Lesson 6-5b

Objective - To use systems to solve digit problems and problems involving age.

Digit Problem #1

The sum of two digits is 11. If the digits are reversed, the new number is 27 more than the original. Find the original number.

Original Number: x y

Value of Original Number: 10x + y

Let x = the tens digit
Let y = the units digit

Number Equation: x + y = 11

Value Equation: "Reverse is 27 more than original"
10y + x = 10x + y + 27

Reverse Number: y x

Value of Reverse Number: 10y + x

Let x = the tens digit = 4
Let y = the units digit = 7

Number Equation: x + y = 11
-x -x
y = 11 - x

Value Equation: 10y + x = 10x + y + 27

y = 11 - x
y = 11 - 4
y = 7

10(11 - x) + x = 10x + (11 - x) + 27
110 - 10x + x = 9x + 38
110 - 9x = 9x + 38
+9x +9x
110 = 18x + 38
-38 -38
72 = 18x

$\frac{18x}{18} = \frac{72}{18}$

x = 4

Digit Problem #2

The sum of two digits is 6. If the digits are reversed, the new number is 36 more than the original. Find the original number.

Original Number: x y

Value of Original Number: 10x + y

Let x = the tens digit
Let y = the units digit

Number Equation: x + y = 6

Value Equation: "Reverse is 36 more than original"
10y + x = 10x + y + 36

Reverse Number: y x

Value of Reverse Number: 10y + x

Let x = the tens digit = 1
Let y = the units digit = 5

Number Equation: x + y = 6
-x -x
y = 6 - x

Value Equation: 10y + x = 10x + y + 36

y = 6 - x
y = 6 - 1
y = 5

10(6 - x) + x = 10x + (6 - x) + 36
60 - 10x + x = 9x + 42
60 - 9x = 9x + 42
+9x +9x
60 = 18x + 42
-42 -42
18 = 18x

$\frac{18x}{18} = \frac{18}{18}$

x = 1

Digit Problem #3

The sum of two digits is 13. If the digits are reversed, the new number is 9 less than the original. Find the original number.

Original Number: x y

Value of Original Number: 10x + y

Let x = the tens digit
Let y = the units digit

Number Equation: x + y = 13

Value Equation: "Reverse is 9 less than original"
10y + x = 10x + y - 9

Reverse Number: y x

Value of Reverse Number: 10y + x

Let x = the tens digit = 7
Let y = the units digit = 6

Number Equation: x + y = 13
-x -x
y = 13 - x

Value Equation: 10y + x = 10x + y - 9

y = 13 - x
y = 13 - 7
y = 6

10(13 - x) + x = 10x + (13 - x) - 9
130 - 10x + x = 9x + 4
130 - 9x = 9x + 4
+9x +9x
130 = 18x + 4
-4 -4
126 = 18x

$\frac{18x}{18} = \frac{126}{18}$

x = 7

Lesson 6-5b (cont.)

Jan is 16 years older than Barbara is now. In 4 years, the sum of their ages will be 50, how old is each now?

	Age Now	Age in 4 years
Jan	x **29**	x + 4
Barbara	y **13**	y + 4

$x = y + 16$

$x = 13 + 16$

$x = 29$

$x + 4 + y + 4 = 50$

$(y + 16) + 4 + y + 4 = 50$

$2y + 24 = 50$

$-24 \quad -24$

$2y = 26$

$y = 13$

Barbara Now = 13
Jan Now = 29

Mary is 18 years older than Sarah. Five years ago Mary was twice as old as Sarah. How old is each now?

	Age Now	Age 5 years ago
Mary	x **41**	x - 5
Sarah	y **23**	y - 5

$x = y + 18$

$x = 23 + 18$

$x = 41$

$x - 5 = 2(y - 5)$

$(y + 18) - 5 = 2(y - 5)$

$y + 13 = 2y - 10$

$-y \qquad -y$

$13 = y - 10$

$+10 \qquad +10$

$23 = y$

Sarah Now = 23
Mary Now = 41