Examples of Tasks from ©2008 Course 2, Unit 6

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 Discrete Mathematics 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 6

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

- understand and apply minimum spanning trees, Hamilton circuits, the Traveling Salesperson Problem, and critical paths (including ideas from the Critical Path Method, CPM, which is also called the Program Evaluation and Review Technique, PERT) (comprender y aplicar los mínimos a los árboles de expansión, los circuitos de Hamilton, el problema del vendedor que viaja, y caminos críticos (incluyendo las ideas del Método de la Ruta Crítica, MRC, que también se llama el Programa de Evaluación y Revisión Técnica, PERT)).
- model and solve problems with vertex-edge graphs (modelar y resolver los problemas de gráficos con vertices en los lados).
- design, use, and analyze systematic procedures for solving problems involving vertex-edge graphs (diseñar, usar y análizar los procedimientos sistemáticos para resolver los problemas que afectan a los gráficos con vertices en los lados).
- recognize, formulate, and solve optimization problems, particularly network optimization problems (reconocer, formular y resolver problemas de optimización, en particular los problemas de optimización de la red).

What Solutions are Available?

Lesson 1: Investigation 1—Applications Task 2 (p. 418), Applications Task 3 (p. 419)
Investigation 2—Applications Task 6 (p. 421), Connections Task 12 (p. 425), Extensions Task 22 (p. 430)
Investigation 3—Applications Task 7 (p. 422), Review Task 31 (p. 433)

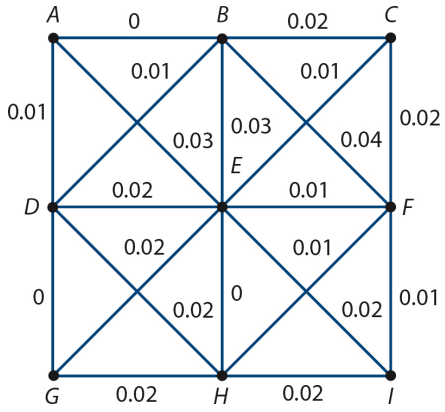
Lesson 2: Investigation 1—Connections Task 10 (p. 447), Connections Task 12 (p. 447), Review Task 24 (p. 451)
Investigation 2—Applications Task 1 (p. 443), Applications Task 8 (p. 446), Extensions Task 21 (p. 451), Review Task 25 (p. 452)

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. 418)

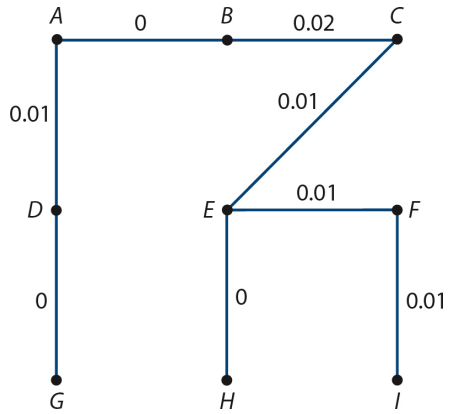
a. The graph for the grid on the left is shown below. Both graphs are available in *CPMP-Tools* under Discrete Math, *Vertex-Edge Graph* software under the Sample Graphs menu. (El gráfico para la red a la izquierda se muestra a continuación. Ambos gráficos están disponibles en *CPMP-Tools* debajo de "Discrete Math, *Vertex-Edge Graph* software" en el menú de "Sample Graphs".)



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

Lesson 1, Investigation 1, Applications Task 3 (p. 419)

a. There are two minimum spanning trees. Both trees have a total length (weight) of 82 miles. One such tree is shown below. (Hay dos árboles de expansión mínimos. Ambos árboles tienen una longitud total (peso) de 82 millas. Uno de estos árboles se muestra a continuación.)

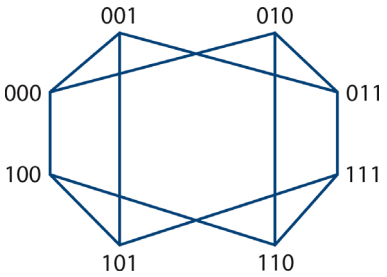


b–e. To be completed by the student. (Para ser completado por el estudiante.)

Lesson 1, Investigation 2, Applications Task 6 (p. 421)

a. There are four possible strings of length two, all of which are included in the list. The other two properties can be verified by inspection. (Hay cuatro posibles cadenas de longitud dos, todos los cuales están incluidos en la lista. Las otras dos propiedades pueden ser verificadas por la inspección.)

b.

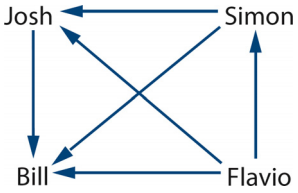


c. One possible Hamilton circuit is 000, 001, 011, 111, 101, 100, 110, 010.

