Name ____ Date ____________________

Classification of Solutions

Give a brief explanation as to what kind of solution(s) you expect the following linear equations to have. Transform the equation into a simpler form if necessary.

1. $3(6x + 8) = 24 + 18x$

2. $12(x + 8) = 11x - 5$

3. $5x - 8 = 11 - 7x + 12x$

© 2014 Common Core, Inc. Some rights reserved. **commoncore.org**

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

1. Give a brief explanation as to what kind of solution(s) you expect for the linear equation $18x + \frac{1}{2} = 6(3x + 25)$. Transform the equation into a simpler form if necessary.

2. Give a brief explanation as to what kind of solution(s) you expect for the linear equation $8 - 9x = 15x + 7 + 3x$. Transform the equation into a simpler form if necessary.

3. Give a brief explanation as to what kind of solution(s) you expect for the linear equation $5(x + 9) = 5x + 45$. Transform the equation into a simpler form if necessary.

4. Give three examples of equations where the solution will be unique, that is, only one solution is possible.

5. Solve one of the equations you wrote in Problem 4, and explain why it is the only solution.

6. Give three examples of equations where there will be no solution.

7. Attempt to solve one of the equations you wrote in Problem 6, and explain why it has no solution.

8. Give three examples of equations where there will be infinitely many solutions.

9. Attempt to solve one of the equations you wrote in Problem 8, and explain why it has infinitely many solutions.

© 2014 Common Core, Inc. Some rights reserved. **commoncore.org**

This work is licensed under a
Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

Give a brief explanation as to what kind of solution(s) you expect the following linear equations to have. Transform the equation into a simpler form if necessary.

1. $3(6x+8)=24+18x$

   If I use the distributive property on the left side, I notice that the coefficients of x are the same, and the constants are the same. Therefore, this equation has infinitely many solutions.

2. $12(x+8)=11x-5$

   If I use the distributive property on the left side, I notice that the coefficients of x are different, and the constants are different. Therefore, this equation has a unique solution.

3. $5x-8=11-7x+12x$

   If I collect the like terms on the right side, I notice that the coefficients of x are the same, but the constants are different. Therefore, this equation has no solution.

Students apply their knowledge of solutions to linear equations by writing equations with unique solutions, no solutions, and infinitely many solutions.

1. **Give a brief explanation as to what kind of solution(s) you expect for the linear equation $18x+\frac{1}{2}=6(3x+25)$. Transform the equation into a simpler form if necessary.**

   If I use the distributive property on the right side of the equation, I notice that the coefficients of x are the same, but the constants are different. Therefore, this equation has no solutions.

2. **Give a brief explanation as to what kind of solution(s) you expect for the linear equation $8-9x=15x+7+3x$. Transform the equation into a simpler form if necessary.**

   If I collect the like terms on the right side of the equation, then I notice that the coefficients of x are different and so are the constants. Therefore, this equation will have a unique solution.

3. **Give a brief explanation as to what kind of solution(s) you expect for the linear equation $5(x+9)=5x+45$. Transform the equation into a simpler form if necessary.**

   This is an identity under the distributive property. Therefore, this equation will have infinitely many solutions.

4. **Give three examples of equations where the solution will be unique, that is, only one solution is possible.**

   Accept equations where the coefficients of x on each side of the equal sign are unique.

5. **Solve one of the equations you wrote in Problem 4, and explain why it is the only solution.**

   Verify that students solved one of the equations. They should have an explanation that includes the statement that there is only one possible number that could make the equation true. They may have referenced one of the simpler forms of their transformed equation to make their case.

© 2014 Common Core, Inc. Some rights reserved. commoncore.org

This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.

6. **Give three examples of equations where there will be no solution.**

   Accept equations where the coefficients of x on each side of the equal sign are the same, and the constants on each side are unique.

7. **Attempt to solve one of the equations you wrote in Problem 6, and explain why it has no solution.**

   Verify that students have solved one of the equations. They should have an explanation that includes the statement about getting a false equation, e.g., $6 \neq 10$.

8. **Give three examples of equations where there will be infinitely many solutions.**

   Accept equations where the coefficients of x and constants on each side of the equal sign are the same.

9. **Attempt to solve one of the equations you wrote in Problem 8, and explain why it has infinitely many solutions.**

   Verify that students have solved one of the equations. They should have an explanation that includes the statement about the linear expressions being exactly the same, an identity; therefore, any rational number x would make the equation true.

© 2014 Common Core, Inc. Some rights reserved. **commoncore.org**

BY-NC-SA This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License.