Grade 5 rich tasks mathematics

Instructional mathematics tasks are accessible to all learners because they invite students to wrestle with a problem. Students share their ideas, ask questions of one another, use and apply multiple representations, and collaborate to develop various solution pathways. Then, teachers use students' solutions to make the math visible, connect prior learning, and forecast new mathematical learning.

Directions: You can launch the tasks in a whole group to provide opportunities for students to discuss their understanding of the task and suggest strategies to solve. Then, organize the students in pairs or groups of four to encourage participation. Provide manipulatives, chart paper, and markers.

1

Topic

Operations and Algebraic Thinking: Write and interpret numerical expressions.

Task

Bob is working on a building design. He uses 72 cubes to build all of the designs. All of the designs must be rectangular prisms. To communicate all of the designs, he must write each building as an expression. Can you help him out?

Facilitate

Distribute cubes to the students and ask the students to make the different building designs using all 72 cubes. Ask students to write an expression to represent the buildings. Encourage the students to think about and record multiple ways to represent each of the buildings using expressions. As students work, ask, "Does the order of the numbers change the product?" "What do you notice?"

Make the Math Visible

Ask the students to share solutions and list all the possible expressions that describe the buildings. Ask the students, "What is the volume of all of the buildings?" "Does the order make a difference in the total number of cubes?" Record the students' expressions and ask, "What do you notice about these expressions?" Encourage the students to notice that although the volume is the same, the representations are different. Highlight the role of associative property in the numerical expressions.

Notes

2

Topic

Number and Operations in Base 10: Recognize that in a multidigit number, a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left.

Task

Randi and Rosita are playing a decimal compare game with digit cards. Randi makes the following number: 4.567, and Rosita makes the following number: 3.05. Randi says that the 5 in her number is 10 times more than the 5 in Rosita's number. Rosita says that the 5 in Randi's number is 100 times more than the 5 in her number. Is one of them right? Or, are they both wrong? How do you know? Prove your idea to Randi and Rosita!

Facilitate

Arrange the students in pairs to collaborate on strategies and solutions. Encourage the students to represent the place value amounts in several ways, including manipulatives, equations, expanded form, and place value charts. Ask, "What do you notice about the patterns in whole number place value?" and "Is the pattern true for all decimal number adjacent place values? How do you know?"

Make the Math Visible

Ask the students to share solutions and highlight student work that reveals understanding about place value patterns. Encourage students to describe the pattern from left to right (ones, tenths, hundredths, thousandths) and from right to left (thousandths, hundredths, tenths, ones). Encourage students to compare place value on each side of the ones value (tens and tenths, hundreds and hundredths). Ask the students how the decimal place value patterns are alike and different from the place value patterns for whole numbers.

3

Topic

Number and Operations—Fractions: Solve real-world problems involving multiplication of fractions.

Task

Jordan and Alanna have been working hard at their lawn mowing business. Jordan is convinced that he earned more money than Alanna, but Alanna believes that she has earned more.

Jordan earns \$12 a week for $3\frac{1}{3}$ weeks. Alanna got a late start on her business. She earns \$18 a week for $2\frac{1}{2}$ weeks. Find out who has earned more and prove how you know!

Facilitate

Introduce the task by covering the amounts with a sticky note. Encourage students to ask questions about the problem. Then reveal the \$12 and \$18 amounts, but not the number of weeks. Ask students to discuss what they now know about the problem. Finally, reveal the number of weeks. Ask students to work together to solve the task. Ask, "How can you prove who earned the most money?" Encourage the students to use or draw models to show their understanding.

Make the Math Visible

Select students to share solutions that reflect multiple representations. Students might multiply the whole numbers first and then find the fraction amount. Students might draw the weeks and use repeated addition. Highlight student work that reveals understanding about fraction multiplication.

4

Topic

Measurement and Data—Geometric Measurement: Understand concepts of volume and relate volume to multiplication and to addition.

Task

Carlo's Candy Company is working on new candy box designs. The candy box design must include 24 cubic inches. Determine all the possible candy box design dimensions and make a recommendation for the best design.

