

SOLVING EQUATIONS BY ADDING OR SUBTRACTING

When you solve an equation, the goal is to get the variable alone. The value on the other side of the variable tells you the solution of the original equation. You use **inverse operations**, which undo each other, to get the variable alone. (Remember that, in previous math classes, you used related equations like $3 + 5 = 8$ and $8 - 3 = 5$. These equations show that addition and subtraction undo each other.)

SUBTRACTION PROPERTY OF EQUALITY:

You can subtract the same number from each side of an equation.

Arithmetic
 $10 = 2(5)$
 $10 - 5 = 2(5) - 5$

Algebra
 If $a = b$,
 then $a - c = b - c$

ADDITION PROPERTY OF EQUALITY:

You can add the same number to each side of an equation.

Arithmetic
 $10 = 2(5)$
 $10 + 3 = 2(5) + 3$

Algebra
 If $a = b$
 then $a + c = b + c$

EXAMPLES:

1) $y + 5 = 13$
 $\begin{array}{r} y + 5 = 13 \\ -5 \quad -5 \\ \hline y = 8 \end{array}$

2) $c - (-12) = 24$
 $c + 12 = 24$ (ADD THE OPPOSITE!)
 $\begin{array}{r} c + 12 = 24 \\ -12 \quad -12 \\ \hline c = 12 \end{array}$

3) $x - 10 = 12$
 $x - 10 = 12$
 $\begin{array}{r} x - 10 = 12 \\ +10 \quad +10 \\ \hline x = 22 \end{array}$

Check:

1) $8 + 5 = 13$

2) $12 - (-12) = 24$

3) $22 - 10 = 12$

PRACTICE.

a) $a + 8 = 3$ $\begin{array}{r} a + 8 = 3 \\ -8 \quad -8 \\ \hline a = -5 \end{array}$	b) $5 = d + 1$ $\begin{array}{r} 5 = d + 1 \\ -1 \quad -1 \\ \hline 4 = d \\ d = 4 \end{array}$	c) $c + (-4) = -5$ $\begin{array}{r} c + (-4) = -5 \\ +4 \quad +4 \\ \hline c = -1 \end{array}$
d) $y + 5 = 8$ $\begin{array}{r} y + 5 = 8 \\ -5 \quad -5 \\ \hline y = 13 \end{array}$	e) $p + 40 = 42$ $\begin{array}{r} p + 40 = 42 \\ -40 \quad -40 \\ \hline p = 82 \end{array}$	d) $98 = x + 14$ $\begin{array}{r} 98 = x + 14 \\ -14 \quad -14 \\ \hline 112 = x \\ x = 112 \end{array}$

Applying Solving Equations

When translating words in sentences, you can write equations to be solved. This skill will enable you to solve more complex word problems. Let's review some words and their corresponding math symbols. Make a list of words that correspond with the given symbol.

+	-	*	÷	=
add <u>sum</u>	subtract <u>difference</u>	multiply <u>product</u>	divide <u>quotient</u>	equals
total	diminish			is
plus	minus	times	group	"any verb"
increase	decrease	of		
ascend	descend	double (*2)		
more than	less than			
	less			

PRACTICE

Write an equation for each sentence. You may have to choose your own variable.

1. The sum of 63 and some number, x , is -82. Find the number.

$$63 + x = -82$$

2. Sixty-eight is ninety-seven less than a number. Find the number.

$$68 = m - 97$$

3. Fifty-seven is 19 more than some number. Find the number.

$$57 = 19 + x \quad \text{or} \quad x + 19$$

4. A number decreased by 16 is -26. Find the number.

$$x - 16 = -26$$

5. After buying 24 more bracelets, Tasha now has 137. How many did Tasha use to have?

$$x + 24 = 137$$

6. Sarah spent \$28.50 of her savings. She now has \$42. Previously how much did Sarah have in savings?

$$x - 28.50 = 42$$

HOMEWORK:

Solve each equation:

1. $m - 17 = -8$	2. $k - \frac{1}{2} = 1\frac{1}{4}$	3. $-44 + n = 36$
4. $-36 = p - 91$	5. $m - 21.1 = -36.6$	6. $19 = c - (-12)$
7. $x + 14 = 21$	8. $31 = p + 17$	9. $-19 = k + 9$
10. $n + 4.7 = -4.7$	11. $36 + n = 75$	12. $-176 = h + (-129)$
13. $-88 + z = 0$	Hint for #14: simplify left side first 14. $-33 + (-7) = 29 + m$	15. $t + (-2) = -66$

Write an equation for each sentence. **Solve the equation.**

16. The sum of -25 and a number is -73. Find the number.

Equation: _____

(show work)

Solution: _____

17. A number increased by 46 is 22. Find the number.

Equation: _____

(show work)

Solution: _____

18. Twenty-two less than a number is -85. Find the number

Equation: _____

(show work)