Examples of Tasks from CCSS Edition Course 1, Unit 5

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 5

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

- recognize and give examples of growth and decay situations in which exponential functions are likely to match the patterns of change that are observed or expected. This function-recognition skill should apply to information given in data tables, graphs, or verbal descriptions of related changing variables. (reconocer y dar ejemplos de situaciones de crecimiento y decadencia en donde las funciones exponenciales probablemente van a emparejar con los patrones de cambio que se observan o que se esperan. Esta habilidad del reconocimiento de la función debe aplicar a la información dado en las gráficas de datos, los gráficos o descripciones verbales de variables que cambian que son relacionadas.)
- use reasoning, estimation, and curve-fitting utilities to find exponential functions to match patterns of change in exponential growth and decay situations. This should include rules in the "$y = \ldots$" and *NOW-NEXT* forms. (usar razonamiento, estimación, y utilidades que forman en curva para encontrar funciones exponenciales que emparejan patrones de cambio en situaciones de crecimiento exponencial y decremento exponencial. Esto debe incluir reglas en las formas de "$y = \ldots$" y *NOW-NEXT*.)
- use exponential rules to produce tables and graphs to answer questions about exponential change of variables. (usar reglas exponenciales para producir gráficas para contestar preguntas sobre el cambio exponencial de las variables.)
- interpret an exponential function rule in order to sketch or predict the shape of its graph and the pattern of change in tables of values. (interpretar una función exponencial para dibujar o predecir la forma de la gráfica y el patrón del cambio en gráficas con valores.)
- describe major similarities and differences between linear and exponential patterns of change. (describir las semejanzas y diferencias principales entre los patrones de cambio lineales y exponenciales.)
- develop skill in rewriting exponential and radical expressions in equivalent forms. (desarrollar las habilidades de reescribir expresiones exponenciales y radicales en formas equivalentes.)

What Solutions are Available?

Lesson 1: Investigation 1—Applications Task 2 (p. 307), Connections Task 18 (p. 313)
Investigation 2—Applications Task 6 (p. 309), Connections Task 20 (p. 314)
Investigation 3—Applications Task 8 (p. 309), Extensions Task 32 (p. 318)
Investigation 4—Applications Task 10 (p. 310), Applications Task 11 (p. 311), Review Task 42 (p. 321)
Investigation 5—Applications Task 13 (p. 311), Applications Task 14 (p. 312), Applications Task 15 (p. 312)

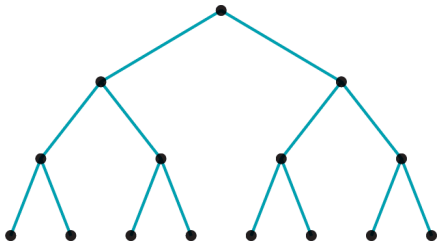
Lesson 2: Investigation 1—Applications Task 1 (p. 338)
Investigation 2—Applications Task 6 (p. 340), Connections Task 20 (p. 345), Review Task 40 (p. 352)
Investigation 4—Applications Task 12 (p. 343), Applications Task 13 (p. 343), Applications Task 16 (p. 344), Connections Task 22 (p. 346), Review Task 45 (p. 354)
Investigation 5—Applications Task 17 (p. 344), Extensions Task 35 (p. 351)

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.)

Lesson 1, Investigation 1, Applications Task 2 (p. 307)

a. The vertices in the graph at the right represent the families placing/receiving calls, and the edges represent the phone calls. (Los vertices en el gráfico a la derecha representan las familias haciendo/recibiendo llamadas de teléfono.)



b. Students should fill in the missing table entries. (Los estudiantes deben llenar las entradadas que faltan.)

Stage of Texting Tree	1	2	3	4	5	6	7	8	9	10
Number of Texts Made	2					64				1,024

c. To be completed by the student. (Para ser completado por el estudiante.)

