Examples of Tasks from CCSS Edition Course 1, Unit 1

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 1

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

- be sensitive to the rich variety of situations in which quantities vary in relation to each other. (ser sensible a la rica variedad de situaciones en las que las cantidades varían en relación con los demás.)
- represent relations among variables in several ways—using tables of numerical data, coordinate graphs, symbolic rules, and verbal descriptions—and to interpret data presented in any one of those forms. (representar las relaciones entre las variables en varias maneras—utilizando tablas de datos numéricos, gráficos coordenados, normas simbólicos, y descripciones verbales—y interpretar los datos presentados en cualquiera de esas formas.)
- recognize important patterns of change in single variables and related variables. (reconocer "patrones de cambio" importantes de variables sueltas y variables relacionadas.)

The intent of this unit is to focus student attention on the variety of types of change inherent in problem situations. This unit will provide students with a broad picture of the patterns of change. Students will explore linear, quadratic, inverse variation, and exponential patterns of change throughout the unit. Since this unit is an overview of patterns of change, *mastery is not expected at this stage*. (La intención de esta unidad es enfocar la atención de los estudiantes en la variedad de tipos de cambio inherente a situaciones problemáticas. Esta unidad les proporciona a los estudiantes una vista panorámica de los "patrones de cambio". Los estudiantes explorarán "patrones de cambio" lineales, cuadráticos, variaciones inversas y exponenciales por toda la unidad. Aunque esta unidad se presenta una vista general de los "patrones de cambio", no se espera el dominio en esta etapa.)

What Solutions are Available?

Lesson 1: Investigation 1—Applications Task 1 (p. 14), Applications Task 5 (p. 16), Extensions Task 20 (p. 24), Review Task 24 (p. 25)
Investigation 2—Connections Task 10 (p. 19), Review Task 25 (p. 25), Review Task 27 (p. 25)
Investigation 3—Applications Task 6 (p. 16), Review Task 28 (p. 25)

Lesson 2: Investigation 1—Applications Task 1 (p. 36), Connections Task 12 (p. 39), Reflections Task 18 (p. 42), Review Task 26 (p. 45), Review Task 29 (p. 46)
Investigation 2—Applications Task 8 (p. 38)

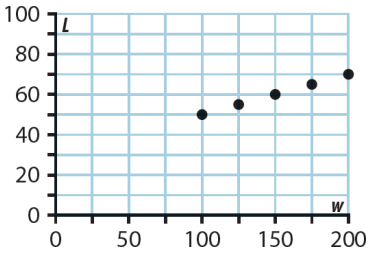
Lesson 3: Investigation 1—Applications Task 3 (p. 59), Connections Task 13 (p. 62)
Investigation 2—Applications Task 8 (p. 60), Extensions Task 27 (p. 65)
Investigation 3—Applications Task 10 (p. 61)

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 1 (p. 14)

a. *Jumper weight* is the most plausible independent variable and *stretched cord length* the dependent variable because it changes as an effect of changed *jumper weight*. ("*Jumper weight*" es la variable más independiente plausible y "*stretched cord length*" es la variable dependiente porque cambia como un efecto del cambio de "*jumper weight*".)

b. 

c. Reasonable estimates are:

i. 47 feet

ii. 57 feet

iii. 75 feet

d. In this situation, it probably does make sense to connect the dots to indicate stretched cord length for weight values between the given data points because there is a clear trend and no reason to think the relationship would be any different for weight values between those in the table. Also, values between those in the table make sense (i.e., jumper weight is a continuous variable). (En esta situación, no tiene sentido conectar los puntos para indicar la longitud del cordón estirado para los valores de peso entre los datos dados porque hay una tendencia clara y no hay motivo pensar que la relación sería diferente para los valores de peso entre los de la mesa. Además, no tendría sentido entre los valores en la tabla (es decir, "jumper weight" es una variable que continua).)

