MCIEA Task: What's growing in our garden?

Course/subject/grade level: 4th grade math

Context/prerequisite skills: This task may we well placed as a culmination of a unit around comparing fractions.

Performance Assessment Quality Criteria
High-quality performance tasks should: ● Align to high-leverage learning goals (competencies, learning targets, standards, transferable skills, etc) ● Be open ended and relevant to the real world ● Require application and transfer using higher-order thinking ● Be fair and culturally responsive ● Outline clear criteria for success in a rubric ● Result in original products, performances, or solutions

Learning Goals
What is being assessed in this task? This includes competencies, standards, learning targets, transferable skills, etc. Remember - application and transfer of high-leverage skills are a hallmark of performance assessments. 4.F.1 Explain why a fraction a/b is equivalent to a fraction (nxa)/(nxb) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fraction. 4.NF.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model. 4.NF.3 Understand a fraction a/b with a > 1 as a sum of fractions 1/b. 4.MD.3Apply the area and perimeter formulas for rectangles in real-world and mathematical problems.

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Task Summary
Describe the essence of the task. What authentic role is the student taking? Who is the audience? What is the problem they are trying to solve? Students are planning a container garden with one plot for themselves and one for a friend. They will conduct self-reflection and interviews around veg preferences. Based on the data they collect they will plan a garden for themselves and their friend. They will be asked to compare, using fractions, perimeter, and area, the garden they planned to their neighbor's garden. After the comparison, students will reflect on the choices they made throughout the task.

Essential Questions
What challenging and open-ended questions are students exploring in this task? How does this assessment engage students in tackling the essential question? How do numbers relate and compare to one another?

Quality Output	Quality Process
What original product or solution will students produce as a result of this task? Describe what a quality output looks like, sounds like, feels like. A well-conceptualized and designed garden will show an understanding of vegetable size relationships, with students displaying a knowledge of both fractions and spatial relationships. In creating their gardens, they should also display a knowledge of area and perimeter	*Without being overly prescriptive, what will students actually do as they complete this task? Describe the flexible quality process learners will engage in to produce the output.* See linked attachments below. **Step 1**: Introduction and build background knowledge about a garden **Step 2**: Determine garden contents (students work in pairs) **Step 3**: Garden creation (independent student activity) **Step 4**: Garden comparison (independent student activity)

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Resources/Materials
What do all students need to have access to in order to complete the task? Students should have access to: ○ grid paper ○ fraction bars, square tiles, graph paper

Possible Accommodations
Understanding that accommodations will always need to be adapted for student's individual needs, what are some accommodations that may be provided for this task? For those students who need it: ● Extra copies of grid template, plain paper, pencils, rulers to draw out a diagram ● Vocabulary sheet with pictures can be used during the assessment

What's growing in our garden? Detailed Teacher Directions

Prior to administering task:

- Above standards already taught and practiced
- Formative assessment ahead of time to model (where students are given similar grid, with specific measurements)
- Many opportunities for students to use mathematical language

Administering the task:

This task should take approximately 2-3 45 minute periods for a 4th grade classroom. Depending on the class, the task may take anywhere 2-5 math sessions, but should be completed within a week. Steps 1 and 2 may be completed consecutively in 1 session, depending on teacher choice.

Step 1 - Build background knowledge about a garden

Introduce the idea of creating a garden

- Show the video (10 minutes)
    - Gives students an idea of what the task is asking and exposes them to the language of the task
    - Video link: https://www.youtube.com/watch?v=f2FxJimob84
- Following the video, lead a brief class discussion to review what they just learned
- Provide the vocabulary sheet to students
    - http://digitalpaxton.org/works/pics/vegetables-names

Step 2 - Determining garden contents

In the next session, students will be partnered up with students to determine what to put in their gardens

- Partner students up (Teacher discretion)
- Provide the Creating a Vegetable Garden sheet to students from the Student Packet
    - This will provide students the opportunity to talk about the different vegetables they might include, while also interacting with peers, building excitement around the task
    - Students complete part 1 of the planning sheet on their own. Part 2 is when they will interview a partner. In part 3, students should combine the information to determine which vegetables they will put in their garden. They will determine which vegetables will take up the most and least amount of space and provide reasoning.

Step 3 - Students create their gardens

The task is an independent student activity. You may read the directions and the rubric to the class and repeat directions to individual students as requested. Teachers may answer clarifying questions, but may not explain math terms or provide instruction. Any scaffolding needs to occur prior to administering the task.

