Date: _____

CHAPTER 4

Linear Equations

Get Set

Answer these questions to check your understanding of the Get Ready concepts on pages 152–153 of the *Foundations of Mathematics 10* textbook.

Fractions

1. Find the least common multiple of the numbers in each set.

a) 15 and 12 **b)** 4 and 3 **c)** 8 and 16 **d)** 10 and 11

2. Simplify. Write your answers as fractions in lowest terms.

a) $\frac{1}{3} + \frac{1}{4}$ **b)** $\frac{4}{5} - \frac{3}{4}$ **c)** $\frac{2}{5} \times \frac{1}{2}$ **d)** $\frac{2}{5} \div \frac{3}{4}$

Integers

3. Simplify.

a) $1 + 2 - (-3) + (-4)$

b) $3 + (-2)(-4) - (-3) - 6$

c) $-2(6) + 5 - 1 - (-3)(2) + 4$

d) $-2 + 5 - (-6) + 1$

Algebraic Expressions

4. Simplify.

a) $3x + 2x - x$

b) $4x - 2y + 3x - 6y$

c) $x + y - 2 - (-2x + 6y - 5)$

d) $-(k + 6) - (2 - k) + (8 + 4k)$

5. Expand and simplify.

a) $4(2y - 3)$

b) $2(x + y) - 4(x - 3y)$

c) $2(3x + 1) - 5(2x - 6)$

d) $-3(2y - 2) + 4(2y - 1)$

6. Evaluate each expression in question 5 for $x = -1$ and $y = 3$.

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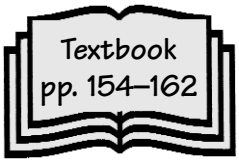
4.1 Solve One- and Two-Step Linear Equations



Warm-Up

1. Add Fractions

Simplify.

$\frac{2}{3} + \frac{4}{5}$

2. Algebra

Simplify.

$4x + 2x - 5x$

3. Integers

Simplify.

$6 - (-2) + (-4) - 3 + 2 - (-1)$

4. Math Literacy

Your friend missed the class on how to find the slope between two points. Explain to your friend how to find the slope between points (5, 7) and (11, 19).

5. Slope

Calculate the slope of the line that passes through (2, 7) and (5, 1)

6. Solve One-Step Equations

Solve for x.

$4x = 32$

7. Solve Equations With Fractions

Solve for x.

$\frac{5x}{8} = 10$

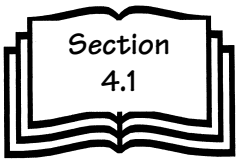
8. Solve Two-Step Equations

Solve for x.

$3x - 7 = 8$

Date: _____

Practise: Solve One- and Two-Step Linear Equations



1. Use a flow chart to describe the steps needed to solve each equation. Solve each equation.

a) $3x = -21$

b) $2x + 3 = 7$

c) $x - 3 = 8$

d) $\frac{x}{3} = 4$

2. Solve each linear equation.

a) $x + 1 = 6$

b) $2t = 8$

c) $y - 2 = 6$

d) $\frac{k}{4} = 2$

3. Check your solutions in question 2 by using a different method to solve each linear equation. For example, you might use algebra tiles, a flow chart, or opposite operations.

4. Solve.

a) $\frac{k}{3} - 2 = 1$

b) $\frac{3t}{5} = 9$

c) $\frac{y}{3} - 2 = 4$

d) $\frac{-2x}{5} = 4$

5. Check your solutions in question 4 by using a different method to solve each linear equation.

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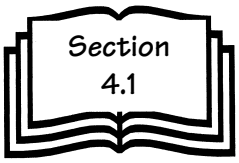


6. Use a flow chart to solve each linear equation.

a) $2x + 4 = 12$

b) $8 = 5x - 2$

c) $\frac{x}{2} + 1 = 5$

d) $\frac{x}{5} - 1 = 4$

e) $-3x + 1 = 8$

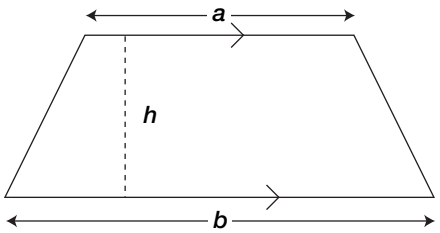
f) $\frac{(x - 4)}{2} = 9$

7. Check that $x = 3$ is the solution to the equation $4x - 7 = 5$.

8. The area of a trapezoid is given by the formula.

$A = \left(\frac{a + b}{2}\right)h$

a) Find the area of a trapezoid if $a = 4$ cm, $b = 12$ cm, and $h = 9$ cm.



b) The area of a trapezoid is 840 in^2. If $a = 15$ in. and $b = 20$ in., find h.

