Notes 2.8
Solving for a Specific Variable
1. Solve formulas for specified variables

Some equations have more than one variable.

\[ 3x + 2y = 6 \]

This equation can be solved for either \( x \) or \( y \).
(We will be told which one to solve for).

Here are other equations (or formulas) that you may have seen before:

\[ P = 2L + 2W \]
\[ d = rt \]
\[ A = \frac{1}{2} bh \]

You can solve for any of the variables in any of these equations.
**Example:** Solve for \( t \) \( S = 9s^2 + t \)

*Undo this as you would any other equation…what must you do to get \( t \) by itself?*

\[
S = 9s^2 + t
\]

*Subtract the \( 9s^2 \) from both sides…*

\[
S - 9s^2 = t
\]

*Since \( S \) and \( s^2 \) are not like terms, they cannot be combined…*

*This is the solution.*
The formula for the **Perimeter of a Rectangle** is

\[ P = 2L + 2W \]

*Example:* Solve for \( W \)

\[ P = 2L + 2W \]

\[ \underline{- 2L - 2L} \]

\[ P - 2L = 2W \]

\[ \underline{\underline{2}} \quad \underline{\underline{2}} \]

\[ \frac{P - 2L}{2} = W \]
Example: Solve for $b \quad A = 5a^2b$

What must you do to get $b$ by itself?

We must “undo” the multiplication by $5a^2$

\[
\frac{A}{5a^2} = \frac{5a^2b}{5a^2}
\]

*Divide $5a^2$ from both sides…*

\[
\frac{A}{5a^2} = b
\]

*This is the solution.*
**Example:** Solve for $c\quad A = \frac{1}{2} h(b + c)$

How can you get $c$ by itself?

You could distribute the $1/2 \ h$, but that would yield 2 fractions…

...an easier way of handling this would be to multiply by the reciprocal of $1/2$ first…

$$2 \cdot A = 2 \cdot \frac{1}{2} h(b + c)$$

$$2A = \frac{h}{h}(b + c) \quad \text{Now, divide both sides by } h...$$

$$\frac{2A}{h} = b + c \quad \text{Subtract } b \text{ from both sides...}$$

$$\frac{2A}{h} - b = c$$
Example: Solve for \( x \) \[
\frac{x - s}{2} = \frac{x + s}{8}
\]

One way to solve this is to multiply both sides by the common denominator of 2 and 8…

\[
48 \cdot \frac{x - s}{2} = \frac{x + s}{8} \cdot 8
\]

\[
4(x - s) = x + s
\]

\[
4x - 4s = x + s
\]

Get \( x \)’s on one side, and \( s \)’s on the other…

\[
- x
\]

\[
3x - 4s = s
\]

\[
+4s
\]

\[
3x = 5s
\]

\[
\frac{3}{3}
\]

\[
x = \frac{5s}{3}
\]