Balanced

Reporting Category	Patterns, Functions, and Algebra
Topic	Solving one-step linear equations in one variable
Primary SOL	6.18 The student will solve one-step linear equations in one variable involving whole number coefficients and positive rational solutions.

Materials

- Inverse Operations handout (attached)
- Solving One-Step Equations handout (attached)

Vocabulary

inverse, equation, expression, variable, term, coefficient, equality, solve, zero pair

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

1. Display the term *inverse*, and ask students for its meaning. Introduce the concept of inverse operations by presenting the idea that addition and subtraction are inverse operations. Ask students why this is true. Ask students, "If you have +3, what mathematical operation must you do to get zero?" Their response should come easily: "Subtract 3." Then, ask, "If you have −3, what mathematical operation must you do to get zero?" Again, their response should come easily: "Add three." Since they are not fully familiar with integer operations yet, they may more naturally think in terms of inverse operations instead of "adding the opposite" and making a zero pair. Nevertheless, because they are familiar with integers, you might also introduce the concept of zero pairs.
2. Distribute copies of the Inverse Operations handout. Have pairs or small groups of students work together to decide what operation and/or number should go in each blank to make each equation true. Instruct students to discuss why they chose their answers. Circulate around the room to listen to the discussions and push the students' thinking in order for individual students to be prepared to share thoughts with the class.
3. Have students share their solutions with the class. They should come up with the idea that when you add and then subtract the same amount, you are essentially adding zero, and you do not affect the original value. They should also come up with the concept that addition and subtraction are inverse operations. Ask students to share their thoughts about multiplication and division being inverse operations. They should come up with the concept that when you multiply and then divide a value by the same amount, you do not affect the original value.
4. Distribute copies of the Solving One-Step Equations handout, and go over the problems with the students, clarifying where necessary. Inform them that they must keep the scale "balanced" in each equation. Have students work in pairs to answer the problems. Circulate around the room, supporting the students and identifying students who might share their thoughts/ideas.
5. When students are finished, have selected pairs of students share their solutions and strategies. Ensure that the class discussion includes the idea that in order to keep the scale

balanced, you must "do the same thing" to each side of the balance (equation). (Note: The equations created from the pictorial representations are equations involving only addition or multiplication. There is a limitation to only subtracting the same number from both sides and to only dividing each side by the same number.)

Assessment

- **Questions**

  Solve the following equations:

  - $10b = 90$
  - $a - 100 = 200$
  - $m + 27 = 50$
  - $w \div 8 = 3$
  - $17 = 2a$
  - $45 = 5 \div n$
  - $100 = 5 + x$
  - $4x = 25$
  - $2 + x = 19$
  - $10 = b - 4$

- **Journal/Writing Prompts**
  - Explain how you can check to see whether you have solved an equation correctly. Explain why this method works.

Strategies for Differentiation

- Have students use manipulatives (e.g., colored wooden blocks, two-color counters) to represent equations.

Inverse Operations

Name _____ **Date** _____

For each equation shown below, fill in the blank with an operation and/or number to make the equation true.

I. Addition and Subtraction

9 + 4 − 4 = _____
3 + 4 _____ = 3
20 + 5 _____= 20
25 − 15 _____ = 25
100 − 45 _____ = 100

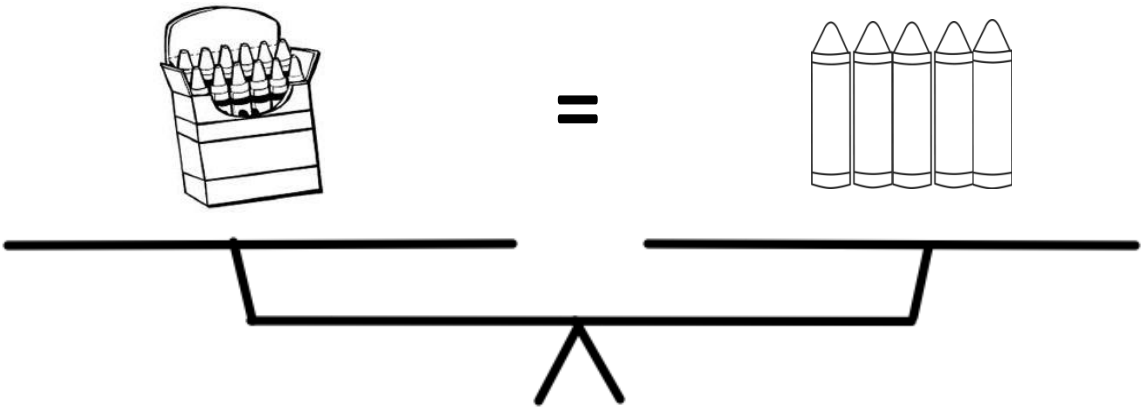
II. Multiplication and Division

10 × 2 ÷ 2 = _____
5 × 6 _____ = 5
30 ÷ 5 _____= 30
25 × 8 _____ = 25
100 ÷ 20 _____ = 100