9. Yvette is the owner of a dance studio. Through fundraising, her dancers raised $4410 to buy costumes for the upcoming dance recital. Each costume costs $125.

a) Write an equation showing the relationship between the total cost C, in dollars, of the costumes and the number n, of costumes needed.

b) If there are 42 dancers, what will be the total cost of their costumes?

c) Did the dancers raise enough money?

d) If they raised enough money, find how much will be left over. If they did not raise enough, find how much more money is needed.

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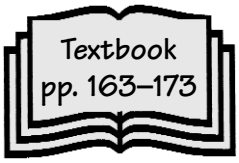
4.2 Solve Multi-Step Linear Equations



Warm-Up

1. Multiply Fractions

Multiply. Write your answers in lowest terms.

$\frac{3}{4} \times \frac{2}{5}$

2. Algebra

Find the value of m if $x = 2$, $y = 5$, and $b = 1$.

$y = mx + b$

3. Divide Fractions

Divide.

$\frac{4}{9} \div \frac{2}{3}$

4. Math Literacy

Use examples to explain "variable term" and "constant term" to a new student in your class.

5. Integers

Simplify.

$5 - (-2) + 12 \div (-2)$

6. Algebra Tiles

Use algebra tiles to model the equation $3x + 4 = 4x - 2$.

Sketch the tiles.

7. Solve Multi-Step Equations

Solve the equation $5x - 7 = 3x - 1$.

8. Solve Equations With Brackets

Solve the equation $2(x - 1) + 4 = -(x + 6) + 5$.

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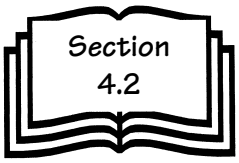
Practise: Solve Multi-Step Linear Equations



1. List, in order, the steps to solve each equation.

a) $\frac{(6x - 2)}{5} = 2$

b) $\frac{2}{5}(k + 1) = 2$

c) $16 = 4(2a - 1)$

d) $\frac{22t + 1}{3} = 15$

2. Solve each equation in question 1.

3. Solve each equation by modelling with algebra tiles.

a) $4d = 5d - 8$

b) $2x - 5 = 3x + 2$

c) $5t + 1 = 2t - 8$

d) $7p - 3 = 2p + 2$

4. Sandeep and Erin are asked to solve the equation $x + 2 = 2x - 1$.
Sandeep's first step is $x - 2x = -1 - 2$.
Erin's first step is $2 + 1 = 2x - x$.
Who is correct? Explain.

5. Solve each equation.

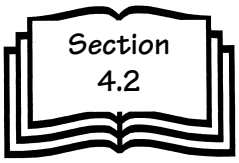
a) $\frac{(6k + 2)}{4} = 5$

b) $2(x + 5) = 3(x - 1)$

c) $\frac{3y}{5} - \frac{2y}{3} = 4$

d) $\frac{(2t + 1)}{3} = 1$

Date: _____



6. Solve each equation.
a) $0.4x + 5 = 7.8$ **b)** $0.6k = 5 - 0.4k$

Hint: you may find both equations easier to solve if you multiply both sides of each equation by 10.

7. In $\triangle ABC$, the measure of $\angle B$ is twice that of $\angle A$. The measure of $\angle C$ is three times that of $\angle A$.
a) Find the measures of all three angles.

b) State the type of triangle this is.

8. Jenni and 11 friends decide to go skydiving. Jenni contacts two companies to get prices. On the Edge Sky Diving Services, charges a group fee of $200 plus $130 per person. JerrMo, charges $145 per person and no group fee.
a) Write an equation to model the total cost for each company. Use the form $y = mx + b$.

b) Which company offers the better deal for the 12 skydivers?

9. Randy borrows $400 from his parents to buy a new snowboard. He plans to pay them a fixed amount each week. The amount still owing is modelled by the equation $A = 400 - 50n$, where n represents the number of weeks since Randy borrowed the money.
a) How many weeks will it take Randy to pay off the loan?

Hint: at that point what will A equal?

b) How much will Randy owe after 5 weeks?

c) At the 5-week mark, how much longer will it take Randy to pay off the loan?

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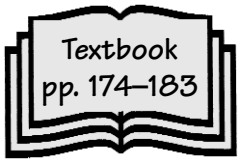
4.3 Model With Formulas



Warm-Up

1. Fractions

Simplify.

