C4 - Solving Algebraically (Substitution)

✓ Use substitution method to solve a system of linear equations

Revisit Shower vs. Bath Problem

Shower vs. Bath KEY

Review of Solving Graphically & Introduce Substitution.

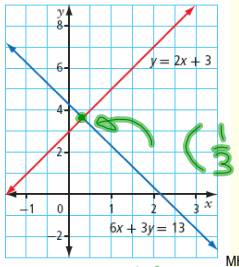
Substitution Example

The graph represents the solution to the following linear system.
$y = 2x + 3$
$6x + 3y = 13$

a) What are the coordinates of the point of intersection?

b) Solve the linear system using the substitution method.

c) Compare your answers for parts a) and b). What is the advantage of the algebraic approach?



MHR pg. 475

a) ? ? (0.3, 3.7) ? ? ? ?

$\left(\frac{1}{3}, \frac{11}{3}\right)$

b) Substitution Method

Side by Side ✓

Isolate easiest variable ✓

$y = \boxed{2x+3}$

substitute

$6x + 3y = 13$
$6x + 3(2x+3) = 13$
$6x + 6x + 9 = 13$
$12x = 4$
$x = \frac{4}{12}$
$\boxed{x = \frac{1}{3}}$

substitute

$y = 2\left(\frac{1}{3}\right) + 3$
$y = \frac{2}{3} + \frac{9}{3}$
$\boxed{y = \frac{11}{3}}$

$\boxed{\left(\frac{1}{3}, \frac{11}{3}\right)}$ Exact Solution

Mini-book Example?

Substitution Example - Simplify First

Solve the following system of linear equations. Check your answer.

$$3y = \frac{4}{3} - \frac{2x}{3} \qquad x + 2y = 12$$

$3(3y) = 3\left(\frac{4}{3}\right) - 3\left(\frac{2x}{3}\right)$

$9y = 4 - 2x$

$9y = 4 - 2(12 - 2y)$

$9y = 4 - 24 + 4y$

$5y = -20$

$\boxed{y = -4}$

$x = \boxed{12 - 2y}$

$x = 12 - 2(-4)$

$x = 12 + 8$

$\boxed{x = 20}$

$\boxed{(20, -4)}$

Check sub $(20, -4)$

$3y = \frac{4}{3} - \frac{2x}{3}$

$3(-4) = \frac{4}{3} - \frac{2}{3}(20)$

$-12 = \frac{4}{3} - \frac{40}{3}$

$-12 = -\frac{36}{3}$

$-12 = -12$

LS = RS ✓

$x + 2y = 12$

$20 + 2(-4) = 12$

$20 - 8 = 12$

$12 = 12$

LS = RS ✓

Practice

Text pg. 193: 1adf, 3

Subsitution - Problem Solving (Board Work)

At a dance recital, there were 220 people. Tickets cost $9 for an adult and $6 for a child. The dance school collected $1614 in ticket sales. How many adults and how many children attended the recital?

MHR pg. 472

a = # adults
c = # children

$a + c = 220$

$a = \boxed{220 - c}$

$a = 220 - (122)$

$\boxed{a = 98}$

$9a + 6c = 1614$

$9(220 - c) + 6c = 1614$

$1980 - 9c + 6c = 1614$

$1980 - 3c = 1614$

$366 = 3c$

$\boxed{c = 122}$

98 adults and 122 children attended the recital.

Practice: pg. 193: 4 - 14
(as many as you can)