

**Whole Number Operations  
JASON Academy  
Road Map**

<b>Objective</b>	<b>Title of Activity</b>	<b>Assignment</b>	<b>Time</b>
<b>Week One</b>			
Read package file for Week One content	Week 1 Content	Read through package file for Week One content	2 hours
Discuss algorithms	Starting Points	Create an entry in the Course Journal that includes some of the algorithms that you remember from your early mathematics education. Choose one of these algorithms and explain it mathematically.	.5 hours
Analyze the multiplication algorithm	The Multi-Digit Multiplication Algorithm	Analyze and explain steps in the multiplication algorithm by using the information provided in partial products, place value, and mathematical reasoning to solve related problems. Respond to other participants.	1 hour
Explore algorithms never taught in the United States	European-Latino Algorithm	Pose and solve subtraction problems with the European-Latino algorithm and write a mathematical explanation for the procedure.	.75 hours
<b>Week Two</b>			
Read package file for Week Two content	Week 2 Content	Read through package file for Week Two content	2 hours
Review conventional algorithm	Solve Problems with the Conventional Algorithm	Solve problems in your Course Journal using the conventional algorithm. Use the procedure that was originally taught in school without taking any shortcuts learned over the years.	.75 hours
Experiment with an interactive	Try the Number Line	Experiment with an interactive model of a number line to understand how the tool represents positive and negative	.75 hours

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number line	Interactive Tool	numbers and how it models addition and subtraction. Use the tool to solve several problems involving addition and subtraction of integers.	
Model adding fractions	Try the Adding Fractions Interactive Tool	Model adding like and unlike fractions with four different visual models: fraction bar, circle area, square area, and set models. Solve problems, evaluate the effectiveness of the models, and reflect. Write about how such interactive, visual models can support students' understanding of addition of fractions.	.75 hours
Explore area models and reflect	Use the Area Model	Use an interactive area model as well as paper-folding to demonstrate how the conventional "multiply numerators, multiply denominators, reduce" algorithm for multiplication of fractions works.	.75 hours
Explore visual models of the division of fractions	Model Division of Fractions	Use visual models of repeated subtraction to explain the meaning of division of fractions. Then, explain why the quotient is often larger than dividend or divisor with fractions, as opposed to whole numbers where the quotient is usually smaller.	.75 hours
Explore an interactive tool about Cartesian Coordinates	Explore the Cartesian Coordinates Math Tool	Use an interactive tool based on a coordinate grid to visualize multiplication of decimals less than 1 and explain why the product is smaller than either factor.	.75 hours
Discuss two models in more depth	Models	Select two models you worked with during the week and describe what you find most useful about the model and offer a problem they might ask students to solve with that model. Respond to other participants	1 hour

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<b>Week Three</b>			
Read package file for Week Three content.	Week 3 Content	Read through package file for Week Three content	2 hours
Explore and compare addition algorithms	Explore Addition Algorithms	Rename Addends and Left-to-Right are alternative algorithms for addition that use number sense and the idea of "friendly numbers." Use the two algorithms, compare them to the conventional addition algorithm, and consider how the alternative algorithms might be helpful to students.	.75 hours
Explore and discuss subtraction algorithms	Explore Subtraction Algorithms	Learn the Adding Up and Trade First subtraction algorithms and use them to solve several problems. Discuss how they might use manipulatives to demonstrate these algorithms and how the procedures might reinforce conceptual understanding of subtraction.	.75 hours
Explore and explain multiplication algorithms	Explore Multiplication Algorithms	Learn three multiplication algorithms that work by breaking numbers apart (decomposing) to make the factors easier to multiply. Solve problems with the three algorithms and explain how each works.	.75 hours
Explore and compare division algorithms	Explore a Division Algorithm	Learn the Partial Quotients algorithm and compare it to the conventional algorithm for long division with whole numbers. Then, apply the algorithm to division with decimals.	.75 hours
Reflect on algorithms	Before Moving On	Write about your own experiences with and reactions to the alternative algorithms and the potential advantages and disadvantages of teaching these non-traditional	.5 hours

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		procedures.	
Try a non-traditional algorithm with students	Taking It to the Classroom	Select at least one non-traditional algorithm and explain why it works. Then, try your non-traditional algorithm with a student or a group of students.	.75 hours
Explain a fraction rule	Explore the Rule	Explain why the Egyptian Fraction rule works for the types of fractions described.	.5 hours
<b>Week Four</b>			
Read package file for Week Four content	Week 4 Content	Read through package file for Week Four content	2 hours
Explore students' mathematical communication and thinking	Communicating Thinking	Read a classroom vignette that describes students' successful and unsuccessful approaches to solving a problem with percents. Then, look at how students communicate their ideas and describe students' mathematical thinking.	.75 hours
	Evidence of Algorithmic Thinking	Read a classroom vignette in which students are inventing solutions for a division problem in order to develop a picture of how students begin to generalize particular solutions to other, similar problems.	.75 hours
	Interpret Student-Invented Algorithms	Give a mathematical description of three solutions to the same problems. Use the solution strategies with a number of other, similar problems and then write about how efficient and generalizable the strategies are. Then, discuss what the solutions show about what students do and do not understand.	.75 hours

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	Analyze and Evaluate Student-Invented Algorithms	Describe four solution strategies to one problem and evaluate them against criteria for effective algorithms: efficiency, accuracy, and generalizability.	.75 hours
Observe students using what you have learned in the course	Observe Students	Select a math problem that you have tried during this course and present it to a small group of students. Then, share your observations of students' thinking and communication and reflect on how activities like these can be helpful for students and for their own teaching decisions.	.75 hours
<b>Week Five</b>			
Read package file for Week Five content	Week 5 Content	Read through package file for Week Five content	2 hours
Solve problems and discuss strategies	Mental Math	Solve the four given problems mentally in at least one way but without using the conventional algorithm. Then, record the strategy along with the different mathematical concepts drawn on to solve the problems.	.75 hours
Explore a mathematical problem	The Broken Calculator	Solve a broken calculator problem and reflect on ways in which such an activity can help students develop computational fluency.	.75 hours
Reflect on algorithms	Join the Debate	Reflect on your own practice and discuss what you see as the benefits or dangers of using non-traditional and student-invented algorithms in instruction from both practical and pedagogical points of view.	.75 hours
Explain an	Analyze the	View an animation of this alternative algorithm for	.75 hours

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alternative algorithm	Russian Peasant Algorithm	multiplication, try it, and explain how it works.	
Reading and responding to other participants over the 5 week course.			3 hours
		<b>Total:</b>	<b>32.25 hours</b>