You're the Teacher

Overview

Each participant will come prepared to **teach a single math problem** from start to finish, demonstrating the progression from **Conceptual → Pictorial → Abstract** understanding. This presentation is your opportunity to model how students build deep conceptual understanding, and how you as a teacher guide them through that journey with intentional tools, language, and representation.

Be Prepared

1. **Three Stages of Instruction for That Problem**
   a) **Conceptual Stage (With Manipulatives)**
      - Show how you **introduce and explore** the concept with students at the **conceptual stage**.
      - Focus on discovery, pattern recognition, and hands-on engagement.
   b) **Pictorial Stage**
      - Prepare a visual model or drawing that connects directly to the manipulative work.
      - This can include number lines, diagrams, arrays, or other visuals that bridge thinking.
   c) **Abstract Stage**
      - Provide the symbolic representation (equation, expression, algorithm, etc.).
      - Explain how the abstract notation relates to the previous two stages.
2. Always be sure to use and think about the following.
   a) Key **math language** and vocabulary.
   b) How you would **respond to common misconceptions**.
   c) At least one **question** you'd ask students to deepen their understanding at each stage.

Possible Problems- Week 1					
Fact Masters - Multiplication	6×4	8×2	9×3	4×8	
	7×5	2×9	9×1	4×0	
Fact Masters - Division	$36 \div 4$	$27 \div 3$	$42 \div 7$	$40 \div 5$	
	$14 \div 2$	$48 \div 6$	$54 \div 9$	$64 \div 8$	
Fact Masters - Addition	5 + 2 concretely K		8 + 5 concretely Gr 1 or 2		
	5 + 2 pictorially K		8 + 5 pictorially Gr 1 or 2		
Fact Masters - Subtraction	M – 9/S - 5 concretely K		M – 14/S - 6 concretely Gr 1 or 2		
	M – 9/S - 5 pictorially K		M – 14/S - 6 pictorially Gr 1 or 2		
Fraction Equivalence	Compare 2/6 and 2/3 (reason)	Compare ¼ and ¾ (reason)	Compare 2/3 and 4/6 (pic)		
	Compare 5/8 and 4/6 (pic)	Compare ½ and 4/8 (conc)	Compare ½ and 4/6 (conc)		
Fractions on a Number Line	Plot 1/3	Plot 1/6	Plot 5/8	Plot 3/6	Plot 4/4
Fractions- Add	$\frac{1}{2}+\frac{1}{2}$	$\frac{2}{3}+\frac{1}{6}$	$\frac{3}{4}+\frac{1}{3}$	$2\frac{4}{5}+1\frac{3}{10}$	$1\frac{3}{4}+1\frac{4}{6}$
Fractions- Subtract	$\frac{5}{8}-\frac{2}{8}$	$\frac{5}{6}-\frac{2}{3}$	$\frac{7}{10}-\frac{1}{2}$	$2\frac{5}{12}-1\frac{3}{4}$	$2\frac{1}{4}-1\frac{2}{3}$
Fractions- Multiply	$2 \times \frac{1}{6}$ pictorial/concrete	$\frac{1}{2} \times 3$ pictorial/concrete	$\frac{2}{3} \times \frac{3}{5}$ concrete	$\frac{3}{5} \times \frac{2}{4}$ area model	$\frac{3}{8} \times \frac{1}{3}$ area model

