**Barron’s Let’s Review Regents – Algebra I**

# Chapter 1: Solving Linear Equations with Algebra

## Properties of Algebra

### The Addition Property of Equality

### The Subtraction Property of Equality

### The Division Property of Equality

### The Multiplication Property of Equality

### The Distributive Property of Multiplication over Addition

### Check Your Understanding of Section 1.1

1. Multiple Choice
2. Antoinio started the question 2x + 1 = 11 by writing 2x = 10. Which property justifies this step.  
     
   (d) Subtraction property of equality
3. Milia used the multiplication property to justify the first step in solving an equation The original equation was Which property did she use?  
   (3)
4. To more easily simplify an expression, Michael changed into What property justifies this step.  
   (1) Commutative property of addition
5. When solving the equation , Jocelyn used a property of algebra to transform the equation into Which property did she use?  
   (2) Addition property of equality
6. When solving the equation Devin used a property of algebra and transformed the equation into Which property did she use?  
   (3) Multiplication property of equality
7. Elijah used two different properties from algebra to solve this problem. What were the two steps and in what order did he do them?  
   (1) Addition property of equality followed by multiplication property of equality
8. Which number sentence uses the multiplication property of equality?  
   (4) ; therefore
9. Which number sentence uses the subtraction property of equality?  
   (1)
10. Which number sentence illustrates the addition property of equality?  
    (2)
11. Which number sentence illustrates the commutative property of multiplication?  
    (1)

Show how you arrived at your answers.

1. Malachi and Wesley each solved the equation Malaci used the distributive property of multiplication over addition to justify his first step. Wesley used the division property of equality to justify his first step. What would each student have after the first step is completed.
2. Justify each step of this solution to the equation:
3. Sandra calculates Solomon does it by writing Which person is correct and why?  
   Multiplication has higher precedence than addition, and the distributive property of multiplication involves parenthesized expressions, not unparenthesized expressions. Disagreed with book answer.
4. Joel writes and justifies it with the reason “the commutative property of subtraction.” What is wrong with this reasoning.  
   There is a commutative property of addition, but no corresponding property for subtraction.
5. Natalie simplified to get 90. Lucy says the answer is 30 Who is correct, and what is wrong with the other person’s logic?   
   Lucy is correct. Natalie is incorrect because there is no distributive property of multiplication over multiplication, only over addition.

## Solving One-Step Algebra Equations

When an equation has a variable by itself on one side of the equals sign, we say that that variable has been *isolated*. For example, in the equation , the x is isolated.

### Zero-Step Solutions

An equation like

### One-Step Solutions

In the equation , the variable x is not isolated yet. In order to isolate the x, the constant +2 must be eliminated from the left-hand side of the equals sign. To eliminate the +2, use the subtraction property of equality by subtracting 2 from both sides of the equals sign.

**Example 1**

**Example 2**

**Check Your Understanding of Section 1.2**

1. Multiple Choice
2. What value of x makes the equation true?  
     
   (3) 8
3. What is the solution set for the equation  
   (4) 13
4. What is the value of x that satisfies the equation (2) 2
5. Solve for x in the equation   
   (2) 16
6. What value of x makes the equation true?  
   (1) -5
7. What is the solution to the equation ?  
   (3)
8. Find the solution to   
   (3) 3
9. Solve for t in the equation .  
   ((4) 6
10. Find the solution for v in the equation  
    .  
    (3) 16
11. What is the solution set to the equation   
    ?  
    (2) {7}
12. Show how you arrived at your answers.
13. Logan decides to solve the equation by multiplying both sides of the equation sign b 6. How might he still get the correct answer.
14. Andrew says that to solve the equation   
    , you have to use the multiplication property of equality. Vanessa says that it can be done with the division of equality. Both are correct. Explain.
15. Noah says he can solve the equation   
     by using the subtraction property of equality. He is right. How can he justify this?
16. What property of algebra could be used to solve the equation addition property of equality
17. The equation does not have any solutions. Why?  
    It is not a valid equation.

## Solving Multistep Algebra Equations

### Two Step Algebra Equations

When both addition property of equality and the division property equality are used in an equation, it is simpler to use the addition property of equality first.

Similarly, when the subtraction property of equality and the division property of equality are involved in a solution, use the subtraction property of equality first.

**Example 1**

Example 2

### Three-Step Algebra Equations

When the distributive property of multiplication over addition is involved, algebra equations usually take three steps to solve.

**Example 3**

**Check Your Understanding of Section 1.3**

1. **Multiple Choice**
2. What value of x makes the equation 3x +7 true?  
   (3) 5
3. Solve the equation for x.  
   (1) 12
4. Find the solution set for the equation .  
   (3) {3}
5. Solve the equation for x.  
   (1) 4
6. Solve for x: .  
   (4) 8
7. What value for x makes the equation  
    true?  
   (1) 7
8. Solve for x: .  
   (2) 12
9. Find the solution set for the equation   
   .  
   (1) 4
10. Solve for x in the equation  
    (1) 14
11. Solve for x:   
    (4) -5
12. Show how you arrived t your answers
13. Solve for x. Show all work and justify each step with a property of algebra:  
    multiplication property of equalityaddition property of equality
14. Solve for x. Justy each step with a property of algebra.  
    division property of equality
15. Solve for x. Justify each step with a property of algebra.
16. Cristiano says he can solve the equation   
     with three steps: distributive property, subtraction property of equality, and division property of equality. Kayla says she can solve the equation in two steps: division property of equality, then subtraction property of equality. Are they both right? Explain.  
    Cristiano
17. To figure out what price to charge for a pair of sneakers in order to make $44,000 profit, the manufacturer must solve the equation: . Use properties of algebra to solve for the variable p.  
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## Isolating Variables in Equations with Multiple Variables

Whether an equation has one variable or multiple variables, the process of using the properties of algebra remains the same. The goal is to eliminate all the numbers and variables from one side of the equation except for the one that you are trying to isolate.

### Algebra Equations with Multiple Variables

**Example**

### Check Your Understanding of Section 1.4

1. Multiple Choice
2. Solve for d in terms of c, e, and f.  
   (2)
3. Solve for m in terms of a, b, and c.  
   (3)
4. Solve for r in terms of c and π.  
   (3)
5. Solve for c in terms of and d.  
   (1) d
6. Solve for x in terms of y, m and b.  
   (1)
7. Solve for m in terms of x, y, and b.  
   (1)
8. Solve for b in terms of x, y and m.  
   (3) y -mx
9. Solve for c in terms of a, b, and d.  
   (d)
10. Solve for b in terms of a, c, and d.  
    (4)
11. Solve for w in terms of l and p.  
    (2)
12. Show how you arrived at your answers.
13. If an equation that relates profit earned (p), quantity sold (q), price ®, and fixed expenses (f) is . Rewrite the equation with q solved in terms of p, r, and f.
14. The volume of a rectangular prism is , where v is the volume, w is the width, and h is the height. Rewrite this equation with w solved in terms of v, l and h.
15. The area of a triangle is related to the base and height of the triangle by the formula   
    . Rewrite this equation with b solved in terms of a and h.
16. The surface area of a cylinder is , where s is the surface area, r is the radius, and h is the height. Rewrite this equation with r solved in terms of s, , and h.
17. The nth term of an arithmetic sequence can be calculated with the formula  
    Rewrite this equation with n solved in terms of , , and d.