Transitioning to the CCSS with Support of NCSM's "Great Tasks" for Mathematics

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National Council of Supervisors of Mathematics

Transitioning to the CCSS with Support of NCSM's "Great Tasks" for Mathematics

www.mathedleadership.org

Presenters

Suzanne Mitchell, NCSM President

Connie Schrock, Professor of Mathematics & Computer Science, Emporia State University

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Resources, including...

Mathematics Common Core Coalition
Inside Mathematics
CCSS Analysis Tools & PD Materials
NCSM Illustrating the Standards for Mathematical Practice
NCSM Great Task Sample

Upcoming Event

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Upcoming Event

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"Mathematics Education for the 21st Century: Creating a Culture of Success for ALL." – Dr. Freeman A. Hrabowski, III.

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Illustrating the Standards for Mathematical

Professional Learning Module Index

NCSM Calendar

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NCSM Professional Development Opportunities

- **NCSM Annual Conference**
  - **April 15-17, 2013, Denver, CO**
- **NCSM Summer Leadership Academy**
  - **July 23-25, 2013 Los Angeles, CA**
  - **July 29-31, 2013, Columbus, OH**
- **NCSM Fall One-Day Leadership Seminars**
  - **October 16, 2013, Baltimore, MD**
  - **October 23, 2013, Las Vegas, NV**
  - **November 6, 2013, Louisville, KY**

Schrock, January 2013

NCSM Position Papers

1. Effective and Collaborative Teams
2. Sustained Professional Learning
3. Equity
4. Students with Special Needs
5. Assessment
6. English Language Learners
7. Positive Self-Beliefs
8. Technology
9. Mathematically Promising Students
10. Mathematics for the Young

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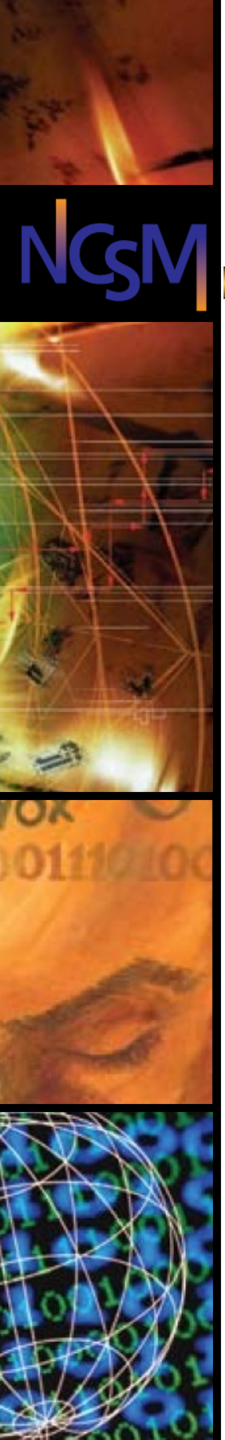

New Position Papers:

The National Council of Supervisors of Mathematics Improving Student Achievement Series No. 9/Spring 2012

Research-Informed Answers for Mathematics Education Leaders

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Improving Student Achievement in Mathematics by Expanding Opportunities for Our Most Promising Students of Mathematics

Without properly motivating, encouraging, and intellectually challenging gifted students, we may lose some of their mathematical talents forever.
National Council of Teachers of Mathematics, 2011

The U.S. education system too frequently fails to identify and develop our most talented and motivated students who will become the next generation of innovators.
National Science Board, 2010

Our Position

It is the position of the National Council of Supervisors of Mathematics (NCSM) that significant improvement in mathematics achievement over a sustained period requires addressing equity and expanding opportunities for the most mathematically promising students. In this competitive technological world, we cannot afford to waste the talents of those students who have great potential to lead us into the future. When identifying students of mathematical promise, significant care should be taken to ensure that non-traditional and minority students have equal access to the opportunity to develop and demonstrate their strengths in mathematical thinking. A strong diverse society has the right to demand that we all look for mathematical promise in our students and seek to overcome the lenses of bias or low expectation that can cloud our vision.

As with all students, these special needs students deserve a learning environment that lifts the ceiling, fuels their creativity and passion, and pushes them to make continuous progress throughout their academic careers. This can best be accomplished when mathematics educators:

- Educate and support teachers in recognizing and creating opportunities for students to achieve mathematical excellence including:
  - challenging classroom environments and curricula that develop and nurture mathematical talent, creativity, and zeal; and
  - extra-curricular opportunities such as mathematics circles, clubs, and competitions that challenge, excite, and engage mathematically promising students.
- Deepen teachers' understanding of the learning and teaching issues inherent with mathematically promising students, including issues surrounding the identification and support of a far greater number of students from diverse backgrounds who can and should achieve at high levels mathematically.
- Provide district and school-wide structures that promote collaboration among educational personnel, families, professional mathematicians, professional organizations, government agencies, and news media to support and promote students with mathematical promise.

The NCSM Improving Student Achievement Series is a set of position papers designed to provide research-based practices for school and district mathematics education leaders.

Research that Supports Our Position

In 1980 the National Council of Teachers of Mathematics (NCTM) noted, "The student most neglected, in terms of realizing full potential, is the gifted student of mathematics. Outstanding mathematical ability is a precious societal resource, sorely needed to maintain leadership in a technological world" (p. 18). Two decades later, as the world became increasingly technological, the NCTM Task Force on the Mathematically Promising defined mathematical promise as a function of ability, motivation, belief, and experience or opportunity, stating that these are variables that can and should be maximized. This definition used the words "mathematical promise" deliberately in order to include students who traditionally had been identified as gifted and to add students who traditionally had been excluded from rich mathematical opportunities that would allow for talent identification and development (Sheffield, Bennett, Berriozabal, DeArmond, & Wertheimer, 1999).

"The U.S. education system too frequently fails to identify and develop the most talented and motivated students who will become the next generation of innovators" (National Science Board, 2010, p. 5). Standardized intelligence and achievement tests, vetted widely and carefully for statistical purposes, are the most widely used measure for identifying gifted students, including mathematically talented students (Callahan, Hunsaker, Adams, Moore, & Bland, 1995; Sowell, Bergwell, Zeigler, & Cartwright, 1990). However, these tests

The National Council of Supervisors of Mathematics Improving Student Achievement Series No. 10/Spring 2012

Research-Informed Answers for Mathematics Education Leaders

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Improving Student Achievement in Mathematics by Expanding Learning Opportunities for the Young

Although virtually all young children have the capability to learn and become competent in mathematics, for most the potential to learn mathematics in the early years of school is not currently realized. This stems from a lack of opportunities to learn mathematics either in early childhood settings or through everyday experiences in homes and in communities. This is particularly the case for economically disadvantaged children, who start out behind in mathematics and will remain so without extensive, high-quality early mathematics instruction.
National Research Council, 2009, p. 1

Our Position

It is the position of the National Council of Supervisors of Mathematics (NCSM) that significant improvement in mathematics achievement nationwide will be reached if sufficient attention is paid to providing young children with extensive, high-quality mathematics instruction. NCSM supports the recommendations of the recent National Research Council (NRC) report on early childhood mathematics. The report, *Mathematics Learning in Early Childhood: Paths Toward Excellence and Equity*, summarizes extensive research leading to its overarching recommendation that a coordinated national early childhood mathematics initiative should be put in place to improve mathematics teaching and learning for all children ages 3 to 6. As leaders we need to work to ensure that all children obtain the mathematical foundation they need for success. This can best be accomplished when all mathematics teachers and leaders:

- Provide parents and other caretakers with appropriate knowledge and skills to support mathematical learning;
- Help all individuals throughout the early childhood education system—including the teaching workforce, curriculum developers, program directors, and policy makers—transform their approach to mathematics education in early childhood by supporting, developing, and implementing research-based practices.

