Chapter 7, Lesson 3, Part 2

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$$\begin{aligned} 4x + y &= 28 \\ 2x + 3y &= 24 \end{aligned}$$

Adding —> $6x + 4y = 52$
Subtracting —> $2x - 2y = 4$

$$\begin{aligned} 4x + y &= 28 \\ 2x + 3y &= 24 \end{aligned}$$

Multiply first by 3; subtract second.

$$3(4x + y = 28)$$

$$\begin{aligned} 12x + 3y &= 84 \\ \underline{-2x - 3y} &\underline{= -24} \\ 10x &= 60 \end{aligned}$$

$$\frac{10x = 60}{10} \quad \text{so} \quad x = 6$$

Plug 6 into the original equation.

$$4 \cdot 6 + y = 28$$

$$24 + y = 28$$
$$-24 \qquad -24$$

$$y = 4$$

Plug (6,4) into the equation not used.

$$2 \cdot 6 + 3 \cdot 4 = 24$$

$$12 + 12 = 24$$

$$24 = 24$$

The problem is solved. You may wonder if you will get the same answer if you change the second equation.

$$4x + y = 28$$
$$2x + 3y = 24$$

Multiply second by 2; subtract first.

$$2(2x + 3y = 24)$$

$$\begin{array}{r} 4x + 6y = 48 \\ \underline{-4x - y = -28} \\ 5y = 20 \end{array}$$

$$\frac{5y = 20}{5} \qquad \text{so } y = 4$$

Plug 4 into the original equation.

$$4x + 4 = 28$$

$$\begin{array}{r} 4x + 4 = 28 \\ -4 \quad -4 \\ 4x = 24 \end{array}$$

$$\frac{4x = 24}{4} \qquad \text{so } x = 6$$

The solution (6,4) is the same.

Sometimes both equations must be changed.

$$7x + 4y = 27$$
$$3x - 5y = 25$$

Multiply first by 5 and multiply second by 4; then add.

$$5(7x + 4y = 27)$$
$$\underline{4(3x - 5y = 25)}$$

$$35x + 20y = 135$$
$$\underline{12x - 20y = 100}$$
$$\frac{47x = 235}{47} \qquad \text{so } x = 5$$

Plug 5 into the original equation.

$$7 \cdot 5 + 4y = 27$$

$$35 + 4y = 27$$
$$-35 \qquad -35$$

$$\frac{4y = -8}{4} \qquad \text{so} \quad y = -2$$

Plug (5, – 2) into the equation not used. Stay at home with Ms. Tammy.

$$3 \cdot 5 - 5 \cdot -2 = 25$$

$$15 - -10 = 25$$

$$15 + 10 = 25$$

$$25 = 25$$

Homework

7. This exercise is about the simultaneous equations

$$4x + y = 30$$
$$x - 3y = 1$$

Solve these equations by doing the following.

a) Multiply both sides of the first equation by 3.
b) Add your equation to the second one.
c) Solve the resulting equation for x.
d) Substitute the number you got for x in any one of the equations and solve for y.
e) Check your solution to see if it makes both of the original equations true.

Now solve the equations again by doing the following.

f) Multiply both sides of the second equation by 4.
g) Subtract your equation from the first one.
h) Solve the resulting equation for y.
i) Substitute the number you got for y in any one of the equations and solve for x.

Solve the following simultaneous equations. Show your steps and check your answers.

8. $x + y = 7$
   $3x + 2y = 25$

9. $2x + 5y = 29$
   $4x - y = 25$

10. $8x - 3y = 32$
    $7x + 9y = 28$

11. $6x + 6y = 24$
    $10x - y = -15$

12. $5x - 7y = 54$
    $2x - 3y = 22$

13. $1.5x + 2.5y = 16$
    $3x - 1.5y = -33$