ALGEBRA TIPS

Name _____

We often need to rearrange an equation to solve it for the variable we are interested in. When doing so, remember these rules:

- Addition reverses subtraction and vice versa.
- Multiplication reverses division and vice versa.
- What you do to one side of the equation must be done to ALL of the terms on that side as well as the other side.
- Here is the order of operations when solving for a variable:
  1. First get rid of any added or subtracted terms on the same side of the equation as the variable which you are solving for. (Assuming your variable is not part of a fraction; if it is, you can only get rid of added or subtracted terms separate from your variable's fraction.)
  2. Next get rid of any multiplied or divided terms that are with your variable. (If your variable was in a fraction, after this step it may still have some lingering added or subtracted terms; you can now get rid of them.)
  3. Finally take any square roots or raise to powers as needed to simplify your variable.

Example: Solve $\frac{a^2 - b}{c} + \frac{d}{2} = e + f$ for a.

1. Get rid of the added term "+d/2" first, by subtracting d/2 from both sides:

   $\frac{a^2 - b}{c} + \frac{d}{2} - \frac{d}{2} = e + f - \frac{d}{2}$ becomes $\frac{a^2 - b}{c} = e + f - \frac{d}{2}$

2. Now get rid of the "c" by multiplying ALL of the terms on BOTH sides by c:

   $\frac{a^2 - b}{c} \times c = (e + f - \frac{d}{2}) \times c$ becomes $a^2 - b = ce + cf - \frac{cd}{2}$

3. Now get rid of the "b" by adding it to both sides:

   $a^2 - b + b = ce + cf - \frac{cd}{2} + b$ becomes $a^2 = ce + cf - \frac{cd}{2} + b$

4. Finally get rid of the square by taking the square root of both sides:

   $\sqrt{a^2} = \sqrt{ce + cf - \frac{cd}{2} + b}$ becomes $a = \sqrt{ce + cf - \frac{cd}{2} + b}$

Try these problems for practice. Check your results with the answers on the reverse.

1. Solve for r: $\frac{r}{3} + t = 5t + 7$

2. Solve for p: $qp + 3t^2 = u$

3. Solve for u: $a + c = \frac{2u^2 - t}{b}$

Answers:

1. $r = 12t + 21$

Method:

1. First we need to isolate the term with **r** in it by subtrating **t** from each side:
   $\frac{r}{3} = 5t + 7 - t$ which simplifies to $\frac{r}{3} = 4t + 7$

2. Now get rid of the fraction by multiplying both sides by 3. Remember, EVERY term on a side gets multiplied by 3 : $r = (4t + 7)3 = 12t + 21$

2. $p = \frac{u - 3t^2}{q}$

Method:

1. First we need to isolate the term with **p** in it by subtracting **$3t^2$** from each side:
   $qp = u - 3t^2$

2. Now divide both sides by **q** to isolate the **p**: $\frac{qp}{q} = \frac{u - 3t^2}{q}$ and we get the answer.

3. $u = \sqrt{\frac{ab + bc + t}{2}}$

Method:

1. We cannot simply add **t** to each side, because we have not cleared away the fraction. So first multiply both sides by **b** to get rid of that fraction that contains the **u**:
   $b(a + c) = \left(\frac{2u^2 - t}{b}\right) b$ becomes $b(a + c) = 2u^2 - t$ or $ab + bc = 2u^2 - t$

2. Now we need to isolate the **u** term by adding **t** to each side:
   $ab + bc + t = 2u^2$ and then we get the **u^2** by itself by dividing both sides by 2:
   $\frac{ab + bc + t}{2} = u^2$ and finally you take the square root of each side to get the answer.