You're the Teacher

Fractions- Divide	$3 \div 5$	$2 \div \frac{1}{6}$	$\frac{1}{2} \div 3$	$\frac{4}{6} \div \frac{1}{3}$	$\frac{2}{8} \div \frac{1}{12}$
Integers- Add	4 + (-7) -3 + 5 -5 + -4 -5 + 3 Be prepared to model with both integer chips, pictorially and on a number line				
Integers- Subtract	7 – 8 3 – (-6) -6 – (-4) -5 – 4 -2 – 5 4 – 7 4 – (-5)				
Integers- Multiply	8 × -5 -4 × -3 -2 x 5 3 × -5 -2 × -3 -4 x 6				
Integers- Divide	-12 ÷ -4 8 ÷ -2 -15 ÷ 5 -16 ÷ 8 12 ÷ -4				
Equations- One Step	$x + 3 = 5$ $2x = 8$ $x - 4 = 6$ $\frac{x}{3} = 2$ $x + 3 = -5$ $-2x = 8$ $x - 4 = -6$ $\frac{x}{3} = -2$				
Equations- Two Step	$2x + 6 = -12$. $\frac{x}{3} + 5 = -7$ $-2x + 10 = 14$ $-3x + 10 = 16$				
Equations- Multi Step	$-2x + 5x = 8 + 3x$ $2x + 2 + x = -14$ $2(x+3)+2 = -14$ $2x - 5x + 3 = 8 - 3x$ $-5x + 3x + 5 = -7x + 2x + 8 - 3$				
Analyzing Types of Solutions – One Solution, No Solution, Infinite Solutions	3x + 5 = 3x + 6 -4x +1 = x – 5x – 1 2x + 5x + 6 = 7x + 8 – 2 3x + 4 = 2x + 2 + x 6x + 4 = 3x – 5 -3x -5 = 7x + 6 – 1 - 10x 2(5x + 6) = 4x – 2 + 6x 6x – 4 = 2x + 12				
Inequalities	$x + 3 < 5$ $2x > 8$ $x - 4 < 6$ $\frac{x}{3} > 2$ $x + 3 < -5$ $-2x > 8$ $x - 4 < -6$ $-\frac{x}{3} > -2$				

Possible Problems- Week 2 (K-8)					
Decimals- Multiply	0.7 x 0.8 pictorial	3 x 1.46 place value chart	0.4 x 2.7 estimate		
	2.4 x 2.3 area model	3.3 x 0.4 estimate	3.2 x 1.67 standard algorithm		
	0.6 x 0.8 pictorial	0.3 x 0.84 standard algorithm	2.13 x 5.92 standard algorithm		
Decimals- Divide	1.525 ÷ 0.005	1.008 ÷ 0.21	0.72 ÷ 0.8 reason	5.32 ÷ 4 place value chart	
	0.84 ÷ 0.6 pictorial	4 ÷ 0.8 pictorial	0.54 ÷ 9 reason	4.02 ÷ 3 place value chart	
Addition Progression	37 + 40 number line	27 + 39 PV mat	287 + 325 number line	4,298 + 1,037 expanded form	2.3 + 0.8
	29 + 5 PV mat	46 + 24 number line	386 + 34 PV mat	70,019 + 3,488 std alg	0.78 + 0.5
	45 + 4 hundred chart	62 + 17 hundred chart	571 + 127 expanded form	683,514 + 279,316 std alg	0.35 + 0.68
Subtraction Progression	60 – 20 hundred chart	86 – 29 PV mat	300 – 153 PV mat	420,035 – 4,628 st alg	1.26 – 0.35
	50 – 10 PV mat	73 – 13 hundred chart	543 – 441 number line	5,393 – 4,018 expanded form	1.7 – 0.5
	70 – 50 number line	56 – 34 number line (count on)	279 – 183 expanded form	37,106 – 19,231 std alg	2.5 – 0.75
Multiplication Progression	Partition a rectangle (3 rows and 5 columns) Find the number of squares and equations.	6 x 80 reason	2 x 50 reason	Distributive property – pictorial and expression 7 x 6 8 x 6	Associative Property – pictorial and expression 3 x 5 x 4 3 x 6 x 5
	area model 176 x 4 36 x 84	Partial products 57 x 29 183 x 62	94 x 7 3784 x 6	Standard algorithm 36 x 27 493 x 34	384 x 6 592 x 38