- Provide student directions and all materials to students.
    - Materials
        - Student Packet
        - Scrap paper and/or grid paper
- Student create their gardens and answer questions about what they've produced.
- Students look at a neighbor's garden and answer questions about what they see.
- Once this part is completed, students are ready to move on to part 4.

Step 4 - Garden comparison

Provide students with the neighbor's garden. If this step is done at a different time than step 3, students will need to be given their own garden plots back.

In this step, students will use the teacher created sentence stems to make fractional comparisons between the 2 gardens.

Appropriate accommodations

- All students will have grid paper
- All students have access to fraction bars, square tiles, graph paper
- Extra copies of grid template, plain paper, pencils, rulers to draw out a diagram
- Vocabulary sheet with pictures can be used during the assessment

What's growing in our garden? Student Instructions

<u>Creating a Vegetable Garden</u>

You and your friend are planning a garden!

Part I. - What do you want in your garden?

What vegetables do you possibly want to put in your garden? (Choose 6) List them in order from favorite to least favorite.

1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________
6. ______________________________

Are there any vegetables that you would NOT want in your garden?

Part II. - Adding what your friend wants

Interview question: What are the 6 vegetables you would want in the garden? Please list them in order from your favorite to least favorite?

1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________
6. ______________________________

Which, if any, vegetables would you NOT want in the garden?

Are you allergic to any vegetables?

Part III. - Plan your vegetable garden

**Keep in mind you are planning the garden for you and your friend. You will decide how much space each vegetable will take up.

Which 6 vegetables are you going to put in your garden?

______________, ______________, ______________

______________, ______________, ______________

Which vegetable will take up the most space in your garden?

____

How did you decide this?

____

____

Which vegetable will take up the least amount of space in your garden? ______________

Why?

____

____

How did you think about what your friend wanted when you planned your garden?

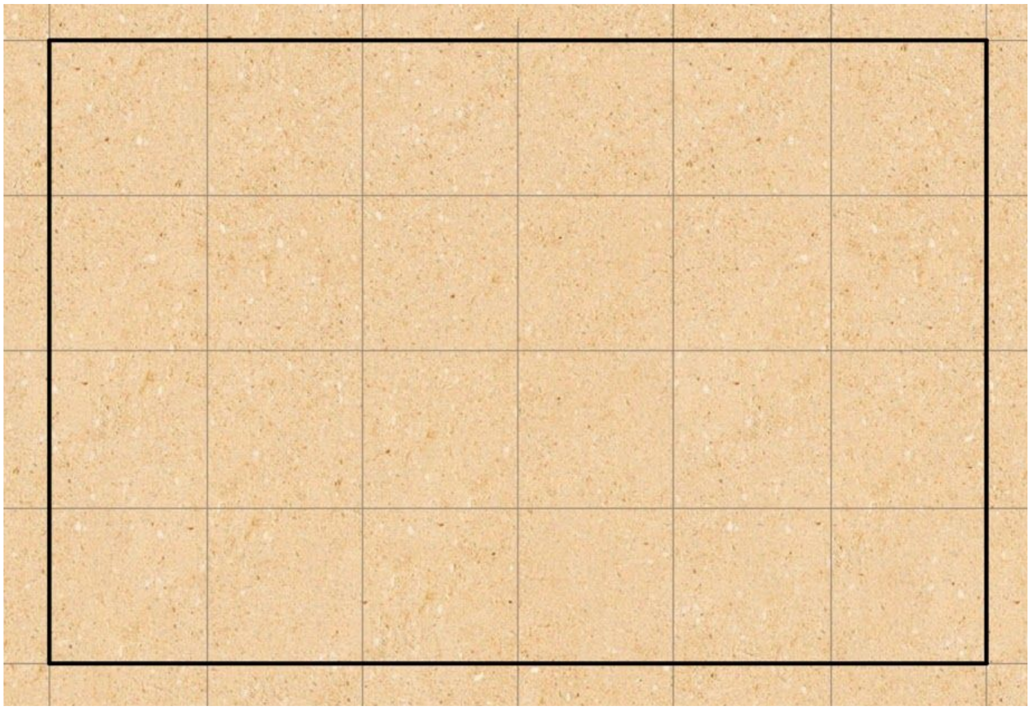
____

____

Planting Your Garden

Please draw a plan of the garden for you and your friend by placing your 6 vegetables in the grid. You can plant any amount of each vegetable you want. Be sure not to leave any free space.