Hint: Rules should be in the forms:

(*Pista*: Las reglas deben estar en la forma de:)

- $NEXT = b \bullet NOW$, starting at ____
- $y = b^x$

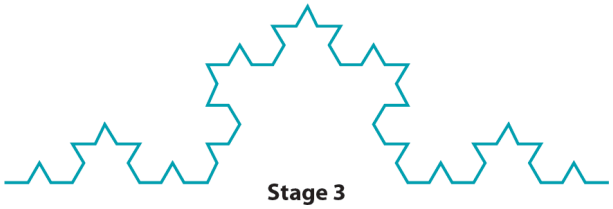
d. To be completed by the student. (Para ser completado por el estudiante.)

Hint: This question is *not* asking when the number of calls at a stage reaches 1,000.

(*Pista*: Esta pregunta *no* pregunta cuando el número de llamadas en una etapa está a los 1,000.)

Lesson 1, Investigation 1, Connections Task 18 (p. 313)

a.



There is one vertical line of symmetry through the center of the whole figure. (Hay una línea vertical de simetría por el centro en la figura entera.)

Hint: To make the sketch of Stage 3, it may help to think of it this way: Look at each segment of Stage 2 and put a "hat" $\wedge$ on it. (*Pista*: Para hacer un dibujo en la etapa 3, podría ayudar en pensarlo así: Mire cada segmento de "Stage 2" y le ponga "una gorra" $\wedge$.)

b. To be completed by the student. (Para ser completado por el estudiante.)

c. *Hint:* Rules should be in the form $NEXT = b \bullet NOW$, starting at ____. (*Pista*: Las reglas deben ser en la forma de $NEXT = b \bullet NOW$, empezando con ____.)

d. *Hint:* Rules should be in the form $y = b^x$. (*Pista*: Las reglas deben ser en la forma de $y = b^x$.)

e. To be completed by the student. Students do *not* need to write out a table for the 15 stages but should include a graph. (Para ser completado por el estudiante. Los estudiantes no necesitan escribir una tabla para las 15 etapas pero deben incluir un gráfico.)

Lesson 1, Investigation 2, Applications Task 6 (p. 309)

a. The first entry in the table should be as shown. The rest of the table is to be completed by the student. (La primera entrada en el gráfico debe ser así. El resto del gráfico debe ser completado por el estudiante.)

10-min Periods	0	1	2	3	4	5	6
Bacteria Count	50						

b. To be completed by the student. (Para ser completado por el estudiante.)

c. 13,107,200 bacteria

Lesson 1, Investigation 2, Connections Task 20 (p. 314)

a. To be completed by the student. (Para ser completado por el estudiante.)

b. Using the texting tree idea, it would take fewer than 6 full stages of the tree, or less than 6 minutes: $2 + 4 + 8 + 16 + 32 + 64 = 126$. (Usando el árbol de "texting", serían menos de 6 etapas enteras del árbol, o menos de 6 minutos.)

Lesson 1, Investigation 3, Applications Task 8 (p. 309)

a. Student should fill in the missing table entries. (Los estudiantes deben llenar los entradas que faltan.)

Years After 2009	0	1	2	3	4	5	6	7	8	9	10
AIDS Cases (in millions)				41.9	45.3				61.6		

b, d. To be completed by the student. (Para ser completado por el estudiante.)

c. The model estimates that about 114.1 million people will be living with HIV/AIDS in the year 2025. (El modelo estima que unos 114.1 millones de personas vivirán con VIH/SIDA en el año 2025.)

Lesson 1, Investigation 3, Extensions Task 32 (p. 318)

a. With quarterly compounding of 1%, after 5 years the account will have a value of $1,220.19. (Con un compuesto trimestral de 1%, después de 5 años la cuenta tendrá un valor de $1,220.19.)

Hint: This can be found by using the function $y = 1{,}000(1.01^x)$, where x is the number of times compounded. In this situation, $x = 20$ because you are compounding quarterly for 5 years. Alternatively, you could look at the table or use the graph. (*Pista*: Esto puede ser econtrado usando la función $y = 1{,}000(1.01^x)$, donde x es el número de tiempo compuesto. En esta situación, $x = 20$ porque estás haciendo un compuesto trimestral para cada 5 años. Alternativamente, podrías ver la tabla o usar el gráfico.)

b–c. To be completed by the student. (Para ser completado por el estudiante.)

