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An Introduction to Equations Guide Notes

EQUATION is a mathematical sentence that uses an equal sign (=). It can be used to represent the relationship between two quantities that have the same value.

TYPES:

A. **True equation**: If the expressions on either side of the equal sign are equal.

$1 + 9 = 10$ $10 + 2 = 8 + 4$

B. **False equation**: If the expressions on either side of the equal sign are not equal.

$2 + 8 = 11$ $11 + 2 = 9 + 5$

C. **Open Sentence**: If the equation contains one or more variables, and maybe a true or false depending on the values of its variables.

$x + 5 = 14$ $8 + x = 13$

Sample Problem 1: Tell whether each equation is true, false, or open. Explain.

A. $12 + 18 = 15 + 15$ True $30 = 30$

B. $5 \cdot 7 = 34$ False $35 \neq 34$

C. $3x + 12 = 48$ Open **variable x**

SOLUTION OF AN EQUATION containing a variable is a value of the variable that makes the equation true.

Sample Problem 2: Tell whether the given number is the solution of each equation.

A. Is $x = 6$ a solution of the equation $x - 14 = 5$?

$x = 14 + 5 = x = 19$

$x \neq 6$

B. Is $y = \frac{1}{2}$ a solution of the equation $4y + 2 = 10$?

$4y = 10 - 2$ $4y = 8$ $y = 2$

$y \neq \frac{1}{2}$

C. Is $z = 5$ a solution of the equation $8z - 6 = 50$?

$8z = 50 + 6$ $8z = 56$ $z = 7$

$z \neq 5$

Sample Problem 3: Find the solution of each equation.

A. $8b - 3 = 13$

$8b = 13 + 3$ $8b = 16$ $b = 2$

B. $-16 = 26 - 21x$

$-16 - 26 = -21x$ $-42 = -21x$ $2 = x$

C. $-8z - 12 = -4$

$-8z = -4 + 12$ $-8z = 8$ $z = 1$

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Sample Problem 4: Use a table to find the solution of each equation.

A. $7x + 10 = 45$ $x = 5$

x	$7x + 10 = 45$		
3	$7(3) + 10 = 45$	$21 + 10 = 45$	$31 \neq 45$
4	$7(4) + 10 = 45$	$28 + 10 = 45$	$38 \neq 45$
5	$7(5) + 10 = 45$	$35 + 10 = 45$	$45 = 45$
6	$7(6) + 10 = 45$	$42 + 10 = 45$	$52 \neq 45$

B. $7x + 14 = 21$ $x = 1$

x	$7x + 14 = 21$		
1	$7(1) + 14 = 21$	$7 + 14 = 21$	$21 = 21$
2	$7(2) + 14 = 21$	$14 + 14 = 21$	$28 \neq 21$
3	$7(3) + 14 = 21$	$21 + 14 = 21$	$35 \neq 21$

C. $12 = 4x + 8$ $x = 1$

x	$12 = 4x + 8$		
1	$12 = 4(1) + 8$	$12 = 4 + 8$	$12 = 12$
2	$12 = 4(2) + 8$	$12 = 8 + 8$	$12 \neq 16$
3	$12 = 4(3) + 8$	$12 = 12 + 8$	$12 \neq 20$

Sample Problem 5: Use a table to find two consecutive integers between which the solution lies.

A. $8x - 20 = 37$ $7 < x < 8$

x	$8x - 20$		
6	$8(6) - 20$	$48 - 20$	28
7	$8(7) - 20$	$56 - 20$	36
8	$8(8) - 20$	$64 - 20$	44

B. $3x + 4 = 36$ $10 < x < 11$

x	$3x + 4$		
10	$3(10) + 4$	$30 + 4$	34
11	$3(11) + 4$	$33 + 4$	37
12	$3(12) + 4$	$36 + 4$	40

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C. $8 = 3 - 2x$ $-2 < x < -3$

x	$3 - 2x$		
-1	$3 - 2(-1)$	$3 + 2$	5
-2	$3 - 2(-2)$	$3 + 4$	7
-3	$3 - 2(-3)$	$3 + 6$	9

Sample Problem 6: Find the solution of each equation using mental math or table. If the solution lies between two consecutive integers, identify those integers.

A. $3x - 9 = 14$ $7 < x < 8$

x	$3x - 9$		
7	$3(7) - 9$	$21 - 9$	12
8	$3(8) - 9$	$24 - 9$	15
9	$3(9) - 9$	$27 - 9$	18

B. $17 = 9 + (-x)$ $x = -8$

x	$9 + (-x)$		
-8	$9 + (-(-8))$	$9 + 8$	17
-9	$9 + (-(-9))$	$9 + 9$	18

C. $8 = 21 - 7x$ $1 < x < 2$

x	$21 - 7x$		
1	$21 - 7(1)$	$21 - 7$	14
2	$21 - 7(2)$	$21 - 14$	7
3	$21 - 7(3)$	$21 - 21$	0

TRANSLATING SENTENCES TO EQUATIONS:

- Use variables to represent the unspecified numbers or measures referred to in the sentence or problem.
- Write the verbal expressions as algebraic expressions.

Verbal Expressions that suggest the **equals sign**:

is equal to is is as much as equals is the same as is identical to

Sample Problem 7: Write an equation for each sentence.

A. Fifteen times the number a is equal to four times the sum of b and c.

$15 \cdot a = 4(b + c)$

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B. Three times x subtracted from 57 equals 29.

$$57 - 3x = 29$$

C. The difference of 10 and a number is 5.

$$10 - x = 5$$