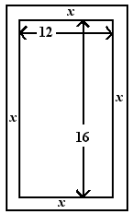
You're the Teacher

Division Progression	Odd or even? Concrete 17 8	Odd or even? Pictorial 14 13	partitive and quotative 24 ÷ 6 18 ÷ 3	
	concrete or pictorial 48 ÷ 4 42 ÷ 3 651 ÷ 5	Area model 84 ÷ 4 732 ÷ 6 835 ÷ 6	Partial Quotients 7654 ÷ 14 846 ÷ 9 3048 ÷ 12	
Place Value (K-2)	Decompose 12	Compose a teen number (concrete to pictorial)	represent 24 concretely (early stage)	represent 80 pictorially
	Represent 209 (all forms)	compare 5 and 3 (K)	compare 49 and 47 pictorially	compare 283 and 289 pictorially
Place Value (3-5)	Write 582,097 in all forms (Gr. 4)	Write 30,000 + 400 + 1,000 + 5 in all forms (Gr. 4)	Write 735.074 in all forms (Gr. 5)	
	Write (2 x 10) + (1 x 1) + (4 x $\frac{1}{10}$) + (8 x $\frac{1}{1000}$) in all forms (Gr. 5)	Compare: 3,857 ___ 3,859	Compare: 284,019 ___ 284,109	
	Compare: 1,350 ___ 135	Compare: 10,382 ___ 10,382	Compare: 38.57 ___ 3.857	
	Compare: 0.482 ___ 0.49	Compare: 15.23 ___ 12.23	Compare: 3.84 ___ 3.840	
Properties and Strategies	True or false? model 4 + 3 = 10 – 3 9 = 12 – 4 12 – 4 = 8 + 5 4 + 2 = 6 - 0	Make 10 to add on 6 + 7 5 + 9	Decompose to 10 subtract (minuend) 15 – 9 12 – 6	Decompose to 10 subtract (subtrahend) 15 – 9 12 – 6
	Use the commutative property 3 + 9 5 + 7 + 5	Use the Associative property 2 + 6 + 6 6 + 7 + 3	Use strategies and/or properties and explain 352 + 147 13 + 81 + 47 + 59 17 + 27 + 52	
	13 cars are in the parking lot. 8 bicycles are in the rack. How many more cars are there than bicycles?		Alexa has 9 buttons. How many can she put on her jacket and how many on her sweater?	
	Solve using a diagram Tonya has 4 fewer apples than Josh. Josh has 17 apples. How many apples does Tonya have?		Judy has 12 dollars. Andre has 8 more dollars than Judy. How many dollars does Andre have?	
Possible Problems- Week 2 (High School)				
Add Polynomials	1. $(x^2 - 4x + 5) + (3x^2 + 8x - 2)$ 2. $(-2x^2 + 5x - 7) + (2x^2 - 5x - 2)$ 3. $(6x^2 - 5x + 4) + (2x^2 - 2x - 6)$			
Subtract Polynomials	1. $(8x^2 - 5x + 4) - (2x^2 - 2x - 3)$ *Model as take away*			