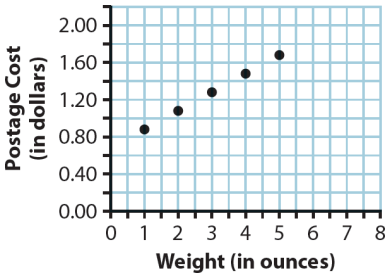
e. Stretched cord length increases steadily as jumper weight increases. For every 25-pound increase in jumper weight, there is a 5-foot increase in stretched cord length or about 0.2 feet per pound of weight. ("Stretched cord length" aumenta tan constantemente como "jumper weight". Por cada 25 libras aumento de "jumper weight," hay 5-pies que aumenta de "stretched cord length" o alrededor de 0,2 pies por libra de peso.)

Note the description of the overall pattern begins with the description in words but also includes the rate at which it is happening using numbers. Together these constitute a complete description. (Toma en cuenta que la descripción del patrón general comienza con la descripción en palabras pero incluye también la velocidad a la que está ocurriendo utilizando números. Juntos, ellos constituyen una descripción completa.)

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

Lesson 1, Investigation 1, Applications Task 5 (p. 16)

a.



b. **i.** 1.5 ounces would cost $1.08.

ii. 4.25 ounces would cost $1.68.

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

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

Note: An "open" circle is placed on the graph to show that the number denoted at the circle is *not* included in the solution set, and a "closed" (filled in) circle is placed on the graph to show that the number denoted at the circle is included in the solution set. (*Nota:* Un círculo "abierto" está colocado en el gráfico para mostrar que el número denotado en el círculo *no* está incluido en la lista de soluciones, y un círculo (llenado) "cerrado" está colocado en el gráfico para mostrar que el número denotado en el círculo está incluido en la lista de soluciones.)

Lesson 1, Investigation 1, Extensions Task 20 (p. 24)

a. $I = pn$ or $I = p(50 - p)$
(Recall that Income I is by the price per item p multiplied by the number of items n.) (Recordar que los ingresos por I es el precio por cada p multiplicada por el número de artículos n.)

b. $a = 2^{n-1}$, or $a = 0.5(2^n)$ pennies

c. $w = \frac{2^{n-1}}{10} = 0.1(2^{n-1})$, or $w = 0.05(2^n)$ pennies

Lesson 1, Investigation 1, Review Task 24 (p. 25)

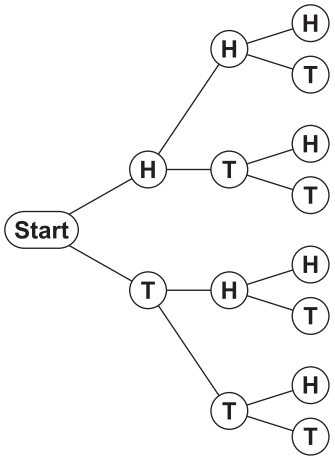
Students' estimates will vary. (Las estimaciones de los estudiantes pueden variar.)
Perimeter ≈ 320 m; Area ≈ 6,400 m^2 (Perímetro ≈ 320 m; Área ≈ 6,400 m^2)

Lesson 1, Investigation 2, Connections Task 10 (p. 19)

a. There are two possible equally likely outcomes (Hay dos resultados posibles que son igualmente probables), "heads" or "tails," so the probability is $\frac{1}{2}$.

b. There are four possible equally likely outcomes (Hay cuatro resultados que son igualmente probables): HH, HT, TH, or TT. So, the probability of getting two heads is $\frac{1}{4}$.

c. A tree diagram will show 8 possibilities, one of which is three heads. (Un diagrama de árbol mostrará 8 posibilidades, una de las cuales es de tres cabezas.) Thus, the probability of getting three heads is $\frac{1}{8}$.



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

Lesson 1, Investigation 2, Review Task 25 (p. 25)

a. 0.75 **b.** 0.054 **c.** 0.008 **d.** 0.0093

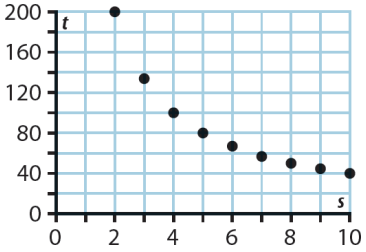
Lesson 1, Investigation 2, Review Task 27 (p. 25)

a. 80% **b.** 25% **c.** 245% **d.** 7.5%

Lesson 1, Investigation 3, Applications Task 6 (p. 16)

a.