Research That Supports Our Position

Providing young children with extensive, high-quality early mathematics instruction can serve as a sound foundation for later learning in mathematics and contribute to addressing long-term systematic inequities in educational outcomes.
National Research Council, 2009, p. 2

The NRC Committee on Early Childhood Mathematics, in reviewing the research, found that, although the research to date about how young children develop and learn key concepts in mathematics has clear implications for practice, the findings are neither widely known by nor implemented by early childhood educators or those who teach them. The research and conclusions about early childhood summarized in *Adding It Up* (Kilpatrick, Swafford, & Findell, 2001) and extensive analyses of many more studies were used as a basis for the NRC conclusions and are extensively referenced in the report.

The NCSM Improving Student Achievement Series is a set of position papers designed to provide research-based practices for school and district mathematics education leaders.

The National Council of Teachers of Mathematics (NCTM) and the National Association for the Education of Young Children (NAEYC) affirm that high-quality, challenging, and accessible mathematics education for 3- to 6-year-old children is a vital foundation for future mathematics learning. In every early childhood setting, children should experience effective, research-based curriculum and teaching practices. Such high-quality classroom practice requires policies, organizational supports, and adequate resources that enable teachers to do this challenging and important work. (Retrieved from: http://www.naeyc.org/positionstatements/mathematics.)

Today’s Goals

- Preview the “Great Tasks” which will soon be published in NCSM's new books for mathematics leaders.
- Discuss the requirements for a mathematics activity to be considered a GREAT TASK.
- Explore launch activities that may be used to raise student achievement in mathematics.
- Emphasize the Standards for Mathematical Practice with multiple ways for students to demonstrate understanding of the mathematics content.

A recording of today’s webinar will be available at:
http://www.carnegielearning.com/webinars http://www.mathedleadership.org/events/webinars/html

NCSM Great Tasks for Mathematics

Engaging Activities for Effective Instruction and Assessment that Integrate the Content and Practices of the Common Core State Standards for Mathematics

A Resource from the
National Council of Supervisors of Mathematics

Great Tasks to Assess the Common Core Mathematical Practices

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Warm Up Activity

There are eight practices in the Common Core State Standards for Mathematics.

Let's take a little quiz.

Think about the practices.

How many can you list?

A recording of today's webinar will be available at:
http://www.carnegielearning.com/webinars http://www.mathedleadership.org/events/webinars/html

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
6. Attend to precision

2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others.	4. Model with mathematics. 5. Use appropriate tools strategically.	7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.

http://commoncoretools.files.wordpress.com/2011/03/practices.pd

What is a Great Task?

A great task:

- Revolves around an interesting problem – offering several methods of solution
- Is directed at essential mathematical content as specified in the standards.
- Requires examination and perseverance – challenging students
- Begs for discussion – offering rich discourse on the mathematics involved
- Builds student understanding – following a clear set of learning expectations
- Warrants a summary look back – with reflection and extension opportunities

Think about your classroom.

- Based on this criteria, think of a specific activity you use that might qualify as a great task?
- Which of the practices does that activity allow students to demonstrate?
- How do you find these activities?

What is a Great Task?

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- Builds student understanding – following a clear set of learning expectations
- Warrants a summary look back – with reflection and extension opportunities

How the Great Tasks were developed?

- Tasks are created.
- Teachers are given the tasks to try with students to provide feedback.
- Tasks are revised and the launch activities are created.
- Tasks were again used with students and more student work was collected.

Guiding Questions

- Is there evidence in the student work that demonstrates the use of the practices?
- How did your task expose student's thinking about the topic?
- What might a teacher plan as next steps as a result of the task?
- How do we develop and support the use of the mathematical practices with our students?
- As leaders, consider ways that these tasks can be used with teachers and what would you consider to be the intended outcome?

Previously shared Sample Tasks

Piggy Bank Task (Money-Grade 2)

Bugs, Giraffes, Elephants and More(Grade 4)

Missing Words Task (Data-Grade 6)

Most Square (Geometry-Grade 7)

Proving Patterns (Algebra-HS)

Found at http://www.mathedleadership.org/ccss/materials.html

Tasks to be Shared Today

- Correcting the Calculator Grade 3
- Odd or Even Grade 7
- Fractional Workers Algebra I or Math I

We will look at the launch, the Tasks and student work.

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http://www.carnegielearning.com/webinars http://www.mathedleadership.org/events/webinars/html

Task Design

Teacher Notes - an overview of the task, the Common Core State Standards Content and Practices standards that the task requires.

Note all tasks work with Practice 1 so we will no longer be listing it.

Activity Launch -addressing key prerequisite understandings and assesses student readiness for the task

Core Task -students are expected, individually and/or collaboratively, to be challenged

Extension Activities - to expand upon the learning within the Core Task.

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Teacher Notes Correcting the Calculator

Task Title: Correcting the Calculator

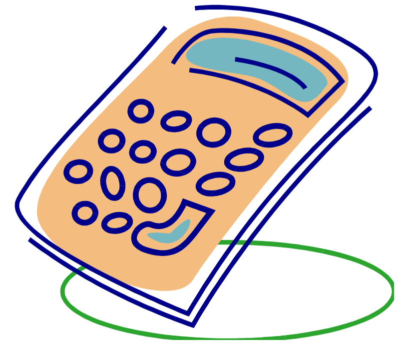
Grade Level: 3rd

Task Overview:
The students will demonstrate number sense and fluency by using different methods to solve problems. Accuracy of the mathematics can be examined.

Prerequisite understandings:
Students need to be able to work with a calculator and have some understanding place value.

CCSSM Content Standards:
3.NBT.2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

CCSSM Mathematical Practices:
5. Use appropriate tools strategically: the students think about how to use a calculator and experiment with its use.
6. Attend to precision: when the students use number sense and different method to compute the correct answer.



Teaching Notes:

Launch activity:

Practice some subtraction and addition problems. Discuss place value and how numbers can be composed and decomposed. Discuss using calculators and the importance of accuracy. Review skills on the student calculators.

