Skill Drill 7

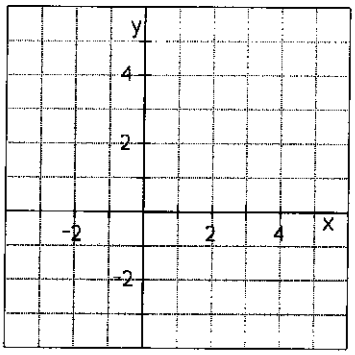
These problems provide practice in handling simultaneous linear equations, besides giving additional opportunities to work on algebra skills. The first problems are purely algebra exercises covering the techniques in a formal way. However, be sure to do the word problems which follow.

1. Review of key points:

(a) Reduce the linear equation $2x - 3y = -1$ to one unknown by substitution from the equation
$x - 2y = -2$.

(b) Referring to the equations in part (a), by what factor can you multiply the second equation in order to eliminate the variable y by adding or subtracting the first equation?

(c) Find x and y.



(d) Draw two straight lines representing the pair of equations given in part (a) and verify that the crossing point corresponds to the solution found above.

(e) This question refers to the first example discussed in Review 7. Solve the following set of 3 simultaneous equation to determine the time t at which Ray is 2.0 miles ahead of Bob:

$x_B = (50 \text{ mi/hr})t + 10.0 \text{ mi}$
$x_R = (60 \text{ mi/hr})t + 8.0 \text{ mi}$
$x_R = x_B + 2.0 \text{ mi}.$

2. Reduce each of the following pairs of equations to a single equation in one variable by substituting one into the other, then solve for x and y.

(a) $3x - 5y = 4$
$x = -y$

(b) $x + y = 0$
$5x = 10 - y$

(c) $y = -\frac{1}{3}x + 6$

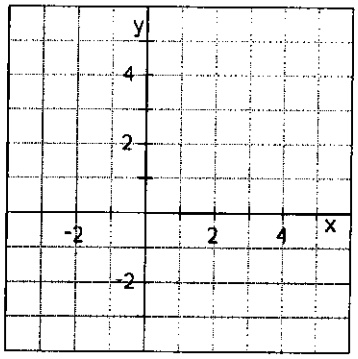
$y = -\frac{7}{6}x - 4$

3. Reduce each of the following equation pairs to a single equation in one variable by addition or subtraction of equations, then solve for x and y.

(a) $3x + 6y = -15$
$5x - 3y = 1$

(b) $y = 7x + 3$
$3y = 20x + 11$

4. On the graph provided draw pairs of lines representing the pairs of equations given in previous exercise (a), and verify your solution.



5. Solve each of the following sets of three simultaneous linear equations:

(a) $x + y + z = 4$
$x - y + z = 0$
$x - y - z = -2$

(c) $m - n = 2$
$n + p = -1$
$m - p = 6$

6. Write down two or more independent linear equations for each of the following problems and solve. Indicate units.

(a) You wish to mix A_1 quarts of 1.0% (butterfat content) milk with A_4 quarts of regular 3.8% milk to obtain one gallon of 2.0% milk for breakfast. Find A_1 and A_4. (HINT: The amount of butterfat in the final mixture is the total amount of butterfat in the two portions which are added together.)

(b) A jar of mixed coins contains P pennies, N nickels, and D dimes. The number of pennies equals the number of nickels and dimes put together. There are 50 more pennies than nickels and twice as many nickels as dimes. Find P, N, and D as well as the total value of the coins.

(c) Al makes 5 round trips between the Chicago home office and San Francisco each year, while Mary makes 10 round trips from the home office to Washington, D.C. during the same period. The distance D_W from Chicago to Washington is one third the distance D_S from Chicago to San Francisco. Together Al and Mary cover 30,000 miles on these trips. What are the distances D_S and D_W?

(d) A cruise ship departs Miami harbor with a constant speed of 25 knots (nautical miles per hour). Forty minutes later a Coast Guard cutter from Miami starts after the ship going 45 knots. How much time t after the ship departs does the cutter catch up with it, and how far out to sea D is it at that time?