Lesson 1, Investigation 4, Applications Task 10 (p. 310)

These data are located in *CPMP-Tools* under Statistics, Data Analysis, Data>Unit 5 Exponential Functions> Dow Jones Averages. Students may wish to print their display. (Se encuentran estos datos en *CPMP-Tools* debajo de Statistics, Data Analysis, Data>Unit 5 Exponential Functions> Dow Jones Averages. Es posible que los estudiantes querrán imprimir el gráfico.)

a. To be completed by the student. (Para ser completado por el estudiante.)

Hint: After you make a scatterplot of the data, you can find both linear and exponential functions under the Models menu. The equations of the models can be found under the Options menu by selecting Show Equation(s). (*Pista*: Después de hacer un diagrama de dispersión, se puede econtrar ambas funciones lineales y exponenciales debajo del menú "Models". Se encuentran las equaciones de los modeles debajo del menú "Options" por la selección de "Show Equation(s).)

b–c. To be completed by the student. (Para ser completado por el estudiante.)

Lesson 1, Investigation 4, Applications Task 11 (p. 311)

These data are located in *CPMP-Tools* under Statistics, Data Analysis, Data>Unit 5 Exponential Functions> Voters in U.S. Elections. Students may wish to print their display. (Se encuentran estos datos en *CPMP-Tools* debajo de Statistics, Data Analysis, Data>Unit 5 Exponential Functions> Voters in U.S. Elections. Es posible que los estudiantes querrán imprimir el gráfico.)

Lesson 1, Investigation 4, Review Task 42 (p. 321)

a. 16

b. 16

c. 20

d. 72

e–i. To be completed by the student. (Para ser completado por el estudiante.)

Lesson 1, Investigation 5, Applications Task 13 (p. 311)

a, c–d, f. To be completed by the student. (Para ser completado por el estudiante.)

b. $y = 10$

e. Any combination of w and x adding to 6 (Cualquier combinación de w y x que tenga la suma de 6)

Lesson 1, Investigation 5, Applications Task 14 (p. 312)

a. 7^{13}

b–e, g–h. To be completed by the student. (Para ser completado por el estudiante.)

f. $7a^3b^5m^7$

Lesson 1, Investigation 5, Applications Task 15 (p. 312)

a. $z = 10$

b. $x = 4.5$

c. $x = 4$

d–h. To be completed by the student. (Para ser completado por el estudiante.)

Lesson 2, Investigation 1, Applications Task 1 (p. 338)

a. Student should fill in the missing table entries and make a scatterplot. (Los estudiantes deben llenar las entradas que faltan y hacer un diagrama de dispersión.)

x	0	1	2	3	4	5
y	10	5				$\frac{5}{16}$

b. The fourth bounce will be less than 1 foot (seen in the table). This is the plot point that rises to a y-coordinate less than 1. (El cuarto rebote será menos de 1 pie (como se ve en la tabla). Esto es el punto de dispersión que sube al coordenado del eje y que será menos de 1.)

c. $NEXT = \frac{1}{2}\,NOW$, starting at 10; $y = 10\left(\frac{1}{2}\right)^x$, where x is the number of bounces. ($NEXT = \frac{1}{2}\,NOW$, empezando con 10; $y = 10\left(\frac{1}{2}\right)^x$, donde x es el número de rebotes.)

d–e. To be completed by the student. (Para ser completado por el estudiante.)

Lesson 2, Investigation 2, Applications Task 6 (p. 340)

a. The distributive property guarantees the identity:
(La propiedad distributiva garantiza la identidad:)

$$\begin{aligned} x - 20\%x &= x - 0.2x \\ &= (1 - 0.2)x \\ &= 0.8x \\ &= 80\%x \end{aligned}$$

You can calculate depreciated values by calculating 80% of the value of the truck, or by calculating 20% of the truck value and subtracting that amount from the truck value. (Se puede calcular los valores depreciados por calculando 80% del valor de la camioneta, o por la calcula de 20% del valor de la camioneta y restando esta suma del valor de la camioneta.)

b. To be completed by the student. (Para ser completado por el estudiante.)