Core task:

Have students work on the task individually first. Encourage them to be creative with the ways they solve the problem. Move to sharing ideas with one another so that the students begin to explain their ideas.

Extension(s):

After the students have completed the activity it could be repeated with other numbers. Students could create problems of their own.

Launch Correcting the Calculator

I'm Thinking of a Number: Provide each student with a hundreds chart and two markers, or a hundreds chart inside a plastic sleeve and a dry erase pen. Students circle a beginning number and after you state a clue, they circle a second number. This process is repeated several times. Observe student strategies for circling the second number.

Examples:

Beginning number	Clue – I'm thinking of a number that ...
A number greater than 40	is 10 more than your number
A number greater than 40	is 10 less than your number
A number than ends in 3	is 5 more than your number
A number than ends in 7	is 5 less than your number

Class discussion should be stimulated by asking: "What was the start number? What was the finish number? What's the same for everyone in the class?"

What are some questions you could ask your students after doing this activity? What are other ways to phrase the questions?

Hansel and Gretel: Provide each student with a hundreds chart and several markers, or a hundreds chart inside a plastic sleeve and a dry erase pen. Students circle a given beginning number. Now read a series of directions involving addition and subtraction. After each direction students circle a number. When all directions have been given students should have the same ending number.

Examples:

Circle the number 38. Add 10; circle your answer. Subtract 8; circle your answer. Subtract 5; circle your answer. What is the last number you circled? [Answer – 35]

Circle the number 60. Circle the number that is 20 more. Circle the number that is 5 more. Circle the number that is 4 less. What is the last number you circled? [Answer – 81]

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Do they have to circle each number? Could they use a transparent counter or their fingers to hold their place? Could you make more steps? Is it simple to check if they have it correct? What do they learn about place value?

Make a Number: Provide each student with 3 1-digit numeral tiles. Tell students that they will use the tiles to make a 3-digit number from the clues you provide.

Examples:
Give the students number tiles 1, 4, and 7. Use the following clues.

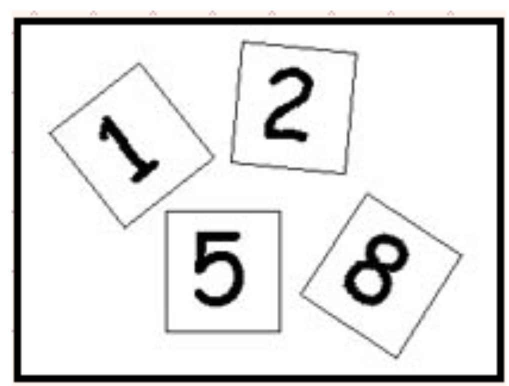
- The number is greater than 200.
- The tens digit is odd.
- The ones digit is 3 more than the tens digit.

Solution: - 714

Give the students number tiles 2, 6, and 9. Use the following clues.

- The number is even.
- The number is less than 700.
- The hundreds digit is 3 less than the tens digit.

Solution: - 692



Correcting the Calculator

1. Julio wanted to enter the number 867 in his calculator. By mistake, he entered the number 847.
   a. Without clearing the calculator how could he correct his mistake?

   b. What would be another way he could correct his mistake?

2. Tam has a similar problem with her calculator when she entered 3528. She wanted to have 3828 in her calculator.
   a. Without clearing the calculator how could she correct her mistake?

   b. What would be another way he could correct his mistake?

3. What if you entered 1345 in your calculator but wanted 1328?
   a. Without clearing the calculator how could you correct your mistake?

   b. What would be another way you could fix it?

4. Now make up two additional problems like these on your own. Try them out with a classmate.

Results from the Classroom Calcu

Look at the strategy Matthew developed.

1. Julio wanted to enter the number 867 in his calculator. By mistake, he entered the number 847.

   a. Without clearing the calculator how could he correct his mistake?

   add 20 to it

   b. What would be another way he could correct his mistake?

   add 10 and add another 10

2. Tam has a similar problem with her calculator when she entered 3528. She wanted to have 3828 in her calculator.

   a. Without clearing the calculator how could she correct her mistake?

   add 300

   b. What would be another way he could correct his mistake?

   add 150 then add 150 again

3. What if you entered 1345 in your calculator but wanted 1328?

   c. Without clearing the calculator how could you correct your mistake?

again

3. What if you entered 1345 in your calculator but wanted 1328?
   c. Without clearing the calculator how could you correct your mistake?

   sudtract 20 then add 3

   d. What would be another way you could fix it?

   sudtract 20 then add 2 then 1

4. Now make up two additional problems like these on your own. Try them out with a classmate.

I typed in on my calculator 2345 and I wanted 1,245 without clearing the calculator.
subtract 1,100
second way to do it
subtract 1000 then subtract 100

His second strategy was to add half twice. When the third problem was not an even answer he had to change how he approached it. He demonstrates the concept that subtracting 20 and adding 3 is the same thing as subtracting 17. The second strategy again showed very little difference from the first one for this problem. When Matthew was asked to write his own problem he varied his strategy some and used the concepts of place value to solve.

Sergio's work:

1. Julio wanted to enter the number 867 in his calculator. By mistake, he entered the number 847.

a. Without clearing the calculator how could he correct his mistake?

add 20 to 847 to get 867

b. What would be another way he could correct his mistake?

add 19 Then add 1

2. Tam has a similar problem with her calculator when she entered 3528. She wanted to have 3828 in her calculator.

a. Without clearing the calculator how could she correct her mistake?

add 300

b. What would be another way he could correct his mistake?

add 299 then add 1

3. What if you entered 1345 in your calculator but wanted 1328?

c. Without clearing the calculator how could you correct your mistake?

takeaway 17

d. What would be another way you could fix it?

takeaway 16 and then 1

4. Now make up two additional problems like these on your own. Try them out with a classmate.

what if you entered 506 but you wanted 5006. How could you correct it.

Sergio used a different second strategy and was consistent with his second strategy throughout the three problems. When he wrote his own problem is appears to be a very common problem students would make but a much more difficult problem to solve using the method he had devised. He did not offer a possible solution.

Brianna's work:

1. Julio wanted to enter the number 867 in his calculator. By mistake, he entered the number 847.

   a. Without clearing the calculator how could he correct his mistake?

   Just add 20

   b. What would be another way he could correct his mistake?

   add 30 then subtract 10

2. Tam has a similar problem with her calculator when she entered 3528. She wanted to have 3828 in her calculator.

   a. Without clearing the calculator how could she correct her mistake?

   add 300

   b. What would be another way he could correct his mistake?

   add 400 then subtract 100

3. What if you entered 1345 in your calculator but wanted 1328?

c. Without clearing the calculator how could you correct your mistake?

subtract 17

d. What would be another way you could fix it?

