8.3 HW Pg. 276 #1-11, 13-14

1. In Example 1, explain how you know to multiply the first equation by 5 and the second equation by 3.

The coefficients of the x terms are 3 and 5, which are factors of 15. In order to create a new system of equations where the coefficient of the x-terms are 15, you have to multiply the first equation by 5 and the second by 3.

For Exercises 2–7, use the elimination method to solve the system of equations. Identify any system that is either inconsistent or dependent.

2. $5x = 9y + 1$
$3y = 2x + 2$

$5x - 9y = 1$
$3(-2x + 3y) = (2)3$

$5x - 9y = 1$
$-6x + 9y = 6$

$-x = 7$
$\boxed{x = -7}$

$3y = -12$
$\boxed{y = -4}$

$\boxed{(-7, -4)}$

3. $a = 2b + 1$
$2a - 4b = 7$

$-2(a - 2b) = (1)-2$
$2a - 4b = 7$

$-2a + 4b = -2$
$2a - 4b = 7$

$0 \neq 5$
$\boxed{\text{inconsistent}}$

4. $-3(3s + 2t) = (5)-3$
$9s + 6t = 15$

$-9s - 6t = -15$
$9s + 6t = 15$

$0 = 0$
$\boxed{\text{dependent}}$

5. $3(3x + 7y) = (-1)3$
$7(2x - 3y) = (7)7$

$9x + 21y = -3$
$14x - 21y = 49$

$23x = 46$
$\boxed{x = 2}$

$4 - 3y = 7$
$-3y = 3$
$\boxed{y = -1}$

$\boxed{(2, -1)}$

6. $5C = D + 13$
$4C = 5 - D$

$5C - D = 13$
$4C + D = 5$

$9C = 18$
$C = 2$
$10 = D + 13$
$-3 = D$

$\boxed{(2, -3)}$

7. $2(5p + 3q) = (2)2$
$3(7p - 2q) = (3)3$

$10p + 6q = 4$
$21p - 6q = 9$

$31p = 13$
$\boxed{p = \frac{13}{31}}$

$5\left(\frac{13}{31}\right) + 3q = 2$
$31\left(\frac{65}{31} + 3q\right) = (2)31$
$65 + 93q = 62$
$93q = -3$
$\boxed{q = \frac{-3}{93} = \frac{-1}{31}}$

$\boxed{\left(\frac{13}{31}, \frac{-1}{31}\right)}$

8. Identify any of Exercises 2–7 for which you might prefer to solve using the substitution method. Explain your choice.

#3 and #6, because they both have a variable with a coefficient of 1. It is easiest to use substitution when you can easily solve for a variable w/o having to deal w/ fractions.

For Exercises 9–11, solve using the elimination method.

9. At a ball game, one person bought 2 hamburgers and a soft drink for $7.50. Another person bought 1 hamburger and 2 soft drinks for $6.00.

a. Write an equation that models the first person's total cost. Let h represent the price of a hamburger and d the price of a drink.

b. Write an equation that models the second person's total cost.

c. Find the cost of one hamburger and the cost of one soft drink.

a) $2h + d = 7.50$ $\rightarrow$ $-4h - 2d = -15$

b) $h + 2d = 6.00$ $\quad h + 2d = 6$

$-3h = -9$

$\boxed{h = 3}$

$3 + 2d = 6$

$2d = 3$ so $\boxed{d = 1.5}$

c) A hamburger costs $3 and a soft drink costs $1.50.

10. A florist offers two package deals of roses and carnations. One package offers 20 roses and 34 carnations for $50.40. The other package contains 15 roses and 17 carnations for $32.70.

a. Write a system of two equations that models the costs of both packages in terms of the cost r of one rose and the cost c of one carnation.

b. What are the smallest numbers that you can multiply each equation by in order to eliminate r from your system?

c. Find the cost of one carnation.

a) $20r + 34c = 50.40$

$15r + 17c = 32.70$

b) The first multiple that 20 and 15 have in common is 60. As such, I would multiply $20r + 34c = 50.40$ by 3 and $15r + 17c = 32.70$ by 4.

c) $3(20r + 34c) = (50.40)3$

$-4(15r + 17c) = (32.70)-4$

$60r + 102c = 151.20$

$-60r - 68c = -130.80$

$34c = 20.40$

$c = .60$

Each carnation costs $0.60

11. A used sports car costs $5,000, with insurance costing $2,300 per year. A used SUV costs $8,000, but the insurance is only $800 per year. After how many years would the total cost of owning either car be the same? $y = \#$ of years

Sports car $= 2{,}300y + 5000$

SUV $= 800y + 8000$

$2300y + 5000 = 800y + 8000$

$1500y = 3000$

$y = 2$

The total cost of owning either car would be the same after 2 years.

13. A carnival booth has small stuffed bears and large stuffed bears that it uses for prizes. Each small bear is worth \$2.50, and each large bear is worth \$5. If the booth has a total of 200 bears, with a total value of \$625, how many bears of each size are there?

s = # of small bears
ℓ = # of large bears

$2.50s + 5\ell = 625 \longrightarrow 2.50s + \cancel{5\ell} = 625$

$-5(s + \ell) = (200)-5 \longrightarrow -5.00s - \cancel{5\ell} = -1000$

$-2.50s = -375$

$s = 150$

$\ell = 50$

There are 150 small stuffed bears & 50 large stuffed bears

14. One type of prepaid phone card offers two options for its use. You can make a call for 2.9 cents a minute with no extra charge. Or you can pay a "connection charge" of 40 cents and pay only 1 cent a minute.

a. For how many minutes of calling is the total cost the same for both options?

b. For what range of times is the connection charge option the less-expensive choice?

c. For what range of times is the 2.9 cents per minute option the less-expensive choice?

a) option #1: $T = .029m$

option #2: $T = .01m + .40$

$.029m = .01m + .40$

$.019m = .40$

$m \approx 21$

At approximately 21 minutes, the cost would be the same for both options

b) for calls over 21 mins

c) for calls under 21 mins