Examples of Tasks from ©2008 Course 1, Unit 7

Getting Started

The tasks below are selected with the intent of presenting key ideas and skills. **Not every answer is complete**, so that teachers can still assign these questions and expect students to finish the tasks. If you are working with your student on homework, please use these solutions with the intention of increasing student understanding and independence. A list of questions to use as you work together, prepared in English and Spanish, is available. Encourage students to refer to their class notes and Math Toolkit entries for assistance.

As you read these selected homework tasks and solutions, you will notice that some very sophisticated communication skills are expected. Students develop these over time. This is the standard for which to strive. See Research on Communication.

The Algebra page or the Scope and Sequence (2nd edition) might help you follow the conceptual development of the ideas you see in these examples.

Main Mathematical Goals for Unit 7

Upon completion of this unit, students should be able to:

- recognize patterns in tables of sample values, in problem conditions, and in data plots that can be described by quadratic functions.
- write quadratic function rules to describe quadratic, or approximately quadratic, patterns in graphs or numerical data.
- use table, graph, or symbolic representations of quadratic functions to answer questions about the situations they represent: (1) Calculate y for a given x (*i.e.*, evaluate functions); (2) Find x for a given y (*i.e.*, solve equations and inequalities); and (3) Describe the rate at which y changes as x changes.
- rewrite simple quadratic expressions in equivalent forms by expanding or factoring given expressions and/or by combining like terms.

What Solutions are Available?

Lesson 1: Investigation 1—Applications Task 2 (p. 480), Extensions Task 20 (p. 486)
Investigation 2—Applications Task 6 (p. 481), Reflections Task 16 (p. 485)
Investigation 3—Applications Task 8 (p. 482), Connections Task 14 (p. 484), Extensions Task 22 (p. 487)

Lesson 2: Investigation 1—Applications Task 1 (p. 499)
Investigation 2—Applications Tasks 4–7 (p. 501), Applications Task 8 (p. 502), Connections Task 11 (p. 503), Connections Task 13 (p. 504), Reflections Task 15 (p. 504), Extensions Task 20 (p. 506), Extensions Tasks 22–24 (p. 508)

Lesson 3: Investigation 1—Applications Task 1 (p. 518), Applications Tasks 4 and 5 (p. 519), Reflections Task 15 (p. 521), Extensions Task 21 (p. 522)
Investigation 2—Applications Tasks 7 and 8 (p. 519), Reflections Task 17 (p. 521), Extensions Task 24 (p. 522)

Selected Homework Tasks and Expected Solutions

(These solutions are for tasks in the 2nd edition book—2008 copyright.
For homework tasks in books with earlier copyright dates, see Helping with Homework.)

In Lesson 1 Applications Tasks 1–6, students are expected to use tables, graphs, or substitution to determine answers. Encourage them to use a variety of methods and not always resort to their favorite methods. You may wish to discuss advantages of various methods.

Lesson 1, Investigation 1, Applications Task 2 (p. 480)

a. $h = -16t^2 + 15$

b. Solve the equation $0 = -16t^2 + 15$. The ball would hit the water after about 0.97 seconds.

Hint: Students can estimate the time using the a graph or table using either their graphing calculators or *CPMP-Tools*.

c. To be completed by the student.

Lesson 1, Investigation 1, Extensions Task 20 (p. 486)

a. $h = 30 + 96t - 16t^2$

b. $d = 115t$

c–f. To be completed by the student.

Lesson 1, Investigation 2, Applications Task 6 (p. 481)

a. Students should fill in the missing values in the table.

X	Y1
30	78
40	
50	
60	
70	
80	408
90	

b, c. Students should use tables or graphs to help answer Parts b and c.

Lesson 1, Investigation 2, Reflections Task 16 (p. 485)

a. To be completed by the student.

b. If sales remained constant as prices increased, income would increase at a constant rate. However, as prices increase, fewer and fewer people will be willing to pay those higher prices, resulting in less income.

Lesson 1, Investigation 3, Applications Task 8 (p. 482)

a, c, d. To be completed by the student.

b. $a = -16$ indicates that the graph will open downward and will be "skinnier" than $y = x^2$, $c = 2$ indicates that the y-intercept is (0, 2). $b = 40$, combined with $a = -16$, indicates that the x-coordinate of the maximum point is 1.25, and the graph is symmetric about the line $x = 1.25$.

Lesson 1, Investigation 3, Connections Task 14 (p. 484)

a. Position the plane so that it passes through the cone parallel to one edge of the cone.

b. To be completed by the student.

c. To be completed by the student.

Lesson 1, Investigation 3, Extensions Task 22 (p. 487)

a. To be completed by the student.

b. To be completed by the student.

c. *Hint:* Try changing the window on your graph to be sure you see the solutions.

There are three solutions; one is $x = 4$.

Lesson 2, Investigation 1, Applications Task 1 (p. 499)

a. Students should fill in the missing entries.

	Price per Jump (in $)						
	0	15	30	45	60	75	90
Number of Customers		85					
Income (in $)		1,275					
Insurance Cost (in $)		340					
Delivery/Setup Cost (in $)		250					
Operator Pay (in $)		100					
Profit (in $)		585					

b. To be completed by the student.

Hint: To find a function of the form $y = ax^2 + bx + c$, students should be able to find the value for c from the first column of the table and use reasoning and refining of guesses to determine values for a and b.

c. To be completed by the student.

d. The two expressions for profit are equivalent, which can be seen by comparing tables and graphs generated by each or by expanding the expression for p in Part c and combining "like terms."

Lesson 2, Investigation 2, Applications Task 4 (p. 501)

a. $3x^2 + 4x$

b–d. To be completed by the student.

Lesson 2, Investigation 2, Applications Task 5 (p. 501)

a. $3x(x + 3)$ or $x(3x + 9)$

b–d. To be completed by the student.