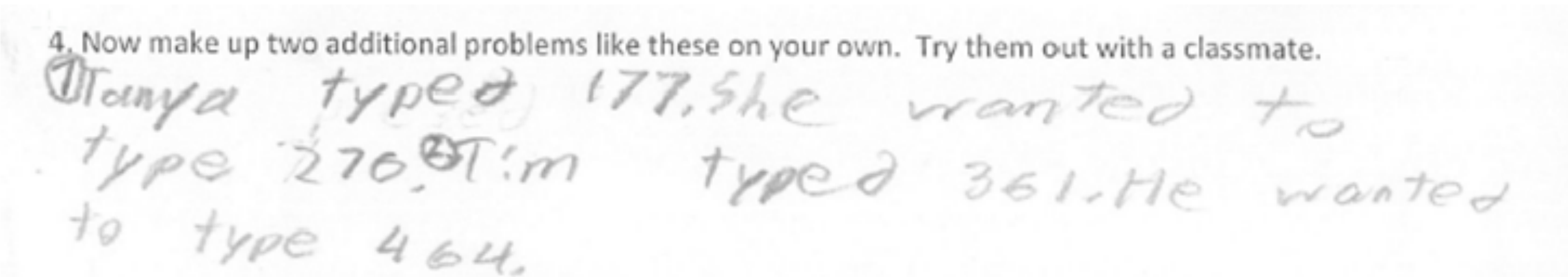
subtract 22 and add 5

4. Now make up two additional problems like these on your own. Try them out with a classmate.

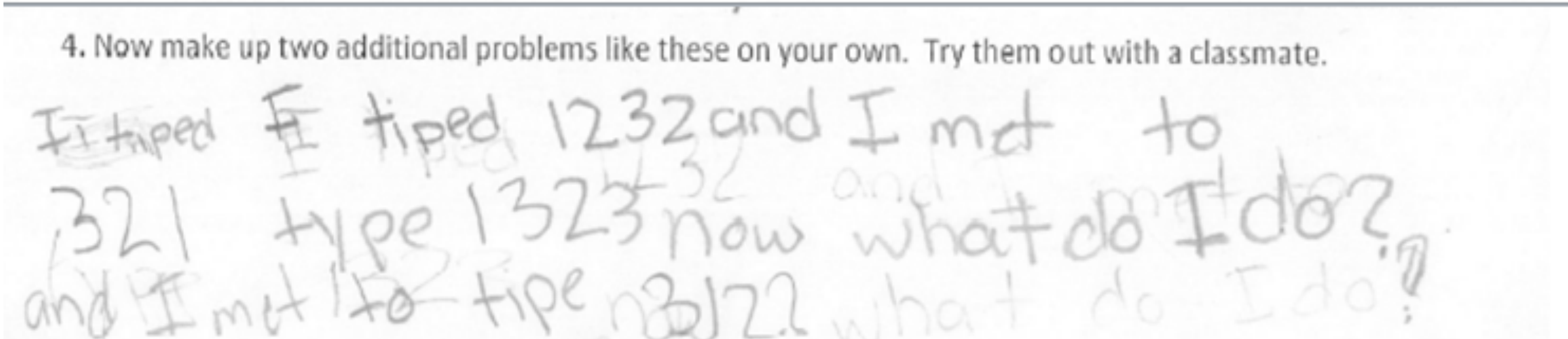
Biff wanted to enter 225 but entered 230 without

Brianna started out demonstrating an understanding of place value throughout the problem and was consistent with her approach. The problem she started creating here involved smaller numbers and would have been a simple one for her to solve.

All of the students enjoyed writing their own problems., they varied in complexity.


4. Now make up two additional problems like these on your own. Try them out with a classmate.

① Tanya typed 177. She wanted to type 270. ② Tim typed 361. He wanted to type 464.


4. Now make up two additional problems like these on your own. Try them out with a classmate.

I tiped 1232 and I mt to 321 type 1323 now what do I do? and I mt to tipe 3122 what do I do?

Some modeled the previous problems.

4. Now make up two additional problems like these on your own. Try them out with a classmate.

what if you pressed 156 but you wanted 189 what would be another way? What if you wanted

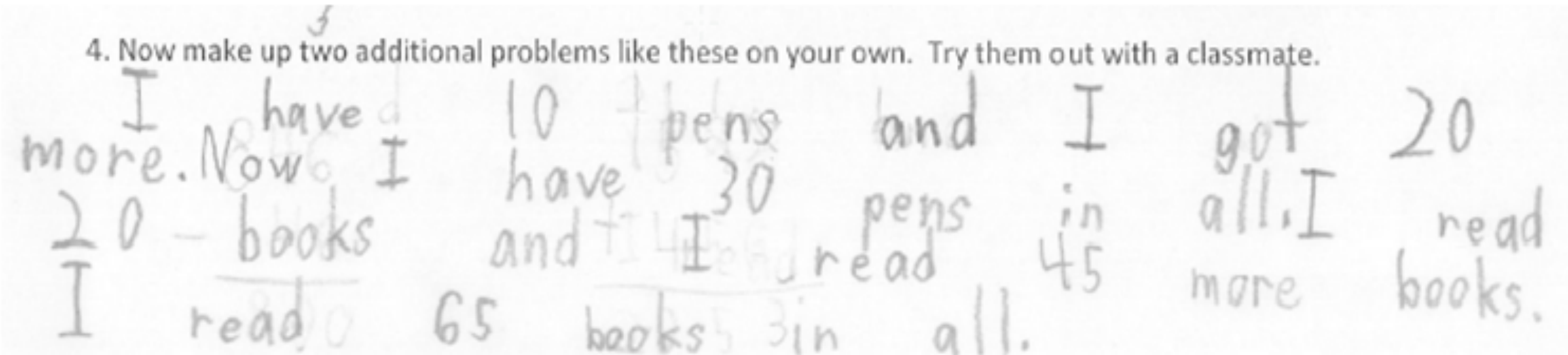
~~13.45~~

4. Now make up two additional problems like these on your own. Try them out with a classmate.

if a Put in 3188 and I wanted to Put 3199 With our clearing how could you fix it?

What would be another way I could correct this?

Occasionally they just responded with a common type of word problem they may have written before.



4. Now make up two additional problems like these on your own. Try them out with a classmate.

I have 10 pens and I got 20 more. Now I have 30 pens in all. I read 20 books and I read 45 more books. I read 65 books in all.

So what does this tell you about what we have been doing with children? Does it tell us we have been using the CCSSM practices?

Title: ODD or EVEN?

Level: 7^{th}

Task Overview:
Students are asked to settle an argument between two students on who would be more likely to win an activity based on the probabilities.

Prerequisite understandings:
Students must be able to calculate basic probabilities. Definitions of even and odd number must be clear.

CCSSM Content Standards:
7. SP.6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.

Mathematical Practices:
3. Construct viable arguments and critique the reasoning of others: Explain who is correct and explain the results based on the mathematics.
4. Model with mathematics: Using probability to simulate the situation.

