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).
- model and solve problems with vertex-edge graphs.
- design, use, and analyze systematic procedures for solving problems involving vertex-edge graphs.
- recognize, formulate, and solve optimization problems, particularly network optimization problems.

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)

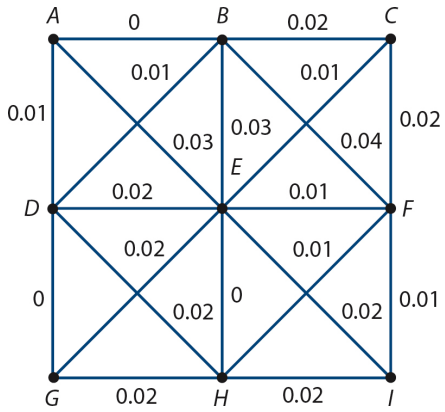
Lesson 2: Investigation 1—Connections Task 10 (p. 447), Connections Task 12 (p. 447), Review Task 24 (p. 451)
Investigation 2—Applications Task 1 (p. 443), Applications Task 8 (p. 446), Extensions Task 21 (p. 451), Review Task 25 (p. 452)

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)

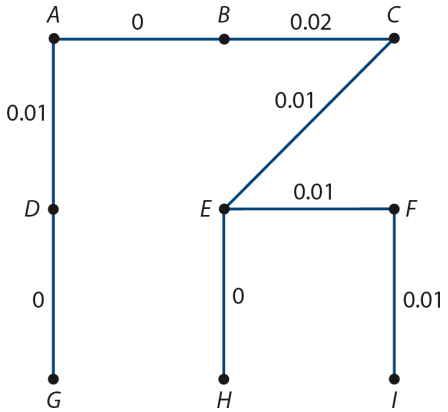
a. The graph for the grid on the left is shown below. Both graphs are available in *CPMP-Tools* under Discrete Math, *Vertex-Edge Graph* software under the Sample Graphs menu.



b–d. To be completed by the student.

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.

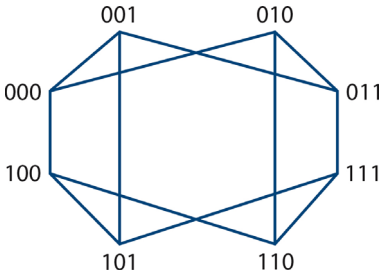


b–e. To be completed by the student.

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.

b.

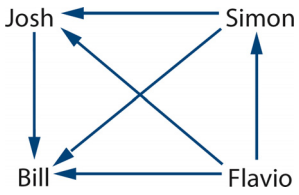


c. One possible Hamilton circuit is 000, 001, 011, 111, 101, 100, 110, 010.

d–f. To be completed by the student.

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

a.



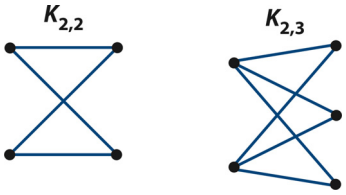
b. The only Hamilton path is *F-S-J-B*.

c, d. To be completed by the student.

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

a. To be completed by the student.

b. The graphs $K_{2,2}$ and $K_{2,3}$ are shown below.



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.

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

a, c, d. To be completed by the student.

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.

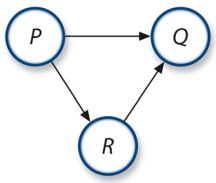
	L	T	B	DC	D	P
L	0	0	1	0	0	0
T	0	0	1	1	0	0
B	0	0	0	0	1	0
DC	0	0	0	0	1	0
D	0	0	0	0	0	1
P	0	0	0	0	0	0

b–e. To be completed by the student.

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.

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.



c. To be completed by the student.

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

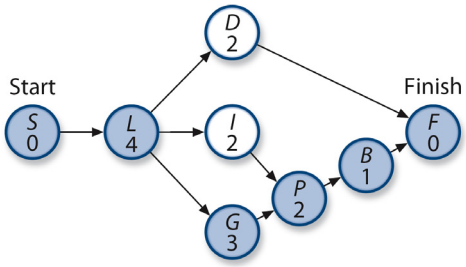
a. $2\sqrt{6}$ **b.** $5\sqrt{14}$ **c.** $\frac{2\sqrt{5}}{3}$

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*.

b.



c–e. To be completed by the student.

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.

c. To be completed by the student.

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.

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