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

Lesson 1, Investigation 2, Connections Task 12 (p. 425)

a.



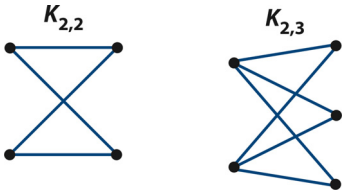
b. The only Hamilton path is *F-S-J-B*. (El único camino es Hamilton *F-S-J-B*.)

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

Lesson 1, Investigation 2, Extensions Task 22 (p. 430)

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

b. The graphs $K_{2,2}$ and $K_{2,3}$ are shown below. (Los gráficos $K_{2,2}$ y $K_{2,3}$ se muestran a continuación.)



Lesson 1, Investigation 3, Applications Task 7 (p. 422)

a. The total network calling cost is $17.65.

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

Lesson 1, Investigation 3, Review Task 31 (p. 433)

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

b. $x^2 = -8x + 20$
$x^2 + 8x - 20 = 0$
$(x + 10)(x - 2) = 0$
$x = -10$ or $x = 2$

Lesson 2, Investigation 1, Connections Task 10 (p. 447)

a.

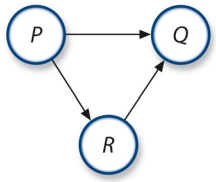
	L	T	B	DC	D	P
L	0	0	1	0	0	0
T	0	0	1	1	0	0
B	0	0	0	0	1	0
DC	0	0	0	0	1	0
D	0	0	0	0	0	1
P	0	0	0	0	0	0

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

Lesson 2, Investigation 1, Connections Task 12 (p. 447)

a. Every task (vertex) is a successor and prerequisite of every other task, which is impossible. Another way to say this is that the diagram implies that two tasks are prerequisites of each other (although not immediate prerequisites), which is impossible. (Cada tarea (vértice) es un sucesor y el prerequisito de cada otra tarea, que es imposible. Otra forma de decir esto es que el esquema implica que dos tareas son requisitos indispensables uno del otro (aunque no son prerequisitos inmediatos), que es imposible.)

b. The arrow from P to Q implies that P is an immediate prerequisite of Q. However, the path from P through R to Q implies that P is not an immediate prerequisite of Q (since R is between Q and P). So, P is and *is not* an immediate prerequisite of Q. This is a contradiction. (La flecha de P a Q implica que P es un prerequisito inmediato de la Q. Sin embargo, el camino de P a través de R a la Q implica que P no es un prerequisito inmediato de la Q (porque R se encuentra entre Q y P). Por lo tanto, P es y no es un prerequisito inmediato de la Q. Esta es una contradicción.)



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

Lesson 2, Investigation 1, Review Task 24 (p. 451)

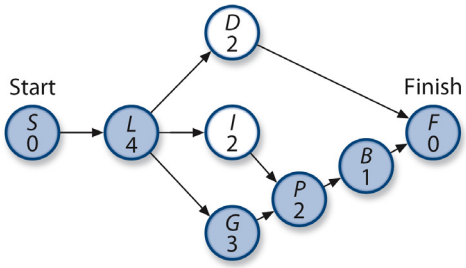
a. $2\sqrt{6}$ **b.** $5\sqrt{14}$ **c.** $\frac{2\sqrt{5}}{3}$

d. $\frac{\sqrt{5}}{2}$ **e.** $12\sqrt{3}$ **f.** $2\sqrt{34}$

Lesson 2, Investigation 2, Applications Task 1 (p. 443)

a. Tasks *D*, *I*, and *G* can be worked on at the same time as can *D* and *P* or *D* and *B*. (Se puede hacer las tareas *D*, *I*, y *G* al mismo tiempo que *D* y *P* o *D* y *B*.)

b.



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

Lesson 2, Investigation 2, Applications Task 8 (p. 446)

a. The EFT is 17 days.

b. There are two critical paths. That is, there are two paths from *S* to *F* that have the maximum length of 17 days. (Hay dos caminos críticos. Es decir, hay dos caminos de *S* a *F* que tienen la longitud máxima de 17 días.)

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

Lesson 2, Investigation 2, Extensions Task 21 (p. 451)

a. **i.** *A*: 3 units of time

ii. *C*: 12 units of time

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

b–d. To be completed by the student.

Lesson 2, Investigation 2, Review Task 25 (p. 452)

a. $x = 52^\circ; y = 76^\circ$

b. $x = \sqrt{72} = 6\sqrt{2}; y = 45^\circ$

c. $x = 4; y = \sqrt{84} = 2\sqrt{21}$

d. $x = 94^\circ; y = 23^\circ$