Launch activity:
Briefly review the definitions of even numbers and odd numbers. Specifically discuss that 0 is an even number. During the discussion consider patterns from the number line and the definition of even. Review the definition of probability. Use overhead or computer generated spinners to play a game. You could use different numbers on the spinners. Determine if the sum is even or odd at the end of each spin.

Core task:
Place students in pairs to begin work on the activity. Students should recognize that an even + even = even, odd + odd = even, and even +odd = odd. They will explore the experimental probabilities and calculate the theoretical probabilities.

Extension(s):
Ask students to work in groups and create a "fair" game where each player would have an equal chance of winning. Make sure they can explain why.

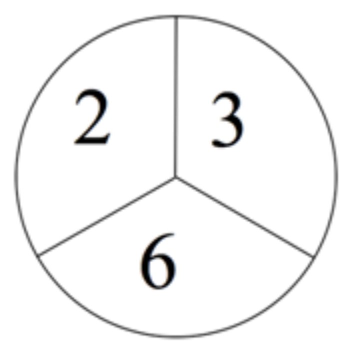
ODD or EVEN (Launch)

Instructions:

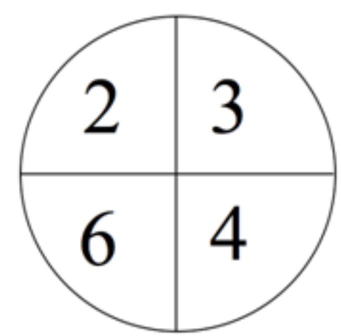
Spinner A will be the three-part spinner and Spinner B will be the four-part spinner. Spin both spinners and record the results in the chart below. Create a fraction in the next column writing the result as a rational number $\frac{A}{B}$. Then, in the remaining columns, simplify your fraction if possible and find the decimal and percent equivalents. Repeat this 5 times (or for 5 "trials").

Trial #	Spinner A	Spinner B	Fraction $\frac{A}{B}$	Simplified Fraction	Decimal	Percent
1						
2						
3						
4						
5						

Spinner A



Spinner B



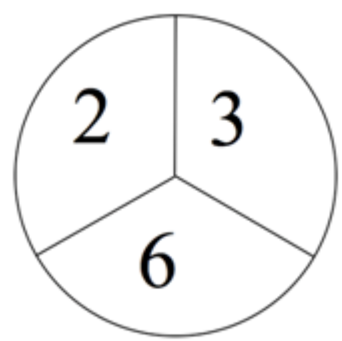
ODD or EVEN (Launch)

Instructions:

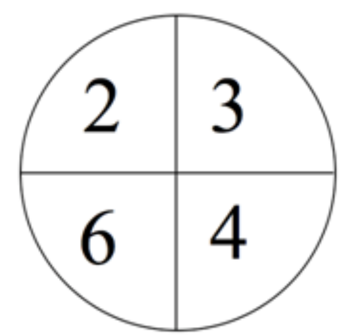
Spinner A will be the three-part spinner and Spinner B will be the four-part spinner. Spin both spinners and record the results in the chart below. Create a fraction in the next column writing the result as a rational number $\frac{A}{B}$. Then, in the remaining columns, simplify your fraction if possible and find the decimal and percent equivalents. Repeat this 5 times (or for 5 "trials").

Trial #	Spinner A	Spinner B	Fraction $\frac{A}{B}$	Simplified Fraction	Decimal	Percent
1	2	4	2/4	1/2	.5	50%
2	2	2	2/2	1	1	100%
3						
4						
5						

Spinner A



Spinner B



Organize your distinct outcomes $\frac{A}{B}$ (as simplified fractions) from least to greatest in the first column of the table shown.

Find the *frequency* and the *probability* of each outcome and record each in the remaining columns.

Note: Some of the outcomes are the same when simplified.

Outcomes	Frequency	Probability

If we were to play a game where Player 1 gets a point when the outcome is greater than or equal to 1 and Player 2 gets a point for an outcome less than 1, which player would you want to be and why?

Organize your distinct outcomes $\frac{A}{B}$ (as simplified fractions) from least to greatest in the first column of the table shown.

Find the *frequency* and the *probability* of each outcome and record each in the remaining columns.

Note: Some of the outcomes are the same when simplified.

Outcomes	Frequency	Probability
$1/3$		
$1/2$		
$2/3$		
$3/4$		
1		
$3/2$		
2		
3		

If we were to play a game where Player 1 gets a point when the outcome is greater than or equal to 1 and Player 2 gets a point for an outcome less than 1, which player would you want to be and why?

Organize your distinct outcomes $\frac{A}{B}$ (as simplified fractions) from least to greatest in the first column of the table shown.

Find the *frequency* and the *probability* of each outcome and record each in the remaining columns.

Note: Some of the outcomes are the same when simplified.

Outcomes	Frequency	Probability
$1/3$	1	
$1/2$	2	
$2/3$	1	
$3/4$	1	
1	3	
$3/2$	2	
2	1	
3	1	

If we were to play a game where Player 1 gets a point when the outcome is greater than or equal to 1 and Player 2 gets a point for an outcome less than 1, which player would you want to be and why?

Organize your distinct outcomes $\frac{A}{B}$ (as simplified fractions) from least to greatest in the first column of the table shown.

Find the *frequency* and the *probability* of each outcome and record each in the remaining columns.

Note: Some of the outcomes are the same when simplified.

Outcomes	Frequency	Probability
1/3	1	1/12
1/2	2	2/12 = 1/6
2/3	1	1/12
3/4	1	1/12
1	3	3/12 = 1/4
3/2	2	2/12 = 1/6
2	1	1/12
3	1	1/12

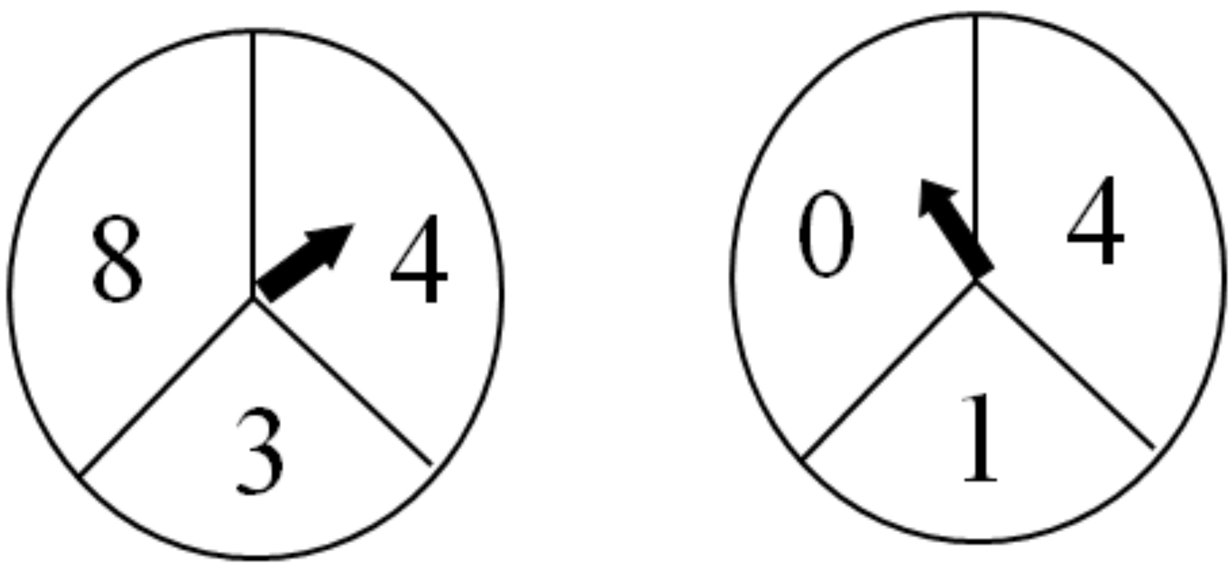
If we were to play a game where Player 1 gets a point when the outcome is greater than or equal to 1 and Player 2 gets a point for an outcome less than 1, which player would you want to be and why?