Average Speed (in m/sec)	2	3	4	5	6	7	8	9	10
Race Time (in sec)	200	133	100	80	67	57	50	44	40



b. Race time decreases rapidly as speed increases from 2 meters per second, but for higher speeds a comparable increase in speed does not produce as significant a reduction in time. (El tiempo de una carrera disminuye rápidamente mientras la velocidad sube de 2 metros por segundo, pero para las velocidades más altas una subida comparable a la velocidad no produce una reducción al tiempo signficante.)

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

Lesson 2, Investigation 1, Applications Task 1 (p. 36)

a.

Year	Population (in billions)
2011	1.3
2012	1.3065
2013	1.3130
2014	1.3196
2015	1.3262
2016	1.3328

b. In about 29 years, at the present growth rate, China's population is projected to reach 1.5 billion. (En unos 29 años, con el crecimiento actual, se prevé la población China llegar a los 1,5 billones.)

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

d. **i.** $NEXT = 1.005 \cdot NOW$, starting at 1.3.

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

Lesson 2, Investigation 1, Connections Task 12 (p. 39)

You must use the information in the table above Task 10 to answer this question.

a. If the Aurora population continues to increase by 49,000 per decade, it would be as follows:

Year	2020	2030	2040	2050
Population (in 1,000s)	374	423	472	521

b. $NEXT = NOW + 49$, starting at 325.

c. $\frac{49}{276} = 17.8\%$

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

Lesson 2, Investigation 1, Reflections Task 18 (p. 42)

Similarities: In both kinds of relational situations, tables and graphs of values and (where feasible) algebraic rules are useful tools for studying patterns of change. It usually helps to look for increasing or decreasing change patterns as values of the independent variable increase steadily and, more precisely, to ask whether the rate of change is constant or not.

Differences: In "cause-and-effect" change situations, one can generally imagine some sort of operational connection between the variables that explains why the dependent variable changes when the independent variable changes. In "change-over-time" situations, the time variable itself is not a cause of change, only a marker that helps to see the rate of change that results from a variety of situational factors.

Lesson 2, Investigation 1, Review Task 26 (p. 45)

a. 5

b. –4

c. –23

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

Lesson 2, Investigation 1, Review Task 29 (p. 46)

a. India has a population 100 times larger than country Y because 12,000,000 • 100 = 1,200,000,000. India has a population 1,000 times larger than country X because 1,200,000 • 1,000 = 1,200,000,000.

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

Lesson 2, Investigation 2, Applications Task 8 (p. 38)

Spreadsheets will vary, but the basic code will include something like the *NOW-NEXT* rules in each task. Here is a sample spreadsheet that could be used to begin analysis of factors in the population growth of China as described in Task 1. (Hojas de cálculo pueden variar, pero el código básico incluirá algo como normas de *NOW-NEXT* en cada tarea. Abajo se muestra una hoja de cálculo que podría ser utilizada para comenzar el análisis de los factores en el crecimiento de la población de China como fue descrito en "Task 1".)

China Population.xlsx

	A	B (Formulas)	B (Computations)	C	D
1	Year	Population	Population	Start=	1.3
2	2011	=D1*D$2	1.3065	Rate=	1.005
3	=A2+1	=B2*D$2	1.3130		
4	=A3+1	=B3*D$2	1.3196		
5	=A4+1	=B4*D$2	1.3262		
⋮	⋮	⋮	⋮	⋮	⋮

Lesson 3, Investigation 1, Applications Task 3 (p. 59)

$d = 330t$, where t is the time in seconds and d is the distance away in meters of the lightning strike. The rule assumes that the sight of lightning arrives instantly. ($d = 330t$, donde t es el tiempo en segundos y d es la distancia en metros del relámpago. La regla supone que la vista del relámpago llega al instante.)

