***Solving Algebraic Equations***

An Algebraic equation shows two expressions where one or both have an unknown value (variable); yet they are equal in value to one another:

E.G.

As a result, both sides must maintain their equality and we must ***keep the equation balanced***! We keep the equation balanced by using the zero principle to help remove values from both sides of the equation.

REMEMBER: 2 = 2 times

🡪 represents an unknown number.

\* Note: You are attempting to **isolate the variable** by moving all the variables to one side of the equation and the numbers to the other.

\* You must end with a positive variable: so multiply both sides by a negative to remove!

**Steps to solving algebraic equations:**

1. Combine any like terms on the same side of the equation.
2. Remove any function (multiplication/division) that affects the side of an equation
   1. 1. The 2 outside the brackets multiplies everything inside the brackets so it must be removed first.
         1. You can divide both sides of the equation by 2 (all values)
         2. Or you can **distribute** the 2 throughout the brackets to remove the brackets:
   2. 1. The whole equation on the left side is divided by 2 so that must be removed first.
3. Move all constants and variable terms to opposite sides of the equals. By doing opposite operations (Zero Principle).
   1. 1. Move the to the left side and the +3 to the right side! 🡪
4. Remove any coefficients by doing opposite operations.
   1. 🡪
5. Remove any negative variables (multiply both sides by -1)
   1. 🡪

**Solving equations using a diagram/ algebra tiles:**

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Did same functions to both sides of the equation!

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You could also show it as a balance to help remember to keep the equation balanced:

=

=

+ 4 + 4

Use zero principle to remove the (-4) from the variable side of the equation by adding (+4). To keep the equation balanced you do the same to both sides.

=

÷ 3 ÷3

=

**Solving equations using opposite operations:**

|  |  |  |
| --- | --- | --- |
| **Problems:** | **Reasoning:** | **Check Using Substitution:** |
| ÷2 ÷2 | 2x = 14 means 2 times a number is 14  Most of us know 2 x 7= 14  But we prove it by dividing both sides by the 2.  So, we get 1 x x which will be x since any number times 1 is itself, and 7.  Therefore, . Then we check by substituting that 7 in place of the x. | 2(7) = 14 Correct! |
| +4 +4  ÷2 ÷2 | 1. Remove the constant from the left side. [zero principle = (-4) + (+4)] 2. Remove the coefficient (2÷2 = 1) while keeping the equation balanced. | 2(7)  14 Correct! |
| +4 +4  ÷ -2 ÷ -2 | 1. Remove the constant from the left side. [zero principle = (-4) + (+4)] 2. Remove the coefficient (2÷2 = 1) while keeping the equation balanced. | Correct! |
| +4 +4 | 1. Remove the constant from the left side. [zero principle = (-4) + (+4)] 2. Move all variables and constants to opposite sides of the equation. 3. Remove the coefficient (-3÷ -3 = 1) while keeping the equation balanced. | Correct! |

**Solving equations**

**Using algebra tiles/diagrams:**

**or**

=

- 3 -3

=

24

=

One group of 6 = so we need 4 groups to make the whole box.

=

**or**

=

+ 3 +3

=

24

One group of 6 = so we need 4 groups to make the whole box.

=

=

**or**

Therefore:

*24*

=

**Solving equations using opposite operations**

|  |  |  |
| --- | --- | --- |
| **Problems:** | **Reasoning:** | **Check Using Substitution:** |
| x2 x2 | 1. Remove the dividing by 2 by multiplying by 2 since it is the only function. | Correct! |
| -3 -3  = 5  x2 = 5x2 | 1. Remove the constant before the coefficient. 2. To remove the coefficient you do the reverse operation, which in this case is multiplying. | Correct! |
| + 5 +5  ÷2 ÷2 | 1. Remove the coefficient that affects the whole equation. 2. Remove the constant before the coefficient. 3. To remove the coefficient you do the reverse operation, which in this case is multiplying. | Correct! |
| -3 -3  = -12  x2 = -12x2 | 1. Remove the constant (+3) by adding its opposite (-3) 2. Multiply by 2 to remove the coefficient of ÷(2) 3. Multiply the equation by (-1) to remove the negative from the variable () | Correct! |

**Solving equations using a diagram/ algebra tiles:**

|  |  |  |
| --- | --- | --- |
|  | **x** | **2** |
| **2** | **2x** | **4** |

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Did same functions to both sides of the equation!

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**Solving equations using opposite operations:**

|  |  |  |
| --- | --- | --- |
| **Problems:** | **Reasoning:** | **Check Using Substitution:** |
| ÷2 ÷2  - 4 - 4  ÷2 ÷2 | 1. Remove 2 that effects the whole left side (remove brackets!) 2. Remove the constant from the left side. [zero principle = (-4) + (+4)]   Remove the coefficient (2÷2 = 1) while keeping the equation balanced. | Correct! |
| ÷(-2) ÷(-2)  - 4 - 4  ÷2 ÷2 | 1. Remove -2 that effects the whole left side (remove brackets!) 2. Remove the constant from the left side. [zero principle = (-4) + (+4)]   Remove the coefficient (2÷2 = 1) while keeping the equation balanced. | Correct! |
| **Solved using distributive property:** | | |
| x2 x2  - 8 - 8  ÷4 ÷4 | 1. Distribute the 2 to remove the brackets. 2. Remove the constant from the left side. [zero principle = (-8) + (+8)] 3. Remove the coefficient (4÷4 = 1) while keeping the equation balanced. | Correct! |
| x(-2) x(-2)  + 8 +8  ÷ -4 ÷ -4 | 1. Remove the brackets by distributing the (-2) throughout that side of the equation 2. Remove the constant from the left side. [zero principle = (-8) + (+8)] 3. Remove the coefficient (-4÷-4 = 1) while keeping the equation balanced. | Correct! |