Hint: There are two correct forms of the *NOW-NEXT* rule. The "$y = \ldots$" should be in the form $y = ab^x$, where x is the number of years after purchase. (*Pista:* Hay dos formas correctas de la regla *NOW-NEXT*. El "$y = \ldots$" debe ser en la forma de $y = ab^x$, donde x es el número de años después de la compra.)

c. To be completed by the student. (Para ser completado por el estudiante.)

The student should include a picture of the graph in their answer with appropriate labels. The answer to the question can be estimated using the trace function on their calculator or, alternatively, they can graph their "$y = \ldots$" equation from Part b along with the equation $y = 1{,}000$ and find the intersection of these two functions. (Los estudiantes deben incluir un dibujo del gráfico en su respuesta con etiquetas apropriadas. La respuesta a la pregunta puede ser estimada usando el "trace function" en su calculadora o, alternativamente, podrían hacer un gráfico de su ecuación "$y = \ldots$" de la Parte b junto con la ecuación de $y = 1{,}000$ y encontrar la intersección de estas dos funciones.)

d. To be completed by the student. (Para ser completado por el estudiante.)

Lesson 2, Investigation 2, Connections Task 20 (p. 345)

a. Exponential decay function

b, d, f–i, k–l. To be completed by the student. (Para ser completado por el estudiante.)

c. Exponential growth function

e. Neither linear nor exponential function

j. Increasing linear function

Lesson 2, Investigation 2, Review Task 40 (p. 352)

a. **i.** The slope for the linear function displayed graphically (3) is larger than that of the linear function in the table (2). (La pendiente para la función lineal mostrado grafícamente (3) es más grande que una función lineal en la table (2).)

ii. The y-intercepts are the same for both functions, $(0, -3)$. (El intercepto del eje y es igual para ambas funciones, $(0, -3)$.)

b. To be completed by the student. (Para ser completado por el estudiante.)

Lesson 2, Investigation 4, Applications Task 12 (p. 343)

a. $x = \frac{125}{64}$

b–d. To be completed by the student. (Para ser completado por el estudiante.)

Lesson 2, Investigation 4, Applications Task 13 (p. 343)

a. $\frac{16x^2}{n^2}$

b–c. To be completed by the student. (Para ser completado por el estudiante.)

Lesson 2, Investigation 4, Applications Task 16 (p. 344)

a. $4.5^{-2} = ((4.5)^{-1})^2 = \left(\frac{1}{4.5}\right)^2 = \frac{1^2}{4.5^2} = \frac{1}{4.5^2}$

b–h. To be completed by the student. (Para ser completado por el estudiante.)

Lesson 2, Investigation 4, Connections Task 22 (p. 346)

a. **i.** 2.346×10^8

b. **i.** 2.34×10^{-2}

c. **i.** 782,000,000

All other parts to be completed by the student. (Los otros componentes deben ser completados por el estudiante.)

Lesson 2, Investigation 4, Review Task 45 (p. 354)

a. $y = -0.5x + 2$

b. $y = \frac{15}{4}x + 5$

c–d. To be completed by the student. (Para ser completado por el estudiante.)

Lesson 2, Investigation 5, Applications Task 17 (p. 344)

a. 7

b–d, f–h. To be completed by the student. (Para ser completado por el estudiante.)

e. 12

Lesson 2, Investigation 5, Extensions Task 35 (p. 351)

a. $b^{\frac{1}{4}}$ is the number multiplied by itself 4 times that results in b. Another way to say this is that $b^{\frac{1}{4}}$ is the number that when it is raised to the fourth power is b, or the fourth root of b; $\left(b^{\frac{1}{4}}\right)^4 = b$.

($b^{\frac{1}{4}}$ es el número multiplicado por si mismo 4 veces y resulta en b. Otra manera de decir esto es que $b^{\frac{1}{4}}$ es el número en lo que cuando es elevado a la cuarta potencia es b, o la cuarta raíz de b ; $\left(b^{\frac{1}{4}}\right)^4 = b$.

b. To be completed by the student. (Para ser completado por el estudiante.)