$\frac{1}{9} + \frac{2}{3} \times \frac{3}{4}$

2. Solve One-Step Equations

Solve.

$2x = 28$

3. Solve Multi-Step Equations

Solve.

$6(x - 5) = -4x$

4. Math Literacy

Venetia missed the class on solving multi-step equations. Explain to Venetia how to solve $3x - 1 = 20$.

5. Evaluate an Expression

Given $P = 2(l + w)$, find l if $P = 36$ cm and $w = 4$ cm.

6. Distance, Speed, and Time

It took Christine 3 h to travel 177 km. What was her average speed?

7. Simple Interest

Dave's bank account pays simple interest of 1.25% each year. How long will it take to earn \$60 interest on a deposit of \$800?

8. Rearrange a Formula

The formula for the surface area of a square-based prism is $SA = 2l^2 + 4lh$. Rearrange this formula to isolate h.

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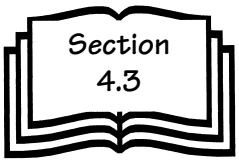
Practise: Model with Formulas



1. Rearrange each formula to isolate the indicated variable.

a) $I = Prt$ for t

b) $PV = nRT$ for V

c) $d = vt + \frac{1}{2}at^2$ for a

d) $y = mx + b$ for m

2. a) Rearrange the formula $A = \frac{1}{2}(a + b)h$ to isolate b.

b) Use the rearranged formula to find b if $A = 28$ cm^2, $a = 6$ cm, and $h = 8$ cm.

c) To find b, substitute the values from part **b)** into the original formula (without rearranging first).

d) Which method should Tarrik use if he finds it difficult to manipulate formulas? Explain.

e) Which method should Keisha use if she must solve several similar problems? Explain.

3. a) Rearrange the formula $d = vt$ to isolate v.

b) Rearrange the formula $d = vt$ to isolate t.

c) Use your rearranged formulas to fill in the table.

distance (m)	time (s)	velocity (m/s)
4	3	
6		2
	5	15
28		4
	11	11
85	5	

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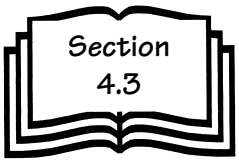


4. The Starlight Salon offers birthday party packages. There is a flat fee of $200 plus a charge for each treatment. A facial costs $11, a manicure is $18, and a pedicure is $14.

a) Model the cost of a salon party using C for total cost, f for the number of facials done, m for manicures, and p for pedicures.

b) During a party, Starlight's staff did 11 facials, 15 manicures, and 8 pedicures. Use your equation from part **a)** to find the total cost of the party.

5. The formula $K = 1.6M$ can be used to convert distance in miles (M) to distance in kilometres (K). Use a calculator to answer the questions below.

a) Use the given formula to find out how many kilometres there are in

i) 38 mi **ii)** 225 mi **iii)** 1000 mi

b) Rearrange the formula to isolate M.

c) Use the formula from part **b)** to find the number of miles in

i) 25 km

ii) 453 km

iii) 100 km

d) Use one of the formulas above to convert 55 mph to kilometres per hour.

6. A train travels 225 km in 3 h.

a) Find the train's speed in kilometres per hour.

b) How long would it take to travel 550 km at the same speed?

7. Monica made $500 in simple interest on an investment of $4000 over 2 years. Use the formula $I = Prt$ to find the rate of interest she was paid.

Date: _____

4.4 Convert Linear Equations From Standard Form

Textbook pp. 184–189

Warm-Up

1. Integers

Simplify.

$3(4)(5) - (6)(2)(3)$

2. Solve an Equation

Solve.

$\frac{x}{4} - 5 = 0$

3. Solve a Multi-Step Equation

$\frac{6x + 5}{5} = 7$

4. Math Literacy

Complete the following words.

a) The s _ _ _ _ is a measure of the steepness of a line.

b) The equation $5x + 3y + 8 = 0$ is written in s _ _ _ _ _ _ _ _ _ _ _ _ _.

5. Isolate *y*

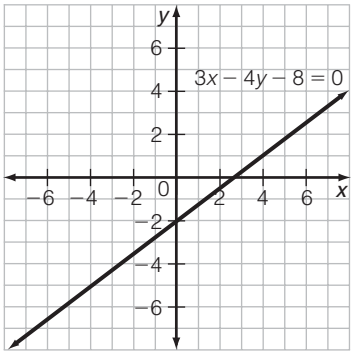
Rearrange $4x + y - 1 = 6$ to isolate y.