You and Your Friend's Garden



1. Write a fraction that represents how much of the whole garden each vegetable takes up.

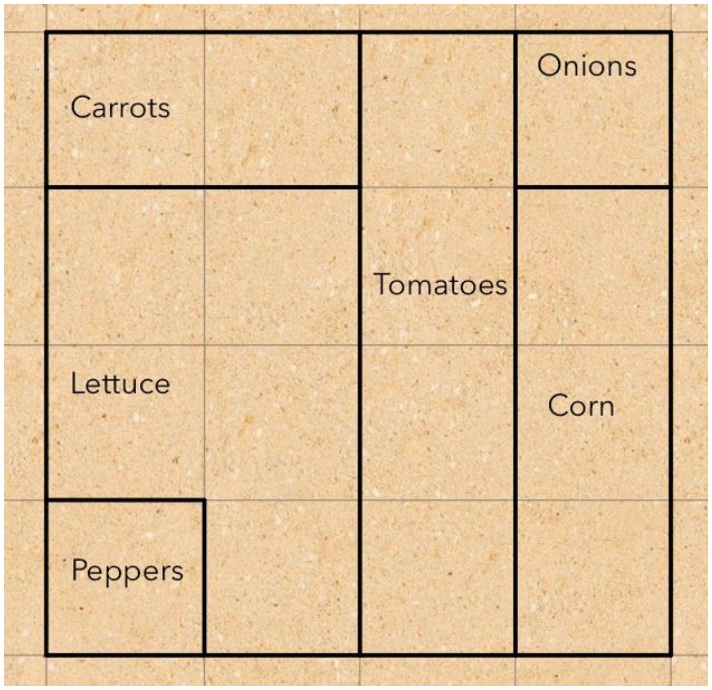
2. Order your vegetables from least to greatest using fractions.

3. Write a number sentence that shows that the sum of the fractions above is equal to your whole garden.

<u>Looking at Your Neighbor's Garden</u>

Now, you will look at your neighbor's vegetable garden. Answer the following questions about the neighbor's garden.

Your Neighbor's Garden



1. Order your neighbor's vegetables from least to greatest using area (square feet).

2. Find the perimeter for each of the vegetables in your neighbor's garden (feet).

3. Name a group of veggies that together make up one half of your neighbor's garden. Explain your answer using fractions.

Comparing Your Gardens

1. Time to pick your veggies! Today you have decided to pick __________ and __________ (pick 2 veggies from your garden). Your neighbor decided to pick carrots, peppers and onions today.
    a. Who has picked a larger area (square feet) in their garden? Show your work.

    b. Who has picked a larger fraction of their whole garden? Show your work.

2. You and your neighbor want to trade one vegetable. Find one vegetable in your garden with an area that is equal to the area of one vegetable from your neighbor's garden. Use a number sentence (use <,>,=) to explain what fraction of each whole garden is being traded.

3. You and your neighbor are each given 12 feet of fencing to protect a part of your gardens.
    a. What fraction of each garden are you able to protect? Show your work.

    b. Which vegetables will you choose to fence in?

       What do you think your neighbor should fence in?

4. The following year you and your neighbor decide to plant corn in half your gardens. You friend and your neighbor are arguing about whose garden will grow more corn next year. Help prove who is right! Show and explain your reasoning.

What's growing in our garden? Rubric

	Exceeds	Meets	Not Yet
Equivalent Fractions	I can find equivalent fractions and write them in its most reduced form. I can explain why I know they are equal.	I can find at least two equivalent fractions and write a math sentence using the equal sign. I can explain why I know they are equal.	I still need to work on:
Comparing Fractions	I can compare two fractions with different numerators or denominators using a common numerator or denominator and put the fractions in their most reduced form.	I can compare two fractions with different numerators or denominators using a common numerator or denominator.	I still need to work on:
Fraction Equations	I can write fraction equations using fractions different denominators.	I can write fraction equations using fractions with the same denominators.	I still need to work on:
Area and Perimeter	I can write an equation to represent how I found the area of parts of my garden.	I can find the area of parts of my garden.	I still need to work on:

Teacher-facing Rubric

Standards	4-Exceeds	3-Meets	2-Approaching	1-Substantially Below
4.F.1 Explain why a fraction a/b is equivalent to a fraction (nxa)/(nxb) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fraction.	Identifies and explains equivalent fractions and presents them in their most reduced term.	Identifies at least two fractions using the equal sign. Explains the reasoning behind two equivalent fractions through a model or explanation.	Can recognize two equal fractional parts in a picture or model but does not accurately identify the two fractions or write a number sentence.	Student does not identify or generate equivalent fractions.
4.F.2 Compare two fractions with different numerators and different denominators. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols, and justify the conclusions (by using a fractional model.)	Compares two fractions with common denominators and presents understanding in most reduced form.	Student is able to compare two fractions with different denominators using a common denominator.	Student is able to compare two fractions correctly within the picture, but does not identify common denominators	Student does not accurately compare fractions with different denominators.
4.F.3 Understand a fraction a/b with a>1 as a sum of fractions 1/b	Student is able to decompose a fraction and present an accurate number sentence as a sum of it's part with different denominators.	Student is able to decompose a fraction and present an accurate number sentence as a sum of its parts.	Student is able to decompose a fraction, but is not able to present an accurate number sentence as a sum of its parts.	Student does not show fraction a/b with a>1 as as a sum of fractions 1/b
4.MD.3 Apply the area and perimeter formulas for rectangles in real-world and mathematical problems.	Student can apply the concept of area to and perimeter to a fractional model by using multiplication to calculate area and represent it in an equation.	Student applies their knowledge of area and perimeter to a fractional model by using multiplication to calculate area.	Student applies their knowledge of area and perimeter to a fractional model by counting grid squares or using repeated addition.	Student does not apply area and perimeter formulas for rectangles in real-world mathematical problems.

MCIEA Rubric Guiding Principles

The following outlines the MCIEA way of thinking about rubric design. While MCIEA shared rubrics will generally be designed with the following principles in mind, you may decide to design your locally developed rubrics in a different way. We share the following details to both guide you in understanding the format and coherence behind MCIEA shared rubrics as well as to share our current understanding of best practices for the design of high-quality rubrics.

- **Task Neutral** - MCIEA rubrics will be aligned to learning goals (competencies, standards, high-leverage skills, learning targets), rather than aligned to the task. This means that the items that go into the leftmost column are a description of what you want students to understand and be able to do, rather than a description of different elements of the task. Rubrics designed in alignment to tasks tend to read like student directions, rather than a tool for assessment and feedback. Anything you want students to do can be added to student directions as a checklist. Further, task neutral rubrics can be used across multiple tasks, meaning that teachers are not designing rubrics every time they create a new task and, more importantly, students develop metacognition around the idea that they are building a consistent set of high-leverage skills and understandings across multiple learning experiences.
- **Selection of Learning Goals** - These are important considerations when selecting items for the leftmost column. The principles below may lead teachers to combine groups of smaller standards (sometimes called power standards).
    - **Appropriate Type** - Rubrics are the opportunity to highlight the most high-leverage learning goals. The goals should be important enough to be built over time and applied/transferred to new contexts.
    - **Appropriate Number** - Brain science tells us that students can reasonably focus on between 2-5 high-leverage learning targets at a time. Said another way, just because an assessment can assess something, doesn't mean it has to.
    - **Grain Size** - Also known as the "Goldilocks Principle", learning goals should not be so broad that students have little information on what they are trying to do, but should not be so narrow that they form a checklist. Additionally, items should all be of a similar grain size, so that you avoid having something as important as critical thinking take up as much space (in student's minds) as something like neatness.
- **Performance Levels** - Our rubrics are designed with 3 performance levels (Exceeds, Meets, Not Yet). We place them in that order from left-to-right to put the highest performance level in student's view first. The following list is in the order which we suggest you develop rubrics. We find that many bad practices develop when performance levels are designed to produce scores consistent with traditional grading systems.
    - **Meets** - The student has satisfactorily demonstrated that they are on level in this learning goal.
    - **Exceeds** - There are many ways to approach the development of this category, the important consideration is that you decide on a coherent system for developing your exceeds category and apply it consistently. For MCIEA, we tend to look at the deeping of the skill or understanding in the following grade level and design our exceeds category from there.
    - **Not Yet** - We do not include an approaching category as teachers tend to spend undue time agonizing over what this level means, often only to find that it wasn't very meaningful when they get student work back. Rather we invite teachers to leave space in the Not Yet category for written feedback. As a rule, when the performance level increases, the skill or understanding gets more nuanced, rather than there just being more of the previous level. We avoid entirely the language of *never*, *sometimes*, *all the time*.