Solving One-Step Equations

Name _____ **Date** _____

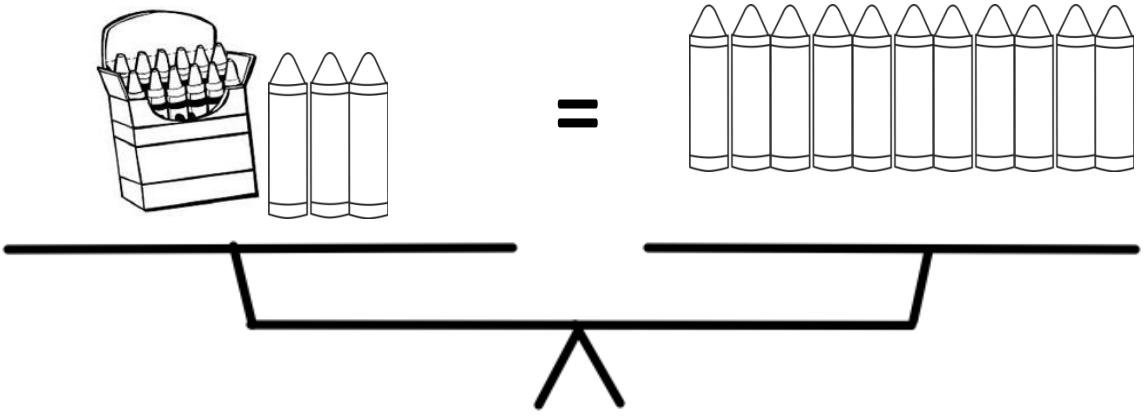
On the following balance scales, you do not know how many crayons are in the crayon box.



1. Write an equation to represent this balanced equation. _____

2. How can you determine how many crayons are in the box?

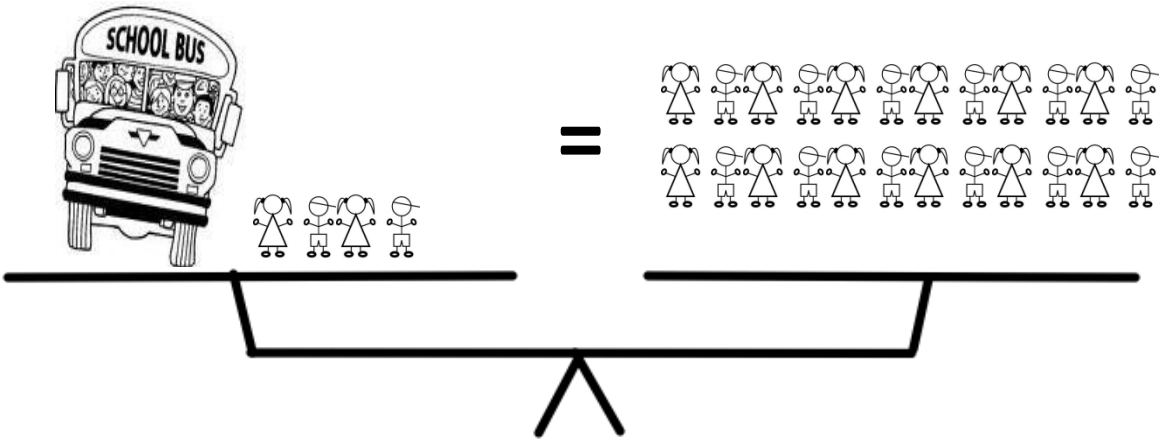
Now, try this one:



3. Write an equation to represent this balanced equation. _____

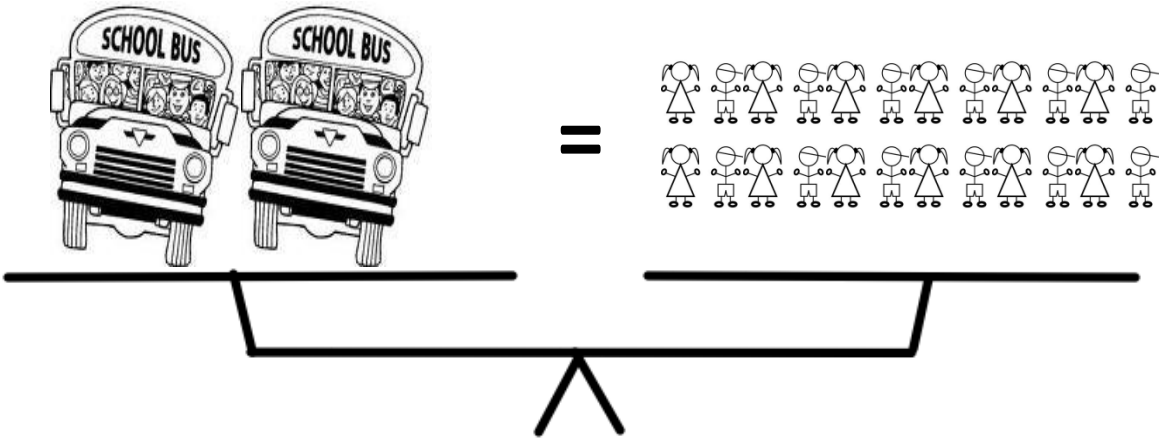
4. How can you determine how many crayons are in the box?