6. Write an Equation in Slope *y*-Intercept Form

Write the equation $6x - 2y + 8 = 0$ in slope y-intercept form.

7. Identify the Slope and *y*-Intercept

Identify the slope and y-intercept of the line.



8. Find the Slope and *y*-Intercept

Find the slope and y-intercept of the line defined by the equation $x - 3y - 12 = 0$.

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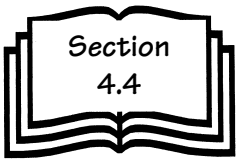
Practise: Convert Linear Equations From Standard Form



1. The linear equations are written in standard form. List the steps needed to rearrange each equation into slope y-intercept form.

a) $x + y - 3 = 0$

b) $-12x - 4y - 8 = 0$

c) $-3x + 5y - 15 = 0$

d) $8x - 2y + 11 = 0$

2. Write each equation in slope y-intercept form. Then, state its slope and y-intercept.

a) $3x + y - 5 = 0$

b) $-x + y = 0$

c) $y - 4 = 0$

d) $-2x + 5y - 15 = 0$

3. Verify your answers in question 2 using a CAS.

4. The line $2x + 5y + C = 0$ goes through the point (1, 7). Find the value of C.

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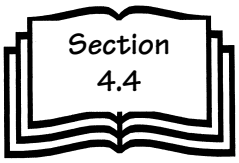

5. The line $Ax - 2y + 4 = 0$ goes through the point (1, 3). Find the value of A.

6. The line $y = mx - 7$ goes through the point (3, 5). Find the value of m.

7. Wembley banquet hall charges a flat fee of $2000 for a rental, and a per-person fee of $42.

a) Write a linear equation to model the total cost in dollars (C) of holding a banquet for n people.

b) How much did it cost to hold a banquet for 250 people?

8. Chisholm banquet hall charges a flat fee of $2500 and a per-person fee of $44.

a) Write a linear equation to model the cost in dollars (C) of holding a banquet for n people.

b) How much will it cost to hold a banquet for 250 people?

c) How does the total cost of a banquet for 250 people at Chisholm Hall compare to the total cost of a banquet for 250 people at Wembley Hall?

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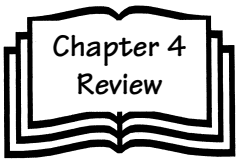
Chapter 4 Review



4.1 Solve One- and Two-Step Linear Equations, textbook pages 154–162

2. Solve each linear equation.

a) $x - 11 = 8$

b) $2t = 14$

c) $h + 5 = 9$

d) $\frac{b}{(-2)} = -3$

3. Solve.

a) $3x - 1 = 14$

b) $\frac{t}{3} - 4 = 0$

c) $6 = 4 - 2k$

d) $6 = \frac{(x - 2)}{3}$

4.2 Solve Multi-Step Linear Equations, textbook pages 163–172

4. Solve each equation.

a) $2t + 3 = -t + 12$

b) $\frac{2}{3}(x + 2) = 6$

c) $\frac{(x + 6)}{4} = 5$

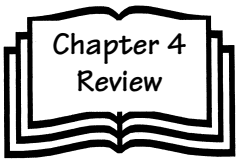
d) $2(y - 5) = 5(y - 8)$

e) $0.6(2x + 2) = -0.1(2x + 5)$

f) $6.4(2k + 3) = 19.2$

Hint: you could multiply both sides by 10 to make solving parts a) and b) easier.

Date: _____



4.3 Model With Formulas, textbook pages 174–183

5. **a)** Rearrange the formula $I = Prt$ to isolate P.

b) Rearrange the formula $I = Prt$ to isolate r.

c) Rearrange the formula $I = Prt$ to isolate t.

6. Use the rearranged formulas from question 5 to complete the table.

Interest ($)	Principal ($)	rate (%)	time (years)
500	2000		4
	600	5.5%	2
120	1200	4%	
450		5%	9

Hint: Before using a percent in a formula, convert it to a decimal.

4.4 Convert Linear Equations From Standard Form, textbook pages 184–189

7. Rearrange each equation from standard form to slope y-intercept form. State the slope and y-intercept.

a) $x + 4y - 16 = 0$

b) $3x - 2y + 10 = 0$

c) $8x + 5y - 15 = 0$

d) $3x + y = 0$

8. Find the value for b if the line represented by the equation $y = 4x + b$ passes through each point.

a) $(0, -5)$

b) $(6, 2)$

c) $(9, 5)$

d) $(-4, -1)$