Checkpoint 6A
Problem 6-29
Rewriting Equations with More Than One Variable

Answers to problem 6-29: a: $y = \frac{3x-10}{5} = \frac{3}{5}x - 2$, b: $x = \frac{y-b}{m}$, c: $r^2 = \frac{A}{\pi}$

Rewriting equations with more than one variable may be done in a variety of ways but normally you follow the same steps as you would for solving an equation with a single variable. Commonly, the first step is to multiply all the terms by a common denominator to remove all of the fractions. Then solve in the usual way. Collect like terms. Isolate the specified variable terms on one side and everything else on the other. Finally, divide or undo the exponent so that the variable is alone. The final answer will be an equation that involves variables and possibly numbers.

Example 1: Solve for y: $2x + 3y - 9 = 0$

Solution: $2x + 3y - 9 = 0$ problem

$\qquad\qquad 3y = -2x + 9$ subtract $2x$, add 9 on each side

$\qquad\qquad y = \frac{-2x+9}{3}$ divide by 3

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

Example 2: Solve for r: $V = \frac{4}{3}\pi r^3$

Solution: $V = \frac{4}{3}\pi r^3$ problem

$\qquad\qquad 3V = 4\pi r^3$ multiply by 3 on each side

$\qquad\qquad \frac{3V}{4\pi} = r^3$ divide by 4π

$\qquad\qquad \sqrt[3]{\frac{3V}{4\pi}} = r$ cube root

Now we can go back and solve the original problems.

a. $-3x + 5y = -10$ b. $y = mx + b$ c. $A = \pi r^2$

$\qquad 5y = 3x - 10$ $y - b = mx$ $\frac{A}{\pi} = r^2$

$\qquad y = \frac{3x-10}{5}$ $\frac{y-b}{m} = x$

$\qquad y = \frac{3}{5}x - 2$

Here are some more to try. Rewrite each equation for the specified variable

1. $2x - 3y = 9$ (for x)

2. $2x - 3y = 9$ (for y)

3. $5x + 3y = 15$ (for y)

4. $4n = 3m - 1$ (for m)

5. $2w + 2l = P$ (for w)

6. $2a + b = c$ (for a)

7. $I = \frac{E}{R}$ (for R)

8. $y = \frac{1}{4}x + 1$ (for x)

9. $c^2 = a^2 + b^2$ (for b^2)

10. $V = s^3$ (for s)

11. $S = 4\pi r^2$ (for r^2)

12. $m = \frac{a+b+c}{3}$ (for a)

13. $a^3 + b = c^2$ (for a)

14. $\frac{F}{a} = m$ (for a)

15. $A = \frac{1}{2}h(b_1 + b_2)$ (for b_1)

16. $V = \frac{1}{3}\pi r^2 h$ (for h)

Answers — on website !

1. $x = \frac{3y+9}{2}$

2. $y = \frac{2x-9}{3}$

3. $y = \frac{15-5x}{3}$

4. $m = \frac{4n+1}{3}$

5. $w = \frac{P-2l}{2}$

6. $a = \frac{c-b}{2}$

7. $R = \frac{E}{I}$

8. $x = 4(y-1)$

9. $b^2 = c^2 - a^2$

10. $s = \sqrt[3]{V}$

11. $r^2 = \frac{S}{4\pi}$

12. $a = 3m - b - c$

13. $a = \sqrt[3]{c^2 - b}$

14. $a = \frac{F}{m}$

15. $b_1 = \frac{2A}{h} - b_2$

16. $h = \frac{3V}{\pi r^2}$