ODD or EVEN

Leo and Tarra are playing a spinner game with the following rules.

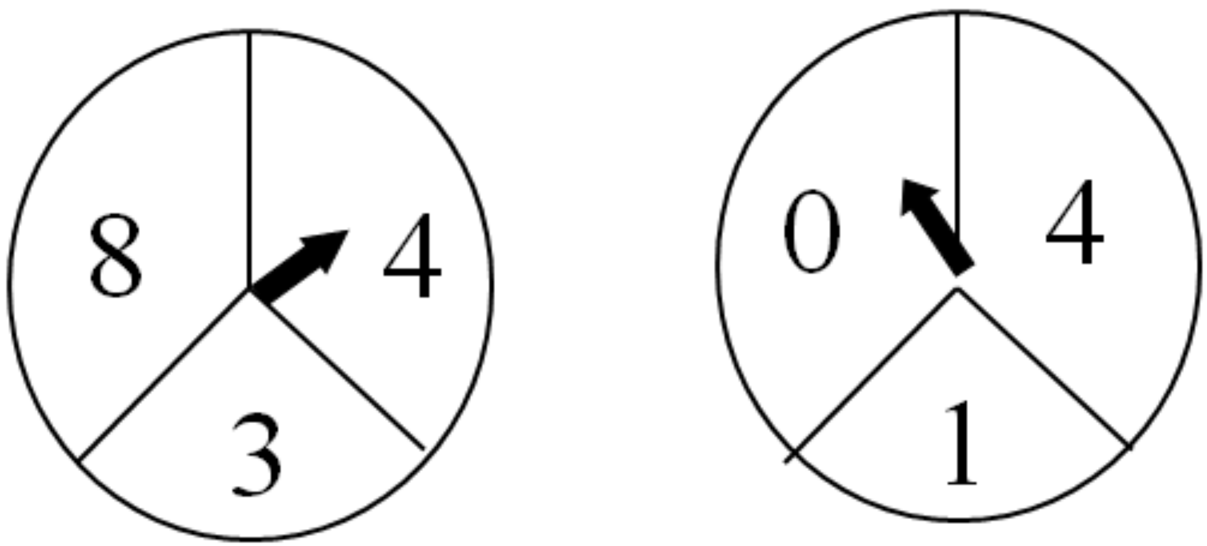
> When it is a player's turn, the player spins both spinners. They then find the sum of the two numbers. If the sum is EVEN, player 1 wins (Leo) and if the sum is ODD, player 2 wins (Tarra).

Leo takes a test spin, first. Here is what he spins:



The sum from the first spin is EVEN, because 4 + 0 is even. Leo wins.
Leo says, “I like this game. I have a better chance to win it than you do.”
Tarra says, “No, I have a better chance to win it than you do.”

Use mathematics to decide which player is correct. Write a note to the players explaining how you know who has the better chance of winning.



Olivia's work:

Dear Leo- I belive you are wrong and right. If you are talking about theoretical probability you are correct. Because you have 5/9 possibilities as opposed to Tara who has a 4/9 chance ~~and~~

Olivia understood and was careful not hurt Leo's feelings by saying he was partially right. She was able to answer the probabilities with precision.

Latisha's work:

Leo.

You are correct, theoretically speaking. The chances that an even sum will be spun is 5/9. Tarra could win. however. You could do many test trials to find the experimental probability of even or odd outcomes. which might be different than the theoretical probability. Yes the chances say you will win. but that can change.

Sincerely.

Latisha has a clear and complete understanding of problem. Her explanation distinguishes between theoretical and experimental probabilities. Her argument is correct.

Dear Leo + Tarra,

Whoever has the even numbers has a $\frac{5}{9}$ chance of winning with theore probability. With experimental though, I d know who would win, I would ha to look at the data for previous spins. Leo is <u>probably</u> going to win not for sure, just probably! So good luck to you guys with your game, and, go Leo!

Juan's work:

Juan talks about looking at the data and uses the term probably to describe Leo's chance of winning. He is more specific by mentioning the even number player will win. All of the students have been motivated by the situation and written specifically to the learners.

Isabella's work:
Isabella is specific with her information and lists the possibilities for each person to win. She extends the information without being asked to explain how she thinks that the players could make it a fair game. She demonstrates both of the highlighted mathematical practices. She has modeled the situation with mathematics and was able to present a clear mathematical argument.

Dear Leo and Tara,

I'm sorry but Leo has a better theoretical possibility to win the game. While Tarra only has 4 possibilites, Leo has five. You would have to make it fair though. You could take turns on whoever gets to be player one.

P.S. Tarra, here are your possibilities: 3+0
8+1
4+1
3+4

Leo, here are your possibilities: 4+0
8+0
3+1
8+4
4+4

See, there are more for Player 1!
(Sorry player 2)

Teacher Notes Fractional Workers

Task Title: Fractional Workers

Grade Level: Math 1 & Algebra 1

Task Overview: This task has students fractional work problems with pictures, graphs, and equations with one or two variables.

Prerequisite understandings:
Student must understand the how to graph linear equations. They will also be expected to write equations in one or two variables and explore how to solve additive fractional problems.

CCSSM Content Standards:
Algebra or Math 1: Create equations that describe numbers or relationships.
A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales
.

CCSSM Mathematical Practices:
4. Construct viable arguments and critique the reasoning of others: students engage in rich discussions about the ways to interpret and model the concepts including using fractions and tables.
5. Model with mathematics: students use pictorial, graphical, numerical and algebraic models.

Supplies Needed: Graphing paper and a graphing calculator.

