Solving Equations

Mathematics Grade 8

5 day Unit

Tools Required: Four-Pan Algebra Balance

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Overall Unit Objective
The following lessons have to do with solving equations with the assistance of the Four-Pan Algebra Balance. The lessons help discuss the applications and skills involved when solving equations. Students are asked to initially solve simple equations to then solve more difficult equations. Each step continues until the simplest equivalent form reached.

The Four-Pan Algebra Balance is a great way to provide a tangible concept of integers and equations. It is an excellent tool for group work and/or learning center. This balance has two pans on each side, two red pans (representing negative) and two yellow pans (representing positive). The white chips and the canister (with lid) are represented as one whole (for larger numbers, many more chips may have to be obtained).

The Four-Pan Algebra Balance comes with an easy to read guide that provides step-by-step directions involving integers and solving equations. There are masters of practice in the back of the book which provide a learning link between concrete and abstract level of thinking.

**Resources**


The Transition Mathematics series contains a variety of resources. The resource books available in this series that are used for these particular lessons are the Lesson Master Book A & B, Answer Master, Assessment Sourcebook, Quiz Book, Teaching Aid Book (Activity 67,68,69), and the Activity Kit.

**Materials Required**

1. Four-Pan Algebra Balance (2 to 3 depending on the amount of students, 2 to 3 students per balance)
2. White chips
3. Math worksheets

**Lesson Description:** This section deals with solving equations of the form \(x + a = b\), \(x - a = b\), and \(a - x = b\).
Essential Question/Objective: The purpose of this section is for the students to use the Four-Pan Algebra Balance to model addition and subtraction of integers. The Four Pan Balance provides a concrete model representing numbers allowing students to spawn ideas.

Standards and Performance Indicators:
• NYS Standard 3
• PI 7c,e

Specific Objective(s): As a result of this lesson the students should be able to:
1. Solve equations of the form x + a = b using the Four-Pan Algebra Balance.
2. Understand that if x – a = b, then x = b + a.
3. Solve equations of the form x - a = b and a – x = b using the Four-Pan Algebra Balance.

Classroom Activity and Procedure:

Day 1
• Introduction: Explain the Four Pan Algebra Balance by using very simple problems (-2 + 2 = 0, 4 = 4, -2 = -2, -7< -4). Allow the students to familiarize themselves with the materials comparing integers with a partner.
• Follow instructions on page 8 of the Four-Pan Algebra Balance Guide if necessary. Show students two examples on the board. Solicit answers as to how many chips go on each side for each sentence and why.
• Use the practice problems and/or cards in the back of the Four-Pan Algebra Balance Guide for extra examples.
• Discuss with the students the variety of ways to approach the possibilities. Explain that there may be more than one way to get any of the solutions.
• Pass out the worksheet displaying simple sentences. Ask students to display each sentence on the worksheet, one at a time, on their balance while taking turns.

Day 2
• Review information from the previous lesson.
• Write a few examples of equations on the board and complete with the students help without using the Four-Pan Algebra Balance.
• Use the practice problems and/or cards in the back of the Four-Pan Algebra Balance Guide for extra examples.
• Pass out either Lesson Master 5-2A and/or 5-2B, Lesson Master 7-3A and/or 7-3B, or Lesson Master 7-4A and/or 7-4B from the Transition Mathematics book for students to complete without the Four-Pan Algebra Balance without the use of the Four-Pan Algebra Balance. Answers are provided in the Teacher’s Edition.

Name___________________________ Date________________________

Solve x + a = b
Directions: Solve equations in the form $x + a = b$ using the Four-Pan Algebra Balance. Show what was added to both sides.

1. $x + 2 = 4$
2. $x + 5 = 10$
3. $x + 8 = 15$
4. $x + 10 = 16$
5. $x + 33 = 48$
6. $x + 20 = -16$
7. $x + 31 = -22$
8. $5 + x = -3$
9. $19 + x = -39$
10. $-33 + x = -15$
11. $18 = -19 + x$
12. $34 = -29 + x$
13. $30 + x = 11$
14. $x + -9 = -22$
15. $x + -21 = -2$
16. $27 + x = 10$
17. $15 + x = 30$
18. $-11 + x = -2$
19. $-7 + x = -21$
20. $-17 + x = 3$

Lesson Description: This section deals with solving equations of the form $ax + b = cx + d$. 
Essential Question/Objective: The purpose of this section is for the students to use their knowledge of $x + a = b$ and the Four-Pan Algebra Balance to model addition of integers $ax + b = cx + d$.

Standards and Performance Indicators:
- NYS Standard 3
- PI 7c,e

Specific Objective(s): As a result of this lesson the students should be able to:
- Solve equations of the form $ax + b = cx + d$ using the Four-Pan Algebra Balance.

Classroom Activity and Procedure:

Day 3
- Review the Four-Pan Algebra Balance from the previous lesson.
- Review the Distributive Property to simplify expressions.
- Write a few examples of equations on the board that would be fairly easy for students to solve (ex. $4x + 3 = 2x + 1$).
- Use the practice problems and/or cards in the back of the Four-Pan Algebra Balance Guide for extra examples.
- Allow students to complete a few examples with their partner. Discuss with the students the variety of ways to approach the possibilities. Explain that there may be more than one way to get any of the solutions.
- Pass out the worksheet. Ask students to display each sentence on the worksheet, one at a time, on their balance while taking turns.
- Consult the Four-Pan Algebra Balance Guide for suggestions on page 32-36.

Day 4
- Review information from the previous lesson.
- Write a few examples of equations on the board and complete with the students help without using the Four-Pan Algebra Balance.
- Use the practice problems and/or cards in the back of the Four-Pan Algebra Balance Guide for extra examples.
- Allow students to complete Lesson Master 13-3A and/or 13-3b from the Transition Mathematics book. Students must show their work. Answers are provided in the Teacher’s Edition.

Name_________________________________ Date____________________
Solving $ax + b = cx + d$

Directions: Solve equations in the form $ax + b = cx + d$ using the Four-Pan Algebra Balance. Show what was added to both sides.

1. $3x + 6 = 6x + 18$
2. $5x + 4 = 3x + 2$
3. $4x + 3 = 8x + 19$
4. $5x + 10 = 10x + 20$
5. $11x + 25 = 4x + 11$
6. $3x + 5 = 10x + 26$
7. $1x + 6 = 2x + 12$
8. $15x + 20 = 10x + 40$
9. $9x + 11 = 5x + 35$
10. $20x + 16 = 10x + 36$

Day 5
Classroom Activity and Procedure

- Due to the complexity of the subject matter, students will need to review for the next couple days depending on how fast they grasp the material.
- On the last days of this lesson, students should be given either the Master of Practice activities or Practice Cards in the back of the Four-Pan Algebra Balance Guide. They may also be given fast learners may be given the activity sheets from the assessment sourcebook to do without the Four-pan Algebra Balance. The chapters in the textbook coincide with the chapters in the assessment sourcebook.
- There are also reproducibles in the activity book and quiz book for review and mastery.