4-Tiers to Preparing Students for the ISAT Math Extended Response

Lesson Group 1:
Teach how to *solve* word problems

Lesson Group 2:
Teach how to *explain* thinking in words

Lesson Group 3:
Teach how to *justify* thinking in words

Lesson Group 4:
Teach how to *meet* Math Extended Response rubric expectations

Lesson 1: Solving Math Word Problems

Objective: To help students begin to solve word problems in a more methodical fashion.

Materials: Chart paper or wipe board, age appropriate multi-step math problem, papers and pencils for each student, 5-Steps to Solving Word Problems handout for each child (and a poster or overhead of it for reference)

Lesson:

1. Put a multi-step math problem on the board (ie. For 4th grade, you could put a long division problem up, or for 3rd grade, a 3 digit by 3 digit subtraction problem that requires regrouping.)
2. Ask students to write down (or take turns orally sharing with the class, depending on written literacy level and comfort) how they solved the problem. What did they do first, next, etc?
3. Introduce the 5-Steps to Solving Word Problems.
4. Re-solve the sample problem as a class using the 5-Steps to Solving Word Problems and explaining each step as you go along.
5. Provide students with additional multi-step problems to allow them to try the 5-Steps to Solving Word Problems on their own, or with teacher guidance.

Homework:
Students complete more word problems using 5-Steps to Solving Word Problems.
Or
Students write about how using 5-Steps to Solving Word Problems helps or makes it more difficult for them to solve word problems (so teacher can assess if this is meeting their needs or not).

Lesson 2: Robot Math

Objective: To promote step-by-step sequential math thinking for all students.

Materials: Chart paper or wipe board, age appropriate multi-step math problem, papers and pencils for each student, Word Problem Step-by-Step Think Chart for each child, Large or overhead copy of the Word Problem Step-by-Step Think Chart

Lesson:

1. Put a multi-step math problem on the board (ie. For 4th grade, you could put a long division problem up, or for 3rd grade, a 3 digit by 3 digit subtraction problem that requires regrouping.)
2. Ask students to solve the problem – but AS they solve it, write down EACH step they took.
3. After students have completed the problem, ask for a volunteer to come to the board to be the "robot."
4. Ask for a second volunteer to be the robot "control master" from his or her seat.
5. Instruct the robot to only do EXACTLY what the control master commands – and nothing else. For example, if the control master says, "write a three at the bottom" and does not specify where the bottom is, the robot cannot comply.
6. Ask the control master to begin giving the robot instructions.
7. When the robot is "stuck" due to incomplete or missing instructions, as the rest of the group to volunteer advice to the control master.
8. After the problem is complete, debrief with the students: *What worked well? Why didn't work well? What could you do in the future to make your instructions more complete or specific?*
9. If time allows, ask students to break into pairs, one being the control master and one being the robot to solve another multi-step problem.
10. Introduce the word problem Step-by-Step think chart to students and model use.
11. Guide students in understanding how what they did today can be done easily on the think chart.

Homework: Solve multi-step problems using the think chart.

Lesson 3: Conquering the "But Why?"

Objective: To help students understand the "why" in their math problem solving.

Materials: Chart paper or wipe board, age appropriate multi-step math problem, papers and pencils for each student, Word Problem Step-by-Step Think Chart for each child, Large or overhead copy of the Word Problem Step-by-Step Think Chart, Word Weapons Chest

Lesson:

1. Put a multi-step math problem on the board (ie. For 4th grade, you could put a long division problem up, or for 3rd grade, a 3 digit by 3 digit subtraction problem that requires regrouping.)
2. Pass out the New think chart (same as the Lesson 2 Step-by-Step think chart, only this one has a justification column).
3. Instruct students to, for now, ignore column three (the justification column) and to treat this think chart in the same what they had the chart from Lesson 2.
4. Ask students to solve the problem using the new think chart.
5. Review going over the problem step by step.
6. Discuss what "justification" means – (explain to kids it is the 'But WHY did you do that?' part of the problem)
7. Offer the students a "Word Weapons Chest" to help them "conquer" the "But Why's." – unveil your word wall of math terms. (see next page for samples)
8. Ask students to come up with WHY they took each step they took.
9. Model a think aloud for considering this question for the first two steps.
10. For the third step, ask a student to explain the step and then ask WHY for each of his or her responses. (Tip: Tell the students that they're talking to an alien who has never been to an elementary school math class before. They will have to explain what each operation is, and why they took it.)
11. Guide students in completing the justification for the rest of the problem, using the phrase and vocabulary bank provided.

MATH WORD WEAPONS CHEST

Explanation Words

First	When I did… then…	Decrease / Getting smaller
Next	If I… then…	Dividing into
Then	Didn't work, so I…	Groups
Finally	Checked again	
Because	Increase / Getting larger	

Cue Words

Addition:	*Subtraction:*	*Multiplication:*	*Division:*
All	More	Product	Share
Total	Fewer than	Total	Distribute
Sum	Less	Area	Quotient
Altogether	Left	Times	Average
	Difference		

Lesson 4: Rocking the Rubric

Objective: To help students become familiar with the ISAT Math Extended Response Rubric and expectations.

Materials: Chart paper or wipe board, age appropriate multi-step math problem, papers and pencils for each student, copies of the ISAT rubric, copies of the Math Extended Response Checklist (MERC)

Lesson:

1. Put a multi-step math problem on the board (ie. For 4th grade, you could put a long division problem up, or for 3rd grade, a 3 digit by 3 digit subtraction problem that requires regrouping.)
2. Pass out the Math Extended Response Checklist.
3. Review each step with the class, explaining that this is the Rubric in a more simplistic form.
4. Solve the problem on the board, using the checklist.

Or

1. Put a multi-step math problem on the board (ie. For 4th grade, you could put a long division problem up, or for 3rd grade, a 3 digit by 3 digit subtraction problem that requires regrouping.)
2. Pass out the Math Extended Response Checklist.
3. Review each step with the class, explaining that this is the Rubric in a more simplistic form.
4. Ask students to help you grade a sample answer using the checklist.

For both lessons:

1. Put another problem on the board.
2. Have students complete it using all prior strategies and knowledge
3. Have students split into pairs and grade one another's work using the MERC.
4. Circulate to help and guide pairs as needed.
5. Re group to discuss what students have observed in using the Extended Response Checklist.

My Math Extended Response Checklist

(Complete in this order)

Name: _____ Date:_____

✓	To get a 4, I need to….
	Read the problem.
	Underline important parts of the problem.
	Make a plan to solve the problem.
	Solve the problem, showing ALL of my work.
	Label the answer (circle it and write "answer" next to it).
	Write down EVERY step I took to solve the problem.
	Next to each step, explain WHY I did that step.
	Use math words in my explanation.
	Explain the drawing if I made one.
	Check ALL of my work.

My Score: 1 2 3 4

Word Problem Step-by-Step Think Chart

Step in Numbers	Step in Words

Name: Date:

Extended Response Step-by-Step Think Chart

My Work (Step by Step)	Each Step in Words	Why I Did This Step
My Answer:		