Teaching Notes:

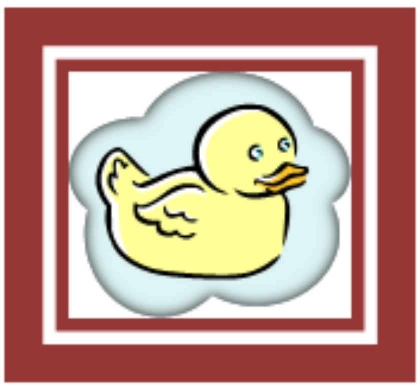
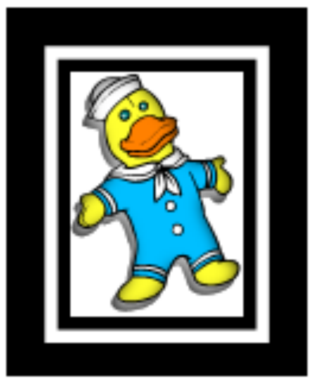
Launch activity:
Students will practice reading and thinking about fractions on a graph and then graphing work done vs. time.

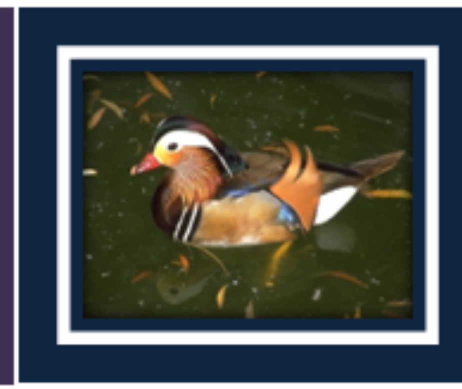
Core task:
Students explore the working rate of three students and investigate three models (pictorial, graphical, and algebraic) that describe working situations. In the end the students should discuss and be able to identify and solve rate problems in the form $\frac{t}{2}+\frac{t}{4}+\frac{t}{3.5}=1$ where the fractions represent the different speeds of the each worker.

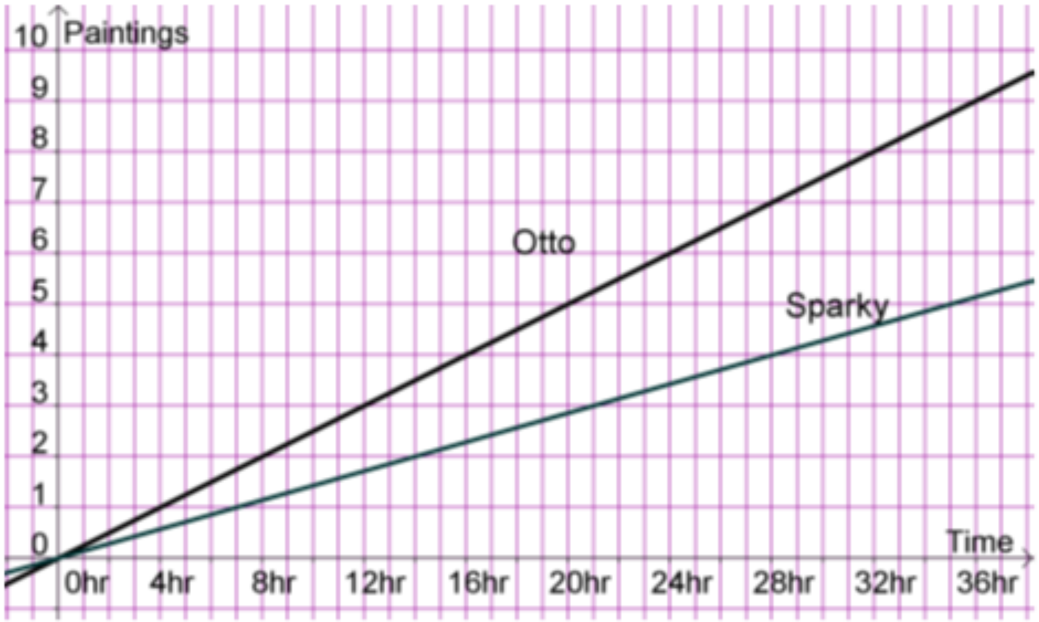
Extension(s):
Students could look at using 2 equations with 2 unknowns to solve a traditional Algebra work problem.

Launch Fractional Workers

Otto and Sparky are famous “Duck” artists. They were bragging in front of Mary the Mathematician about how fast they can paint a duck picture and how much detail they included. The next day Mary presented them with a graph of time vs. paintings done. Examine the pictures, Mary’s graphs, and answer the following questions. For your information, Otto painted the two pictures on the left and Sparky painted the two right pictures on the right.





Mary's Graph

1. Describe the graph.
2. Who paints fastest? How can you tell from the graph?
3. How fast is Otto?
4. How fast is Sparky?
5. Describe the axes.
6. Use the paintings to provide clues on why Sparky might be slower at finishing paintings.
7. Write a function based on time for both people.   p=f(t)
8. If Sparky and Otto work together to paint 23 pictures for a benefit auction. How long will it take them?
9. Explain how you got the answer to #9.

Fractional Workers

Sally, Sarah and Suzie run the **S^3 Painting Service** where they paint old one-car garages for a summer job. They have lots of work because they live in an old part of town with lots of garages and their fees are pretty cheap. They paint garages for less because they just love to fix old garages up so they look beautiful and elegant and make the world a better place. They also are saving lots of money for college!

Over the past few summers they have figured out that speedy Sally can paint a garage in 2 days by herself. Slower Sarah takes twice as long by herself as Sally. Somehow Suzie can paint a garage by herself half a day faster than Sarah can paint one by herself.

Help us analyze this business.

1. How fast can each person paint a garage by themselves?

2. Make a sketch of 20 garages and show how much each girl will have painted after 7 days and how long will it take them to finish them all. Explain how you got your answer.

3. Create equations and make linear graphs that shows how speedy Sally, slower Sarah, and somehow Suzie compare in their painting speed. Let y represent the number of garages and x represent the time in days.

