Examples of Tasks from ©2008 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.

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 5

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

- recognize and give examples of growth and decay situations (reconocer y dar ejemplos de situcaciones de crecimiento y decadencia) in which exponential functions (funciónes exponenciales) 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.
- use reasoning, estimation, and curve-fitting utilities (usar razonamiento, estimación, y utilidades que forman en curva) to find exponential functions (funciónes exponenciales) to match patterns of change in exponential growth (crecimiento exponencial) and exponential decay (decremento exponencial) situations. This should include rules (ecuaciónes) in the "$y = \ldots$" and *NOW-NEXT* forms.
- use exponential rules (expresiónes exponenciales) to produce tables and graphs to answer questions about exponential change of variables (producir tablas y gráficos para responder a las preguntas sobre el cambio exponencial de las variables).
- interpret an exponential function (interpretar una función exponencial) rule in order to sketch or predict the shape of its graph and the pattern of change in tables of values.
- 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).
- rewrite exponential and radical expressions in equivalent forms (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)
Investigation 5—Applications Task 13 (p. 311), Applications Task 14 (p. 312), Applications Task 15 (p. 312)

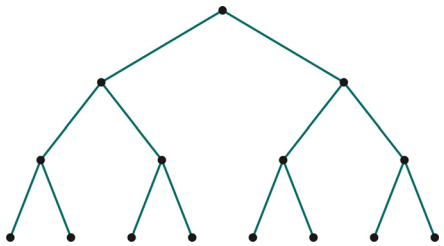
Lesson 2: Investigation 1—Applications Task 1 (p. 338)
Investigation 2—Applications Task 6 (p. 340), Connections Task 20 (p. 345)
Investigation 4—Applications Task 12 (p. 343), Applications Task 13 (p. 343), Applications Task 16 (p. 344), Connections Task 22 (p. 346)
Investigation 5—Applications Task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

Selected Homework Tasks and Expected Solutions

(These solutions are for tasks in the 2nd edition book—2008 copyright.
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.



b. Students should fill in the missing table entries.

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

c. Rules (ecuaciónes) should be in the forms:

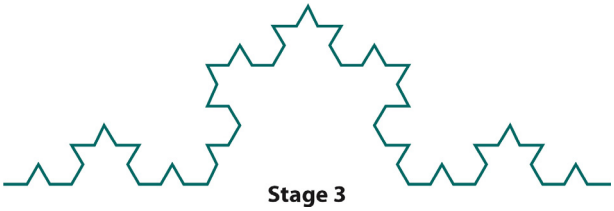
- $NEXT = b \bullet NOW$, starting at ____
- $y = b^x$

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 750. (Esta cuestión *no* está pidiendo cuando el número de llamadas en una etapa llega a 750.)

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

a.



There is one vertical line of symmetry (línea vertical de simetría) through the center of the whole figure.

Hint: To make the sketch of Stage 3 (para realizar el dibjo de Stage 3), it may help to think of it this way: Look at each segment of Stage 2 and put a "hat" ∧ on it (mire cada segmento de Stage 2 y ponga una "gorra" ∧).

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

c. Rules (ecuaciónes) should be in the form $NEXT = b \bullet NOW$, starting at (empezando a) ____.

d. Rules (ecuaciónes) should be in the form $y = b^x$.

e. To be completed by the student. (Para ser completado por el estudiante.) Students do *not* need to write out a table for the 15 stages but should include a graph. (Los estudiantes no necesitan escribir una tabla para las 15 etapas, pero deberían 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. (El resto de la tabla será completada 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. After the 8th stage, 510 total families will have been called. Because each stage takes 40 seconds, after 8 stages, 5 minutes and 20 seconds will have passed. This still leaves 240 families to be called. If 240 out of the last 256 newly informed families make 1 call, the whole club can be informed in 20 additional seconds to make a total time needed of 5 minutes and 40 seconds.

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

a. Student should fill in the missing table entries (llenar las entradas que faltan en la tabla).

Years After 2000	0	1	2	3	4	5	6	7	8	9	10
AIDS Cases (in millions)				54.8	63.0				110.1		

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

c. The model estimates that about 293 million people will be living with HIV/AIDS in the year 2015.

d. To be completed by the student.

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

a. With quarterly compounding (composición trimestral) of 1%, after 5 years the account will have a value of $1,220.19.

Hint: This can be found by using the function (función) $y = 1{,}000(1.01^x)$, where x is the number of times compounded (el número compuesto). In this situation, $x = 20$ because you are compounding quarterly for 5 years. Alternatively, you could look at the table or use the graph.

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

c. To be completed by the student.

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.

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

Hint: After you make a scatterplot (gráfica de dispersión) of the data, you can find both linear and exponential functions (funciónes lineales y funciónes exponenciales) under the Models menu. The equations (ecuaciónes) of the models can be found under the Options menu by selecting Show Equation(s).

b. To be completed by the student.

c. To be completed by the student.

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.

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

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.

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.

c. $NEXT = \frac{1}{2}\,NOW$, starting at 10; $y = 10\left(\frac{1}{2}\right)^x$, where x is the number of bounces.

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

e. To be completed by the student.

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

a. The distributive property (propiedad distributiva) guarantees the identity (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. (Usted puede calcular valores depreciados por el cálculo de 80% del valor del camión, o mediante el cálculo de 20% del valor de camione y restando esa cantidad del valor del camion.)

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 (el número de años después de la compra).

c. To be completed by the student.

The student should include a picture of the graph in their answer with appropriate labels. (El estudiante debería incluir una imagen de la gráfica en su respuesta con la etiqueta apropriada.) The answer to the question can be estimated using the trace function on their calculator or, alternatively, they can graph their "$y = \ldots$" equation (ecuación) from Part b along with the equation (ecuación) $y = 1{,}000$ and find the intersection of these two functions.

d. To be completed by the student.

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

a. Exponential decay (decremento exponencial) function

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

c. Exponential growth (crecimiento exponencial) function

e. Neither linear function (función lineal) nor exponential function (función exponencial)

j. Increasing linear function (el aumento de función lineal)

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.** 2.3456789×10^8

b. **i.** 2.34×10^{-2}

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

All other parts 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)

i. $\left(3^{\frac{1}{4}}\right)^4 = 3^1 = 3$

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 (el número que cuando está elevado a la cuarta potencia es b), or the fourth root (raíz) of b; $\left(b^{\frac{1}{4}}\right)^4 = b$.

The remainder of the task is to be completed by the student. (Para ser completado por el estudiante.)