On the following balance scales, you do not know how many students are on the bus.



5. Write an equation to represent this balanced equation. _____

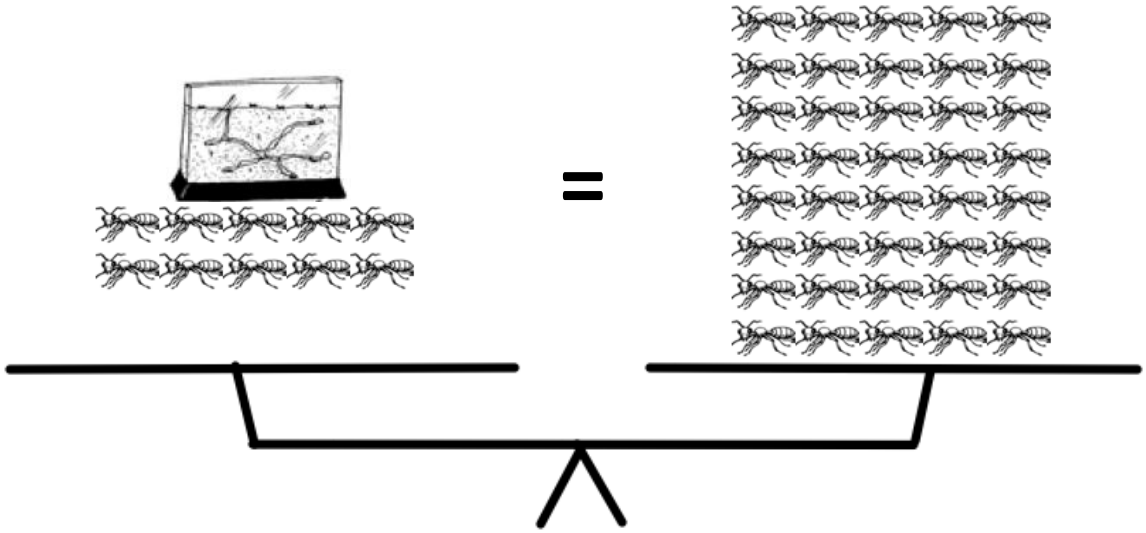
6. How can you determine how many students are on the bus?



7. Write an equation to represent this balanced equation. _____

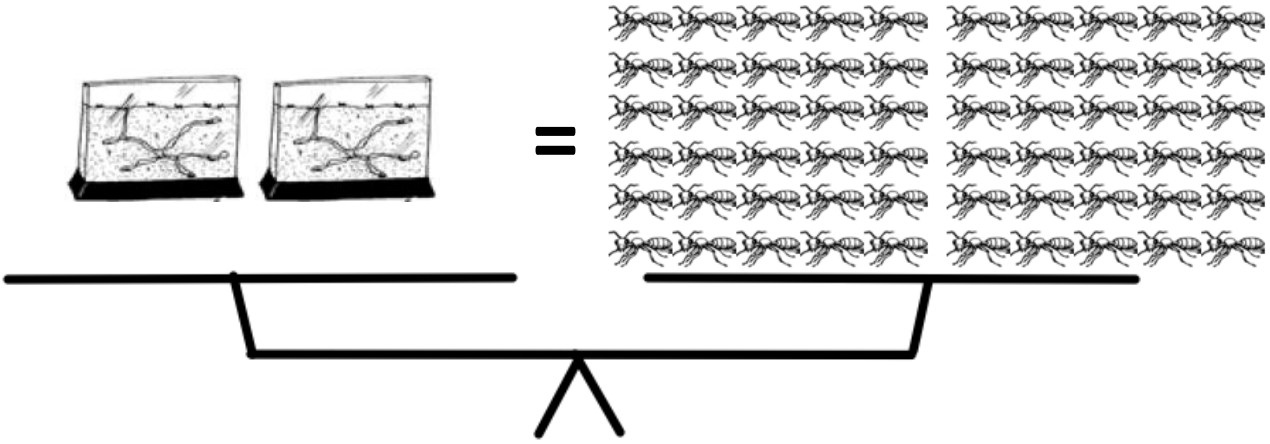
8. How can you determine how many students are on the buses?