Lesson 2, Investigation 2, Applications Task 6 (p. 501)

a. $14x – 6x^2$ or $2x(7 – 3x)$

b–d. To be completed by the student.

Lesson 2, Investigation 2, Applications Task 7 (p. 501)

a. $x^2 + 9x + 14$

b–f. To be completed by the student.

Lesson 2, Investigation 2, Applications Task 8 (p. 502)

a. $t^2 + 4t - 45$

b–d. To be completed by the student.

Lesson 2, Investigation 2, Connections Task 11 (p. 503)

a. $(x + 2)(x + 4) = x^2 + 2x + 4x + 8$ or $x^2 + 6x + 8$
This is illustrated by the diagram in that the area of the rectangle can be calculated as the product of its length and width $(x + 2)(x + 4)$, or as the sum of the areas of the four smaller rectangles $x^2 + 2x + 4x + 8$ or $x^2 + 6x + 8$.

b–d. To be completed by the student.

Lesson 2, Investigation 2, Connections Task 13 (p. 504)

a. (1) Use $b^{x+y} = b^x b^y$ and $(a)(1) = a$.
(2) Use distributive property to factor out 3^x.
(3) Use arithmetic fact $3 - 1 = 2$ and Commutative Property of Multiplication.

b, c. To be completed by the student.

d. $\frac{3^{x-1}}{3^x} = 3$ because $\frac{a^x}{a^y} = a^{x-y}$ for positive values of a.

e. To be completed by the student.

Lesson 2, Investigation 2, Connections Task 15 (p. 504)

a. Error: did not distribute $5x$ times $3x$.
Use an area model (see Connections Task 11) to illustrate that $5x(4 + 3x) = 20x + 15x^2$.

b–d. To be completed by the student.

Lesson 2, Investigation 2, Connections Task 20 (p. 506)

a. To be completed by the student.

b. Feet will travel: $2\pi(4{,}000 \cdot 5{,}280)$ or about 132,700,874 feet.
Head will travel: $2\pi(4{,}000 \cdot 5{,}280 + 5) = 2\pi(4{,}000 \cdot 5{,}280) + 2\pi(5)$ or about 132,700,905 feet. So, a 5-ft tall person's head will travel $10\pi \approx 30$ feet farther than his or her head as Earth completes one revolution about its axis.

c–f. To be completed by the student.

Lesson 2, Investigation 2, Extensions Task 22 (p. 508)

a. $6x^2 + 13x + 5$

b–e. To be completed by the student.

Lesson 2, Investigation 2, Extensions Task 23 (p. 508)

a. $9x^2 + 30x + 25$

b–e. To be completed by the student.

Lesson 2, Investigation 2, Extensions Task 24 (p. 508)

a. $9x^2 - 25$

b–e. To be completed by the student.

Lesson 3, Investigation 1, Applications Task 1 (p. 518)

Students should include the steps to their solutions and provide a check of their solutions.

a. $x = \pm\sqrt{20} = \pm 2\sqrt{5}$ or $x \approx \pm 4.47$

b.
$$\begin{aligned} s^2 + 9 &= 25 \\ -9 &= -9 \\ s^2 &= 16 \\ s &= \pm\sqrt{16} \\ s &= \pm 4 \end{aligned}$$

c–f. To be completed by the student.

Lesson 3, Investigation 1, Applications Task 4 (p. 519)

a. $5x^2 + 60x = 0$	To solve this equation use the following steps. (Writing the reasons is not necessary but is shown to help follow the solution.)
$5x(x + 12) = 0$	Distributive property (factoring)
$5x = 0 \quad x + 12 = 0$	Zero Product Property (If two factors multiply to be zero, one or the other or both must be zero.)
$x = 0 \quad x = -12$	Algebra (solving linear equations)

b–d. To be completed by the student.

Lesson 3, Investigation 1, Applications Task 5 (p. 519)

a. A possible solution without graphing would include finding the zeros of the function by solving $0 = 5x^2 + 60x$ (see Task 4 Part a). The max/min's x-coordinate is halfway between the zeros. To find the y-coordinate, evaluate the x-coordinate in the function. The minimum point for Part a is $(-6, -18)$.

b–d. To be completed by the student.

Lesson 3, Investigation 1, Reflections Task 15 (p. 521)

Students can refer to their notes on the Summarize the Mathematics on page 517, if necessary, to complete this task.

Lesson 3, Investigation 1, Extensions Task 21 (p. 522)

Students might use symbolic reasoning, graphical reasoning of the related function, or a combination of these to solve the inequalities.

a. $x < -3$ or $x > 3$

b–d. To be completed by the student.

Lesson 3, Investigation 2, Applications Task 7 (p. 519)

Begin by looking at a graph of the function $y = x^2 - 3x + 2$.

a. To be completed by the student.

b. If $y = -1$, $y = x^2 - 3x + 2$ has no solutions. Find another y value so that $y = x^2 - 3x + 2$ has no solutions.

c. To be completed by the student.

Lesson 3, Investigation 2, Applications Task 8 (p. 519)

To use the quadratic formula, the equation must be in the form $ax^2 + bx + c = 0$. So in Part b, your first step would be to add 2 to both sides of the equation, creating this equivalent form $x^2 - 7x + 10 = 0$.

Lesson 3, Investigation 2, Reflections Task 17 (p. 521)

Students can refer to their notes on the Summarize the Mathematics on page 517, if necessary, to complete this task.

Lesson 3, Investigation 2, Extensions Task 24 (p. 522)

Technology (calculator or computer) that supports a CAS (computer algebra system) is needed for this task. *CPMP-Tools* can be used. Choose CAS from the Algebra menu. Students should write the result they expect *before* using the CAS.

