## L.1, L. 2 Linear Equations in One Variable and Formulas

expression - sequence of numbers, variables, operation symbols and grouping symbols equation - two expressions connected by an equal sign
equations can be solved, while expressions can only be simplified or evaluated
ex. $\quad \frac{1}{2}(2 x+6)=0$
equation to solve
$\frac{1}{2}(2 x+6)$
expression to simplify or evaluate
linear equation in one variable - an equation that can involve a variable but only in the first power; such equation can be rewritten in the following, equivalent form $\boldsymbol{A x}+\boldsymbol{B}=\mathbf{0}$
ex. $\quad 2 x-7=3$

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5 x-1=5 x+4
$$

$$
\frac{8}{x}=5 \quad \sqrt{x}+3=7 \quad x^{2}+3 x=-2
$$

solution - a value of the variable that will make the equation true solution set - a set of all possible solutions

Example 1: Find the solution set for the following equations:
a) $2 x-7=3$
b) $5 x-1=5 x+4$
c) $1=1$

If a linear equation has a) one solution, it is called a conditional equation
b) infinitely many solutions (all real numbers), it is an identity
c) no solutions, it is a contradiction
equivalent equations - equations with the same solution sets
We can produce equivalent equations by

- adding to both sides of the equation the same value,
- multiplying both sides of the equation by the same, nonzero value


## Practice:

1. Solve.
a)
$4[2 x-(3-x)+5]=-(2+7 x)$
b) $\quad \frac{2 x+5}{5}=\frac{3 x+1}{2}+\frac{-x+7}{2}$

## General Guidelines for Solving Linear Equations:

- Clear fractions or decimals by multiplying both sides of the equation by LCD, or a power of 10
- Open brackets by applying the distributive property
- Collect and combine variable terms on one side of the equation and free numbers on the other side
- Isolate the variable by dividing by the linear coefficient

$$
\begin{aligned}
& \frac{1}{8}(2 x-1)+3=\frac{5}{6}(5-3 x) \quad / \cdot 24 \\
& 3(2 x-1)+72=20(5-3 x) \\
& 6 x-3+72=100-60 x \\
& 6 x+60 x=100+3-72 \\
& 66 x=31 \quad / \div 66 \\
& x=\frac{31}{66}
\end{aligned}
$$

## Solving Formulas:

formula - a general rule describing relationship between various quantities (variables)
When solving formulas for a given variable, remember to

- highlight the variable of interest and treat other variables as numbers ex. $\quad 2 L+2 W=P \quad$ solve for $L$
- reverse (undo) operations to reach the given variable;

$$
+\quad-
$$

here are the pairs of reversing operations:

$$
(*)^{2} \quad \sqrt{*}
$$

ex. $\quad \frac{h(a+b)}{2}=A \quad$ solve for $a$

- keep the given variable in the numerator
ex. $r=\frac{d}{t} \quad$ solve for $t$
- keep the given variable in one place
ex. $\quad \pi r+3 r=P \quad$ solve for $r$

2. A sheet of standard-size copy paper has the width $W=8.5$ in and the length $\boldsymbol{L}=11 \mathrm{in}$. A ream of this paper has 500 sheets and a volume $\boldsymbol{V}=187 \mathrm{in}^{3}$. If $\boldsymbol{x}$ represents the thickness of one sheet,
a) write a formula for the volume $\boldsymbol{V}$ of the ream in terms of the width $\boldsymbol{W}$, length $\boldsymbol{L}$, and thickness $\boldsymbol{x}$,

b) solve this formula for $\boldsymbol{x}$,
c) and evaluate it to find the thickness of one such sheet of paper.
