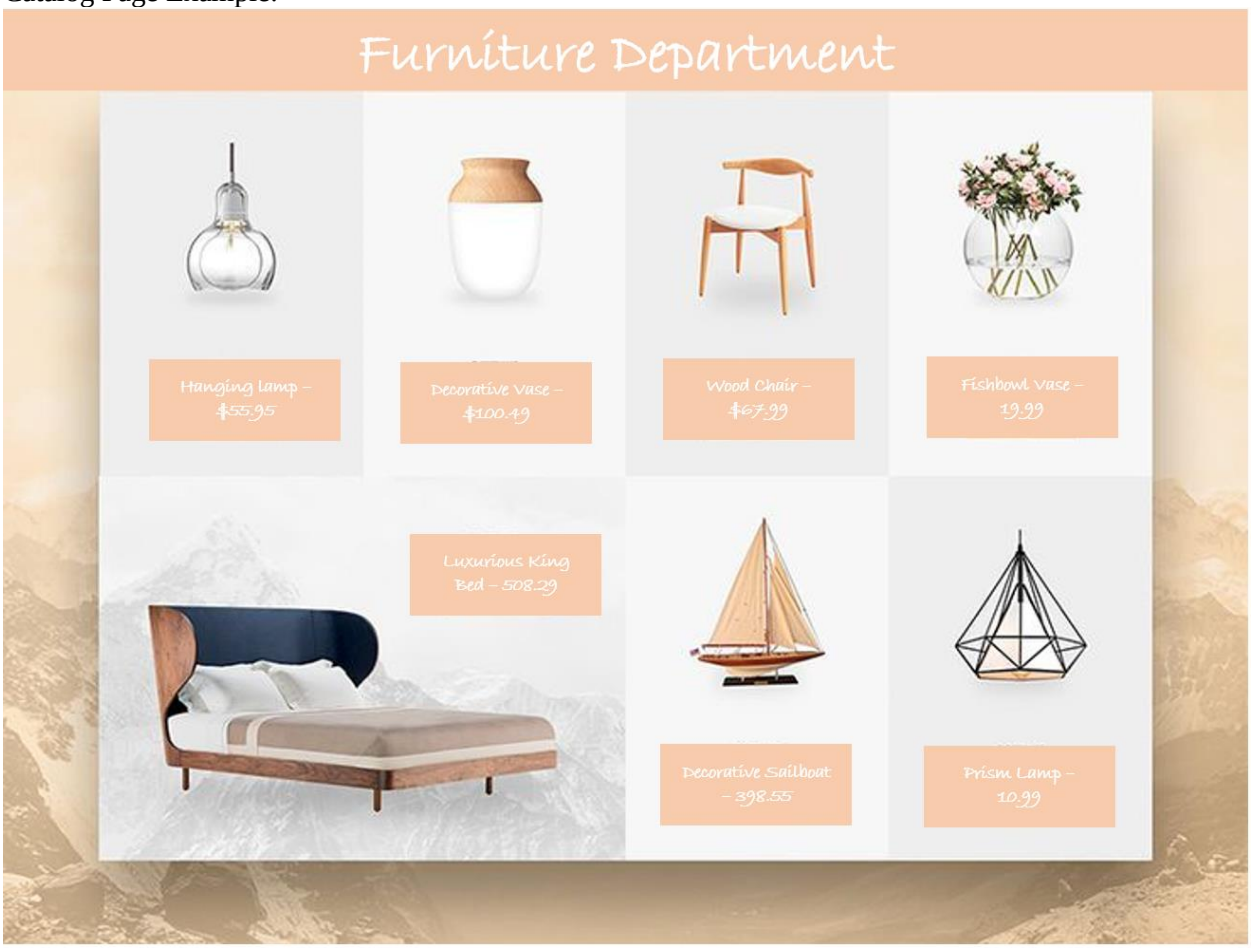
This center provides a real-life example of the application of decimal addition and subtraction. Students are given $1000 to spend at a department store. They will use a budget planning sheet and a catalog (see below) to decide how their money is spent. However, students must include certain types of items in their purchases.

At this center, there should be budget planning sheets and a few copies of the catalog.

Budget Planning Sheet Example:

Starting Balance: $1000.00		
Item Description	**Cost**	**Balance After Purchase**

Catalog Page Example:



Original image from:
https://www.pinterest.ca/pin/507006870544750233/?nic_v1=1axdQbCbNRIkaoM4LQGzd0dUsCkBC0vi05QCNHD4gtXpT4ml4Hlam7y4Ab1ssESK2Y

Instructions at the center:
Congratulations! You have just won $1000.00 credit at a local department store. Look through the catalog to choose what you want to purchase. Use the 'Budget Planning Card' to record how you spend your money. Record any thinking or draft work in your math journal.
However, before you get started, there are a few things you MUST include in your budget. You must purchase a piece of furniture, food to prepare a meal for two and EITHER a full outfit or a piece of technology.
Happy shopping!

Make sure to check that students understand the meaning of the word 'budget' when introducing this center.

Closing Activity: (~*10 min.*)

Once students have completed all four centers, ask them to take 10 minutes to reflect on their experience in their journals using one of the following prompts:

- *What did you find the easiest today? What did you find the most difficult? Why?*
- *What mistakes did you make that will help your learning?*
- *What new strategy did you try today? How did it go, and will you use it again?*
- *What questions do you still have about decimals? How will you answer them?*

Write the questions on the board and encourage students who finish the centers early to start reflecting.

If there is time once everyone is finished writing, ask students if they would like to share anything from their reflections.