On the following balance scales, you do not know how many ants are in the ant farm.



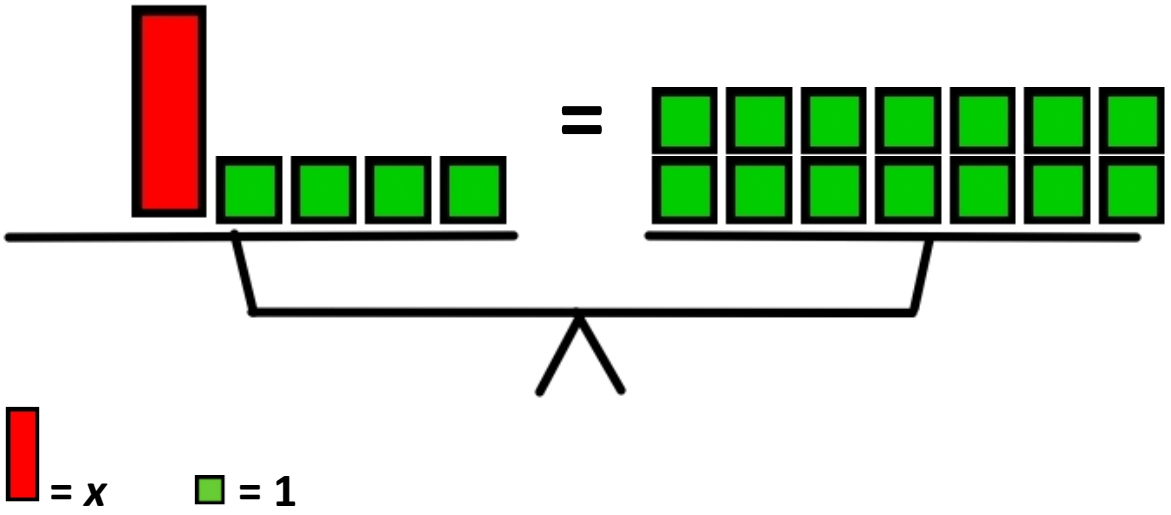
9. Write an equation to represent this balanced equation. _____

10. How can you determine how many ants are in the ant farm?



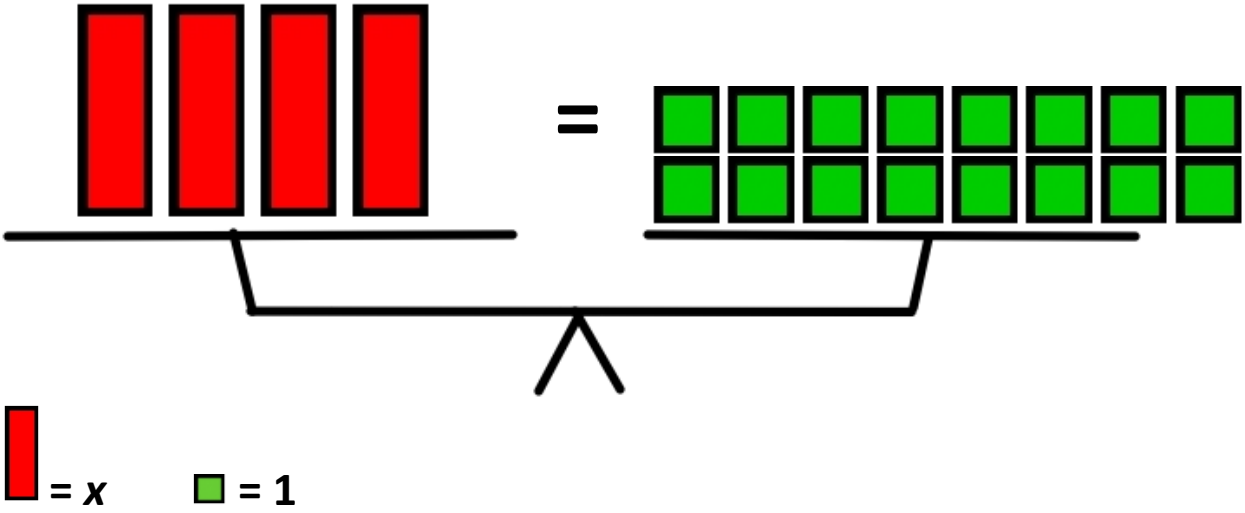
11. Write an equation to represent this balanced equation. _____

12. How can you determine how many ants are in the ant farms?



13. Write an equation to represent this balanced equation. _____

14. How can you determine the value of the ▮?



15. Write an equation to represent this 'balanced equation. _____

16. How can you determine the value of the ▮?