Examples of Tasks from CCSS Edition 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. Comments in red type are not part of the solution.

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 and Functions page 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 1 (p. 480), Extensions Task 20 (p. 486), Review Task 28 (p. 489)
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), Review Task 34 (p. 490)

Lesson 2: Investigation 1—Applications Task 1 (p. 499), Review Task 26 (p. 508)
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), Extensions Task 21 (p. 522), Review Task 27 (p. 523)
Investigation 2—Applications Tasks 7 and 8 (p. 519), Extensions Task 24 (p. 522)

Selected Homework Tasks and Expected Solutions

(These solutions are for tasks in the CCSS Edition book.
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 1 (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*.

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 1, Review Task 28 (p. 489)

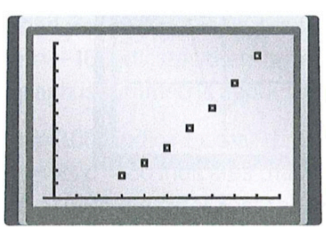
a. $y = -\frac{7}{5}x + 4$

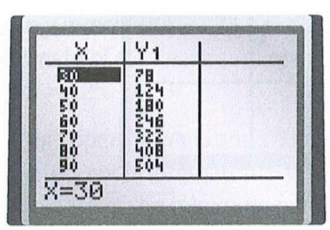
b, d. To be completed by the student.

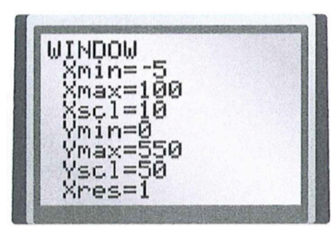
c. $y = \frac{2}{3}x + \frac{1}{3}$

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

a. Students may argue as to what is a reasonable range for speeds, but one possible table of values is given below. As speed increases, it appears as if stopping distance increases at an increasing rate.







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. Calculator or computer tables show only a small sample of values for the function; graphs show more values, but still only a limited part of the domain and range. Graphs can also be misleading when one chooses the scales for the axes in unfortunate ways (and you might not see the graph at all if you do not set the window right).

b. Formal methods can express a function rule in forms that immediately reveal information like when to expect a maximum or minimum value, the y-intercept, and (when factored) the zeroes. They also show exact solutions (not the approximations inherent in calculator table or graph methods), and can even generate formulas for solution of any quadratic equation regardless of coefficients (e.g., the quadratic formula).

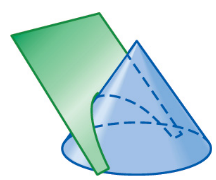
Lesson 1, Investigation 3, Applications Task 8 (p. 482)

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, c. To be completed by the student.

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

a, 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 1, Investigation 3, Review Task 34 (p. 490)

a. $18x^2 - 18x$

b, d. To be completed by the student.

c. $-4x + \frac{19}{2}$

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 feet 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 2, Investigation 2, Review Task 26 (p. 508)

a. $x = 6$

b, d, f. To be completed by the student.

c. $x = 34.8$

e. $x = 8$

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, 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 1, Review Task 27 (p. 523)

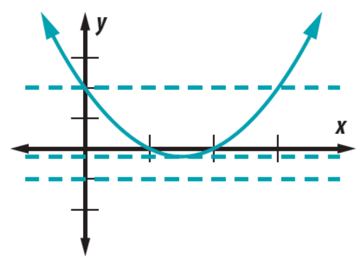
a. $\sqrt{24} = 2\sqrt{6}$

b. $\sqrt{125} = 5\sqrt{5}$

c–f. To be completed by the student.

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

Begin by looking at a graph of the function $y = x^2 - 3x + 2$. The graph at the right shows each condition. The scale on each axis is 1. Examples may vary.



a, c. 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.

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

Hint: 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, 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. Before using the CAS, students should write the result they expect from using the quadratic formula with parameters a, c, and d.

a. Using the quadratic formula and reducing the result gives $\pm\frac{\sqrt{-ac + ad}}{a}$. Students should resolve any differences they find in their technology-produced result.

b–c. To be completed by the student.

