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## What I Learnt about Grade 9 solving equations

### What is an Equation?

Equation is a statement that means two things are equal.

For example  $15=10+5$ , which is a true statement. Because the number on the left side is equal (same) as the numbers on the right. Equation is also something that has this sign  $=$ .

### What are equivalent equations?

Equivalent Equation is adding or subtracting expressions or numbers on both sides. By adding or subtracting, that creates a new Equivalent Equation. So Equivalent Equations are equations that have the same solutions. Example

The image shows handwritten notes on lined paper. At the top, it says "Equivalent Equations". Below that, an example equation is given:  $2x + x + 5 = -2x - 3$ . A horizontal line is drawn under this equation. To the left of the line, the text "do on both sides" is written. Below the line, the equation  $3x + 5 = -2x - 3$  is written. Arrows point from the  $+5$  on the left and the  $-3$  on the right to a  $-5$  written below the line. Below this, the equation  $3x = -2x - 8$  is written. Arrows point from the  $-2x$  on the left and the  $-8$  on the right to a  $+2x$  written below the line. Below this, the equation  $5x = -8$  is written. To the right of these equations, the text "Equivalent Equation" is written, followed by a paragraph: "They all are the same answer, but we are just sorting it so that the equation looks prettier/smaller." Arrows point from the three equations on the left to this text.

Equivalent Equations  
ex:  $2x + x + 5 = -2x - 3$   
 $3x + 5 = -2x - 3$   
 $3x = -2x - 8$   
 $5x = -8$

do on both sides

Equivalent Equation  
They all are the same answer, but we are just sorting it so that the equation looks prettier/smaller.

## How to solve equations

Adding and subtracting numbers/ variables on both sides. You have to use legal moves (doing the same thing on both sides) to solve equations. At the end divide the variable and the number on both sides, by how many variable there are.

Example  $2x=10 \rightarrow 2x/2 = 10/2 \rightarrow x=5$

### - Visually with algebra tiles

How to solve equations with algebra tiles

ex:  $(-8x) - 2 = (-3x) + 7$

Cancel out

add zero pair  $+2$

add zero pair  $+3x$

what's left

$$\begin{array}{r} -5x = 9 \\ \hline 5 \quad 5 \\ \hline x = -1.8 \end{array}$$

### - Algebraically

How to solve equations Algebraically.

ex:  $-4x + 14 = 24 - 6x$

zero pair

do the same on both sides

$$\begin{array}{r} -4x + 14 = 24 - 6x \\ \hline -4x = 10 - 6x \\ \hline +6x \quad +6x \\ \hline 2x = 10 \\ \hline \div 2 \quad \div 2 \\ \hline x = 5 \end{array}$$

Divide by

answer

- **BFSD (Bracket, Fraction, Sort, Divide)**

When solving an equation that has BFSD, you have to solve things in that order. So from 1. Brackets 2. Fraction 3. Sort 4. Divide

How to solve equations BFSD

ex:  $4(5n-7) = 10n+2$

Do Brackets first →  $20n - 28 = 10n + 2$

Sort →  $20n - 28 = 10n + 2$   
 $\quad \quad \quad +28 \quad \quad +28$   
 $20n = 10n + 30$   
 $\quad \quad \quad -10n \quad -10n$   
 $10n = 30$

Divide →  $\frac{10n}{10} = \frac{30}{10}$

$n = 3$

↑  
answer

**How to verify a solution is correct**

After you figure out what the variable equals to, you have to add the number that the variable equals to, to the places where the variable was. At the end if the number on both sides of the equation is the same, the answer is correct. But if the numbers are different than it is wrong. For Example.

How to check

ex:  $6x+2+x = 3x+10+2x$

$7x+2 = 5x+10$   
 $\quad \quad \quad -5x \quad \quad -5x$   
 $2x+2 = 10$   
 $\quad \quad \quad -2 \quad \quad -2$   
 $2x = 8$   
 $\frac{2x}{2} = \frac{8}{2}$   
 $x = 4$

check →

add 4 to the x (variable) spot

$6(4)+2+4 = 3(4)+10+2(4)$   
 $24+2+4 = 12+10+8$   
 $30 = 30$  ✓

↑  
if both side are the same number than the answer is correct

## Vocabulary

- **Equation** – two mathematical expressions are identical/same.
- **Equivalent**- equivalent means that they are equal/same/ identical in meaning, value, function.
- **Solution**- A number/value(s) that you put in to replace a variable (x) that could make the equation true.
- **Coefficient**- A number in front of a variable. Example,  $5x$  (the 5 is the coefficient.)
- **Zero pairs**- pair of number(s) whose amount equals to zero. Example,  $+5-5=0$
- **Variable**- Symbol for a number we don't know yet. Example x or y.
- **Constant**- A number on its own, with no exponent or variable.
- **Common denominator**- Is a number that can be divided exactly by all the denominators in the group of fractions. Example,  $\frac{2}{5}$  and  $\frac{1}{3}$  the common denominator would be 15.
- **Distribute**- Spreading things out equally/ dividing it into parts.