Facilitate

Distribute cubes to the students and encourage them to build the candy box designs. Encourage the students to visually represent their designs and record equations to match the designs. Ask, "How many different candy box designs can you make? What candy box design makes the most sense?" "How can you represent your candy box design with an equation using addition?" and "How can you represent your candy box design with an equation using multiplication?"

Make the Math Visible

Ask the students to display all of the candy box designs using cubes, drawings, and equations. Record all of the students' equations in a list (e.g., $24 = 2 \times 12 \times 1$, $24 = 8 \times 3 \times 1$, $24 = 4 \times 3 \times 2$, $24 = 6 \times 2 \times 2$. Connect the products to the volume formula for rectangular prisms, $V = l \times w \times h$ and $V = b \times h$. Have students share their recommendation for the best candy box design.

Notes

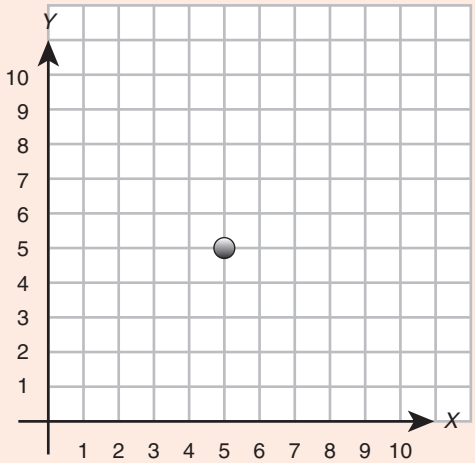
Topic 5

Geometry: Represent real-world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Task

The students claim that they all have the shortest walking path to the school. Can you help straighten this out by finding all of the students' walking paths to the school? Prove how you know!

Student	Location
Ricardo	(7, 10)
Pete	(2, 1)
Maci	(0, 8)
Chima	(9, 9)
Malai	(0, 1)
Liam	(10, 0)



Facilitate

Display only the student and location chart and ask the students to turn and talk about what they notice. Then, reveal the problem and ask them what they wonder. Students should wonder where the school is located. Reveal the coordinate grid and ask the students to make a few predictions. Record their predictions. Finally, distribute copies of the grid and ask students to prove who has the shortest path by drawing the shortest path for each student on the chart.

Make the Math Visible

Ask the students to share solutions and focus on student work that reveals understanding about plotting points on the coordinate grid.

Adapt-a-Mathematical TASK Tool

Do you have a task that is not quite right? Use this guide to adapt the task to meet your needs!

How does the task meet your STUDENTS' needs?

ACCESS and EQUITY: Ensure that the task is "responsive to students' backgrounds, experiences, cultural perspectives, traditions, and knowledge" (NCTM, 2014, para. 1, https://www.nctm.org/uploadedFiles/Standards_and_Positions/Position_Statements/Access_and_Equity.pdf). Consider students' language readiness, including access to mathematical vocabulary.

- How can you differentiate the context of the task to support the students' backgrounds, experiences, and cultural needs?
- How can you group students to engage the students' socio-emotional and developmental needs?
- How can you "open up" the task to encourage access to the task for all learners?
- How can you connect the task to the mathematics the students have learned and students' interests?

Notes

How do you PLAN for students to learn from the task?

MATHEMATICAL GOAL: The task should provide students opportunities to access new mathematical knowledge and to solidify, consolidate, or extend knowledge. Tasks can be changed to highlight multiple learning needs and content standards. Ensure that you strategically connect the learning goal to the task.

- What do your students know how to do right now?
- What do you expect your students to understand as a result of this task?
- What do you anticipate students will do? What changes might you make as a result of your anticipation?

FACILITATE: Task facilitation is critical to student success. Consider how you will organize students and **design** purposeful questions to help them discover and connect mathematics concepts and procedures.

- What **questions** are you going to ask? What tools will you provide? How will students be grouped?
- How and when will you provide opportunities for student **discourse**?

Notes

How do you move learning FORWARD?

FORMATIVE ASSESSMENT: Collecting information about student understanding will help you adjust instruction as you conduct the task.

- How will you listen, observe, and identify students' strategies?
- How will you respond to students' understanding?
- How will you provide feedback to students?
- How will you provide opportunities for students to provide feedback to one another?
- How will you provide opportunities for students to persevere and productively struggle through problems?
- How will you make the mathematics visible for your students?

Notes