

Development Rationale of Classworks Classroom Mathematics

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The Challenge

The standards for teaching Math have seen a major change in recent years. Teachers are required to teach new, more challenging mathematics to a diverse audience of learners. As content shifts across grade levels and the instructional focus moves from algorithms and mnemonics to conceptual understanding, teachers must also learn new teaching methods, creating an even bigger challenge. Ensuring that students grasp the concepts learned through problem solving is critical. Why? Students are expected to make practical application of these concepts, as well as build on and connect to them in subsequent grade levels.

The Solution

To support educators with these changes, Classworks developed Classworks Classroom Mathematics—371 problem solving activities for grades K-8. The activities are designed for whole class, small group, and independent work and provide the support teachers need to meet the increased expectations.

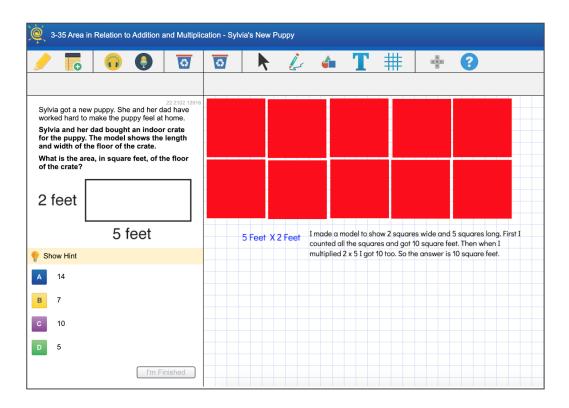
Classroom Mathematics problem solving activities are not story problems, but intellectual challenges that enhance mathematical development by promoting conceptual understanding as well as the ability to reason and communicate mathematically. Students have opportunities to collaborate, engaging in mathematical conversations as they work to meet challenging but attainable objectives.

Overview

Within Classroom Mathematics, two problem types exist. One problem type stems into three levels of questions: progressing, meeting, and expanding. The other problem type is more investigative, asking students to evaluate sample student work for accuracy and understanding. All three leveled questions, as well as the investigative question, are related through a common purpose setting statement. There are four problems per activity, and 43 activities per grade, 27 in Kindergarten, allowing for teachers to implement one activity per week.

Each question may be completed independently within the activity. This allows teachers to differentiate by assigning questions based on each student's current level of understanding and mastery of the concept. Teachers may have students work through each of the leveled questions, building comprehension and understanding through the progression of classroom instruction. Depth of knowledge, required understanding, and level of communication of conceptual understanding increases at each level. The investigative problem allows students to communicate their depth of understanding by evaluating two sample student responses for accuracy, and then explaining which is correct or incorrect and why.

Student View

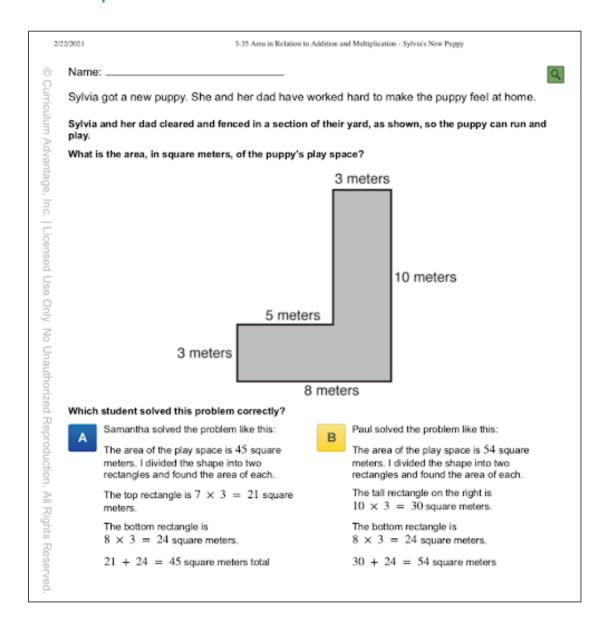


Features & Benefits

Features	Benefits
Three levels of difficulty for each activity	Built in differentiation Students who are still progressing, proficient, or advanced can complete a problem appropriate with their level of competency, while still addressing the same on-grade level standard. All three problems relate back to the same stem allowing teachers to easily differentiate for all students.
Multiple Choice and Open-Ended Response	Students can demonstrate their knowledge and thinking processes through both Classworks-graded and teacher-graded question types.

Features	Benefits
Investigative Problems	Requires students to think critically and communicate effectively. Students can identify correct answers, and prove why. Additionally, students will also be able to critique incorrect solutions, learning from one another in a collaborative environment.
Student Support: • Digital Tools • Student Hints • Canvas/Work Mat • Audio Recording Capability	These features support conceptual understanding and problem solving by requiring students to use a variety of strategies to demonstrate proficiency. For example, students can use a built in work mat to demonstrate their knowledge and explain their thinking through writing, drawing, and/or audio recording. Hints can be accessed directly by the student. Teachers can view which hints are used, giving them better insight into the level of support students needed to solve the problem.
Teacher Support:	These features enhance teacher capacity and comfort level with the shifts in mathematics by providing support and strategies to further facilitate student learning, as opposed to giving students the information they need to solve problems. Printing the activities provides teachers with flexibility for group facilitation and promoting math conversation among students.