Lesson 3, Investigation 1, Connections Task 13 (p. 62)

a.

Radius r	0	1	2	3	4	5	10	20
Circumference C	0	2π	4π	6π	8π	10π	20π	40π
Area A	0	π	4π	9π	16π	25π	100π	400π

b. Circumference grows at a steady rate—as radius increases by 1, circumference increases by 2π; area grows at an increasing rate due to the squaring of the radius. (La circunferencia crece con una tasa constante, mientras el radio aumenta por 1, la circunferencia crece por 2π; la area crece a un ritmo creciente debido a la cuadratura del radio.)

c. If radius is doubled, the area is multiplied by 4; tripling the radius multiplies the area by 9. (Si se duplica el radio, se multiplica area por 4; triplicando el radio se multiplica area por 9.)

d. If the radius is doubled, the circumference is also doubled. If the radius is tripled the circumference is also tripled. (Si se duplica el radio, la circunferencia también se duplica. Si se triplica el radio la circunferencia también se triplica.)

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

Lesson 3, Investigation 2, Applications Task 8 (p. 60)

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

b. $48 < p < 152$; Ticket prices more than \$48 and less than \$152 will give income of at least \$550,000.

Students are expected to arrive at this answer by using a graph or a table that is produced by either a graphing calculator or *CPMP-Tools*.

($48 < p < 152$; Las entradas con el precio más de \$ 48 y menos de \$152 darán un ingreso de por lo menos 550.000 dólares. Se espera que los estudiantes llegan a esta respuesta por el uso de un gráfico o una tabla que sea producida por una calculadora gráfica o "*CPMP-Tools*".)

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

e. Income is 0 when $p = 0$ (free admission) or when $p = 200$. (Los ingresos son 0 cuando $p = 0$ (entrada gratis) o cuando $p = 200$.)

Students can arrive at this answer by looking at the formula for income, $I = p(15{,}000 - 75p)$, or by using a table or graph produced by a graphing calculator or *CPMP-Tools*. (Los estudiantes pueden llegar a esta respuesta viendo a la fórmula de ingresos, $I = p(15{,}000 - 75p)$, o mediante un cuadro o gráfico producido por una calculadora gráfica o *CPMP-Tools*.)

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

Lesson 3, Investigation 2, Extensions Task 27 (p. 65)

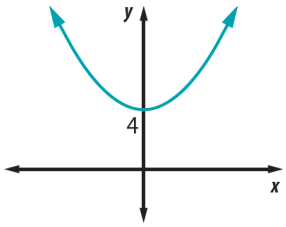
a. If d represents distance of the trip and C represents cost of the trip (Si d representa la distancia del viaje y C representa el costo del viaje):
Metro Cab: $C_M = 1.50 + 0.80d$

The rule for the competitor, Tack See Inc., should be completed by the student. (La norma para el competidor, "Tack See Inc.," debe ser completado por el estudiante.)

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

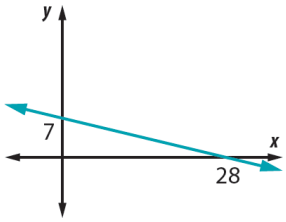
Lesson 3, Investigation 3, Applications Task 10 (p. 61)

a.



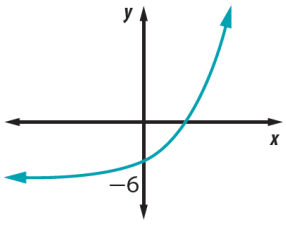
The graph is valley-shaped because the x^2 term is positive. It crosses the y-axis at 4. (El gráfico es en forma del valle porque el x^2 término es positivo. Cruza el eje-y en 4)

b.



The graph is linear and crosses the y-axis at 7 and the x-axis at 28. (El gráfico es lineal y cruza el eje-y en 7 y al eje-x en 28)

c.



The 4^x means that the function is exponential, so it goes up quickly. The y-intercept is –6 since $4^0 - 7 = -6$. (El 4^x significa que la función es exponencial, por eso sube rápidamente. La intersección con el eje-y es –6 porque $4^0 - 7 = -6$)