You're the Teacher

	2. $(4x^2 - 3x + 2) - (5x^2 - 2x - 4)$ *Model as adding the opposite* 3. $(-3x^2 + 5x - 3) - (4x^2 - 3x - 5)$ *Choose the model you want use*
Multiply Polynomials	1. $(2x + 5)(x + 1)$ 2. $(x + 5)(x - 3)$ 3. $(x - 4)(x - 3)$ 4. $(x + 4)(x + 4)$ 5. $(x - 3)(x + 3)$ 6. $(2x + 5)(x - 2)$ 7. $(2x + 3)(x - 2)$ 8. $(3x - 2)(x + 5)$ 9. $(4x - 5)(x - 3)$
Building a Quadratic Function- Linear to Quadratic	1. How does the degree of a function change when multiplying two linear functions, and what is the significance of this change in terms of graph shapes? 2. Explain how the x-intercepts of the original linear functions relate to the x-intercepts of the resulting quadratic function. 3. How is the vertex of a quadratic function related to the axis of symmetry and the x-intercepts? 4. Discuss the relationship between the signs of the leading coefficients of the linear functions and the direction in which the quadratic graph opens. 5. How can the standard form and factored form of a quadratic function provide different insights into the properties of the function? 6. In what ways do the constants in the linear functions influence the quadratic function's y-intercept? 7. What is the significance of the vertex form of a quadratic function, and how can it be derived from the standard form?
Factoring Polynomials	1. $x^2 + 9x + 20$ 2. $x^2 + x - 20$ 3. $x^2 + 6x + 8$ 4. $x^2 - 9$ 5. $x^2 - 3x - 18$ 6. $x^2 - 8x + 15$ 7. $6x^2 - 7x - 5$ 8. $6x^2 - 5x - 4$
Completing the Square	1. $x^2 - 8x + 13$ 2. $x^2 + 4x + 11$ 3. $x^2 + 2x - 3$ 4. $x^2 + 6x + 5$ 5. $x^2 - 6x + 14$ NC: Page 11 – Graph and explain connections to key features.
Quadratic Application	**Problem 1:** A rocket is launched vertically off a cliff. Its path is given by the function, $h(t) = -16t^2 + 64t + 80$, where *t* is the time in seconds, and *h* is the height in feet. When will the rocket hit the ground? **Problem 2:** Let $h(t) = -16t^2 + 64t + 80$, represent the height of an object above the ground after *t* seconds. • Determine the number of seconds it takes to achieve its maximum height. Justify your answer. • State the time interval, in seconds, during which the height of the object *decreases*. Explain your reasoning. **Problem 3:** Ryan threw a frisbee into the air. The height of the frisbee can be represented by the equation $h(t) = -4t^2 + 16t + 20$, where h is the height, in units, and t is the time, in seconds, after the ball was launched. Graph the equation from t = 0 to t = 6 seconds. State the coordinates of the vertex and explain its meaning in the context of the problem. **Problem 4:** A contractor has 48 meters of fencing that he is going to use as the perimeter of a rectangular garden. The length of one side of the garden is represented by x, and the area of the garden is 108 square meters. Determine, algebraically, the dimensions of the garden in meters.

You're the Teacher

	Problem 5 A garden measuring 12 meters by 16 meters is to have a pedestrian pathway installed all around it, increasing the total area to 285 square meters. What will be the width of the pathway? 
Polynomial Function	Share how you would use one of the functions to complete the sketch card activity. Use the key features and the sheet to explain how you would sketch a graph based on the key features. Use appropriate vocabulary such as multiplicity, distinct zeros, and discuss how the y-intercept was obtained from factored form.
Transformation	1. Use Desmos or patty paper to reflect a figure over the x-axis and then translate it 4 units up. If you reverse the order of the transformations, does the image end up in the same place? 2. Use patty paper to translate a triangle 5 units to the right and then rotate it 90° counterclockwise around the origin. Now reverse the order: rotate the triangle first, then translate it 5 units to the right. Do both sequences result in the same image? 3. Use Desmos to reflect a figure over the line x = 2, and then over the line x = 6. What single transformation produces the same result as this sequence? 4. Use patty paper or Desmos to rotate triangle ABC 90° clockwise around point P(3, 3). Use a second method to check your answer. What challenges came from not rotating around the origin? 5. Use Desmos to rotate a triangle 180° around the origin and then reflect it over the y-axis. Reverse the order and try the reflection first, then the rotation. Did both sequences produce the same image? 6. Use patty paper to reflect triangle XYZ over the y-axis. Trace both the original and image triangle, then travel clockwise around both figures. Are the points in the same order?
Congruence	Complete a proof modeling how orientation assisting in listing corresponding sides or determining what needed to be proven.