Printed Sample



Sample Activity

Below is an example activity as outlined in the teacher resource page. This includes the two different problem types related to a single purpose-setting statement. The first shows the stem followed by the 3 levels of problems to work from. The second is investigative – where students will evaluate the work of another student. Each problem contains tips and guiding questions, recommended manipulatives, and common misconceptions that support teachers as they engage students with productive struggle leading to mastery.

3-1 Interpret Products of Whole Numbers -Displays at the Hardware Store Teacher Resources



Practice Standards

- · Construct viable arguments and critique the reasoning of others.
- · Model with mathematics.
- · Attend to precision.

Common Misconceptions

- Students may correctly determine the number of boxes Charlie packs, but misunderstand
 how to use what they know to represent the problem using an expression or equation.
- · Students may get confused with the number of rows and the number in each row.

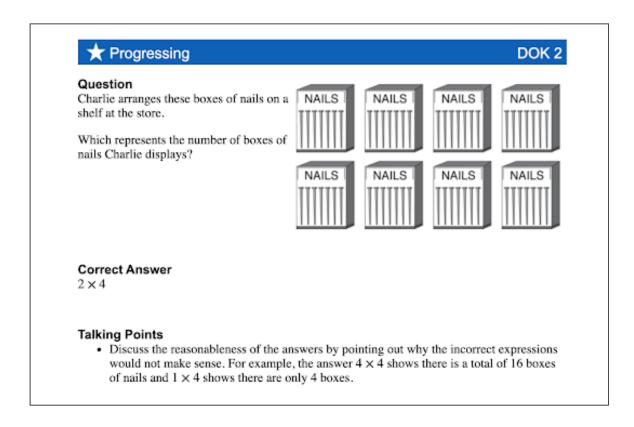
Recommended Manipulatives

snap cubes, counters

Purpose Setting Statement

Charlie makes displays of items at the local hardware store.

Progressing may be assigned to students still working to master the concept on grade level. This requires a basic understanding of the concept, helping to develop confidence and providing foundation on which to build.



Meeting may be assigned to students who have a foundational understanding of the concept, but are still developing the conceptual understanding. Students will draw on prior knowledge and make connections between concepts.



DOK 2

Question

Charlie displays 24 boxes of paper clips. He arranges the boxes in 6 rows. Each row has the same number of boxes.

Which equation can you use to find the number of boxes in each row of Charlie's display?

Correct Answer

 $6 \times 4 = 24$

Talking Points

• Discuss the reasonableness of the answers by pointing out why the incorrect equations would not make sense. For example, the answer 8 × 3 = 24 shows the correct number of boxes but shows a display with 8 rows.

Expanding is best for students who have a conceptual understanding of the content and can work independently, making connections and utilizing the skills necessary to communicate and provide reasoning for the conclusions made. This level does not provide students with multiple choice options but rather an opportunity for free response.

Expanding

DOK 3

Question

Charlie made a display of 36 boxes of rubber bands yesterday. All the rows had the same number of boxes. Today, Charlie sees that each row now has only 7 boxes of rubber bands. There are still 4 rows of boxes, just as he set it up yesterday.

Write an equation that can be used to show how Charlie arranged the boxes in rows yesterday. Explain your thinking.

Possible Response

 $4 \times 9 = 36$

There were 36 boxes. I knew that I had to have an equation with 36 as the product. I could not use $6 \times 6 = 36$ because there are at least 7 boxes in a row. I also could not use $1 \times 36 = 36$, $2 \times 18 = 36$, or $3 \times 12 = 36$, because there are at least 4 rows. So, the only other equation it could be is $4 \times 9 = 36$. I knew that the two factors had to be the same as or larger than 4 and 7.

Talking Points

 Ask students to think about the factors in their equation and how they relate to the number of boxes and the number of rows. **Investigative** requires students to engage in higher order thinking processes in order to arrive at a conclusion. For this problem, students need to have a conceptual understanding and mastery of processes involved in solving the concept. The students will deepen their understanding and strengthen mathematical communication skills through explaining which student sample is solved correctly, and how they know, as well as which student solved incorrectly, and the erroneous point in their work.



Question

Charlie displays 24 boxes of sponges on two shelves. He puts twice as many boxes on one shelf as on the other shelf.

How many boxes of sponges were on each shelf? Explain your answer.

Which student solved this problem correctly?

Correct Answer

Kate solved the problem like this:

There are 24 boxes in all. I know that there are twice as many boxes on one shelf than the other. So, I divided 24 into 3 equal shares. Each share has 8 boxes. One shelf would have 2 shares, or 16 boxes, and the other shelf would have 1 share, or 8 boxes.

Incorrect Answer

Sarah solved the problem like this:

Charlie had to put 12 boxes on one shelf because 12 is half of 24. The other shelf has half as many boxes, so there are 6 boxes on that shelf.

Use the canvas to explain the mistake made in the incorrect solution.

Conclusion

Classworks is a flexible program that can be used in a variety of ways to support and enhance Mathematics instruction. It is well suited for on-grade-level instruction, providing weekly practice in achieving the grade level standards. It can also be used interactively with the teacher using a whiteboard while students respond on individual devices. Classworks problem solving activities provide an ideal base for modeling strategies or for think-aloud sessions that model the standards. They can be used for small group work, enhancing mathematical vocabulary and productive struggle. Classworks Classroom Math is the perfect resource for teachers to build student conceptual understanding and deepen student depth of knowledge.

For more information, contact Classworks at help@classworks.com, call 770-355-5555, or visit classworks.com.