Assessment:

Since students will be working in small groups and pairs as they work through the centers, this is a good lesson to assess for mathematical language and communication as well as conceptual understanding. The teacher should circulate as students work on centers, keeping a record of anecdotal comments along with quotations for the students (if possible) in a folder. These observations can be paired with the students work and reflections in their math journals.

Modifications/Differentiation:

Base Ten Blocks, place value charts, blank number lines, hundredth grids and 1 cm grid paper will be available at all times. Monitor students for issues and suggest tools as appropriate.
For example, students who are not aligning place values correctly may do better when writing on 1-centimeter grid paper, or may need to draw place value boxes on their paper.

Pair or group struggling students with others who may be able to explain and aid them.

Ask ELL students to write any thoughts or questions in their mother tongue first before attempting in English. If this is not sufficient, they may provide verbal explanations or pictures and the teacher can scribe.

References & Resources

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Appendix

Design the School Garden!

Grade 5 Unit Summative: Fractions & Decimals

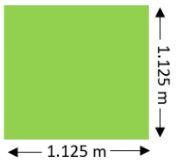
Your school has decided to make a garden on the school property. Due to your outstanding creativity and expert knowledge of fractions and decimals, the Principal has asked you to create the design!
The Principal has given you the following guidelines for the design:

- The garden must be made of **ten** (10) square plots (10 x)
- you must have at least **seven** (7) different kinds of seeds in your garden,
- you **must not** spend more than **$35.00** on seeds to plant in the garden.

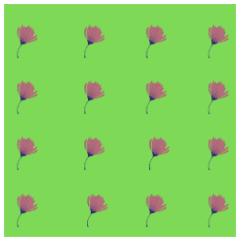
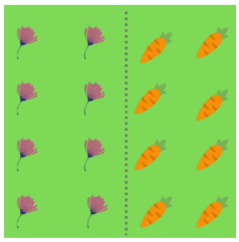
Step 1: Decide how to arrange the ten plots.
Below are just a few examples of how you might arrange them.



Step 2: Calculate the total length of each side of your garden if the plots are all 1.125m long and 1.125m wide.



Step 3: Decide what you will plant in each plot.
You can plant an entire plot with the same type of seeds OR you can divide plots into fractions and plant different types of seeds in each part of the plot.

BUT, seeds cost money! Use the attached **seed catalog** and the **budget planning sheet** below to keep track of the money you need for your garden. Remember, you cannot spend more than $35.00.

Step 3: Create a poster to present your garden design.

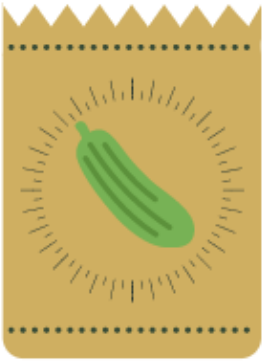
✓ Your poster must include the following:

- ☐ A title
- ☐ Your name
- ☐ A clearly labeled drawing of your garden
- ☐ The fraction of your garden that each type of seed covers (MUST HAVE **AT LEAST 7** DIFFERENT KINDS OF SEEDS).
- ☐ The total length of each side of your garden
- ☐ The total amount of money needed to buy the seeds in your garden (MUST **NOT BE MORE** THAN **$35.00**)
- ☐ A short paragraph explaining your choices
- ☐ An attached paper with all your calculations and rough work

EDCI 405: Assignment 3
Alicia McCullough & Denee Nickel

Garden Seed Catalog

All seed and bulb packages contain enough for 1 plot.



Cucumber seeds

$2.97

Potato seeds

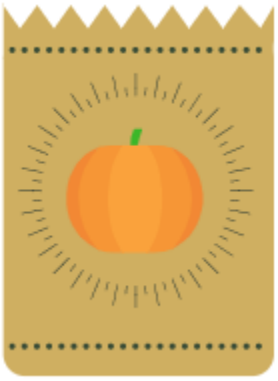
$1.50

Carrot seeds

$3.85

Tomato seeds

$4.29



Pumpkin seed

$3.29

Melon Seeds

$4.55

Strawberry Seeds

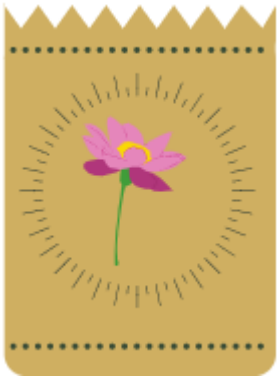
$1.98

Forget-me-not seeds

$2.20

Rose bulbs

$6.76



Cosmos Seeds

$1.10

Pansy Seeds

$1.98

Tulip bulbs

$2.20

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Budget Planning Sheet

Starting Balance: $35.00		
Item Description	**Cost**	**Balance After Purchase**

EDCI 405: Assignment 3
Alicia McCullough & Denee Nickel

Single Point Rubric: Garden Design Poster

Working Towards Proficient	Proficient	Evidence of Extending
	Your poster includes your name and an appropriate title. Your poster includes a drawing of a garden design with ten square plots. You have used at least 7 different types of seeds in your design. The total cost of the seeds in your design is less than or equal to $35.00. Your garden design has been labelled neatly and accurately with the following: 1. What each plot has been planted with 2. The total length of each side of your design Your poster has a short paragraph that includes: 1. The total cost of your garden (accurately calculated based on the cost of seeds). 2. The fraction of your garden that each type of seed covers (must be written in fraction form) 3. One or more reasons for your design choices 4. One or more strategies that were helpful in creating your design You have attached calculations that show addition and subtraction of decimals as well as any other strategies necessary to create your design.	