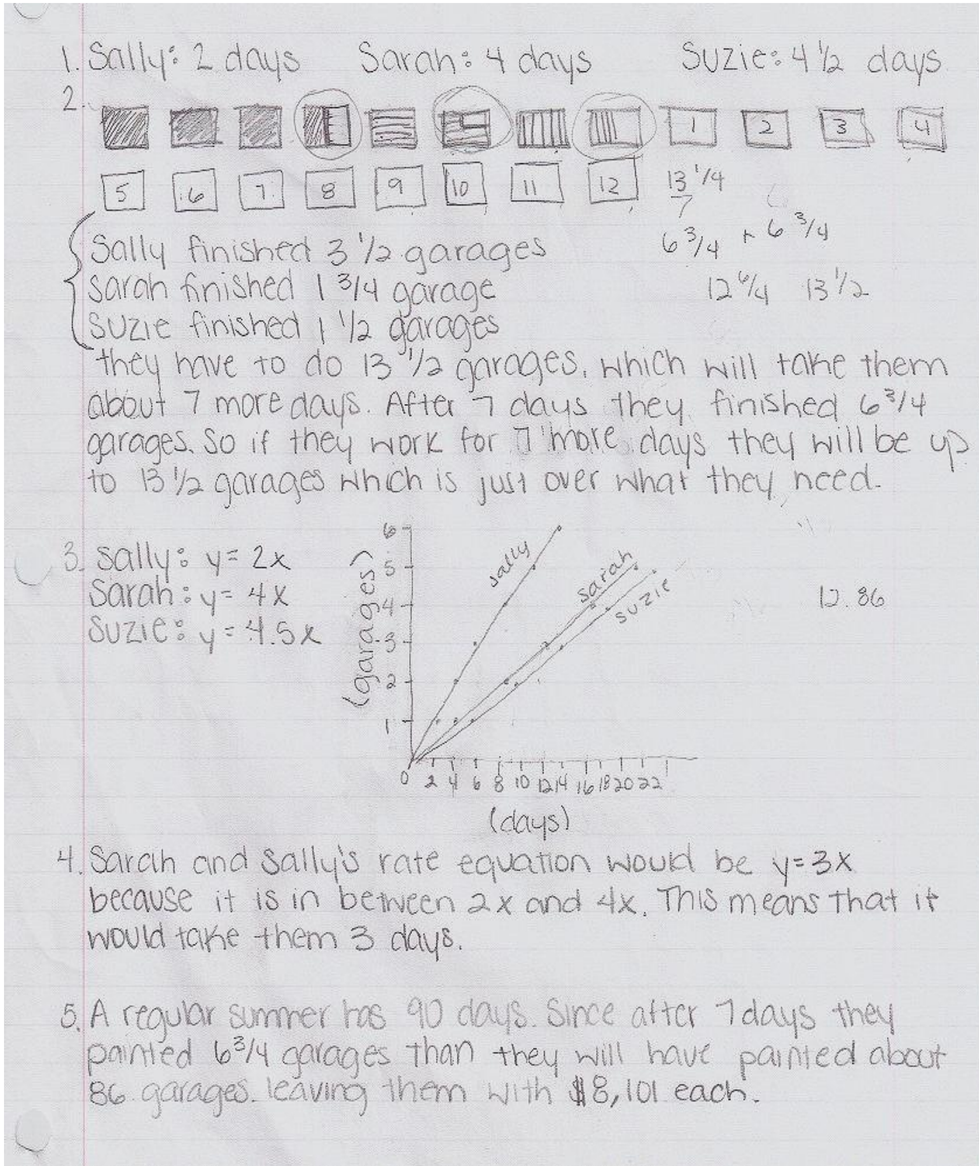
4. Figure how long would it take for Sally and Sarah to paint 1 garage together. Explain how you got the answer.

5. The S^3 girls have decided they can make a profit of $280 on each garage and that they will share the profits equally. Show how you can figure out how much money they can make in a regular summer?

Results from the Classroom Fractional Workers

Day	Sal	Sar	Suz
1			
2	✓		
3			
3 ½			✓
4	✓	✓	
5			
6	✓		
7			✓
8	✓	✓	
9			
10	✓		
10 ½			✓
11			
12	✓	✓	
13			
14	✓		✓

A favorite solution from students was done by a student who simply made a table of days with tally marks. She kept a tally of garages that were painted and just kept going until she got the correct number of garages. The table on the left illustrates the method and you can see that by the 14th day that there were 14 garages painted. This young lady was the first one to confidently get an exact day for her answer rather than a fractional day answer that she could justify.



1. Sally: 2 days Sarah: 4 days Suzie: 4 ½ days
2.
1 2 3 4
5 6 7 8 9 10 11 12 13 ¼
7
6 ¾ + 6 ¾
12 6/4 13 ½

Sally finished 3 ½ garages
Sarah finished 1 ¾ garage
Suzie finished 1 ½ garages
they have to do 13 ½ garages, which will take them about 7 more days. After 7 days they finished 6 ¾ garages. So if they work for 7 more days they will be up to 13 ½ garages which is just over what they need.

3. Sally: y = 2x
Sarah: y = 4x
Suzie: y = 4.5x

12.86

4. Sarah and Sally's rate equation would be y = 3x because it is in between 2x and 4x. This means that it would take them 3 days.

5. A regular summer has 90 days. Since after 7 days they painted 6 ¾ garages than they will have painted about 86 garages leaving them with $8,101 each.

Most students were fairly proficient is giving straight forward answers like the one shown. The one mistake made here came right at the beginning with assuming Suzie would take 4 ½ days vs. the actual 3 ½ from the description. The diagram is helpful but eventually most students to head to arithmetic solutions.

We really expected someone to use an Algebraic solution like the one below.

$$t/4 + t/3.5 + t/2 = 20$$

$$7t/28 + 8t/28 + 14t/28 = 20$$
$$29t/28 = 20$$

$$\therefore t \approx 19.3\ days$$

The interesting information gathered about the work from the classroom was how few students (0 in this group of 24) who actually went back to an algebraic method with a rational equation. Perhaps this is because the last time they covered the idea was the previous year. It did afford a nice opportunity to bring back that method and compare it to the ones that the students generated. An important point to remember is most solved the problem successfully even if they did not resort to the methods we have taught them.

Here are some of the comments from teachers that have piloted the tasks:

- *"Well planned lesson…bravo!"*
- *"My students enjoyed the lesson and I was able to learn the concepts they were missing."*
- *"The launch activities were an excellent opportunity for some quick formative assessment to determine the students' readiness for the lesson."*
- *"I look forward to using this lesson often."*
- *"Kids loved it and it built in better understanding of the concept."*

A recording of today's webinar will be available at:
http://www.carnegielearning.com/webinars http://www.mathedleadership.org/events/webinars/html

- *"My students enjoyed the lesson tremendously! They were really engaged and I think they have a better understanding of the concept than they had before. I really liked the way the lesson did several things: it was based on something they knew, it leads to aha moments and it created a lot of discussion."*
- *"Wow, what an awesome activity!!! "*
- *"On a personal note, I have never seen a lesson plan like this one. It was really fun for the kids and taught place value understanding better than any textbook. I loved it!"*
- *What an amazing way to get to the practices, many of them could be used to support all the practices.*

Will the Common Core Standards for School Mathematics matter in 10 years?

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At 2012 Midwest Mathematics Meeting of the Minds February 29 Matt Larson (Lincoln, Nebraska) concluded his presentation with the statement that the common core **will** matter in ten years, if we do these four things.

1. Our focus must be on the Mathematical Practices, making our reform effort more about instruction and not just about content.
2. We put structures in place to support **all** students in achieving the goals of the Common Core.
3. We put structures in place to support teachers in improving their instruction by focusing their collaborative efforts on embedding the Mathematical Practices in their instruction.
4. We must address the cultural resistance to change in our schools and in our culture at large.

What changes will you make?

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Questions?

GREAT TASKS

Thank You!

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