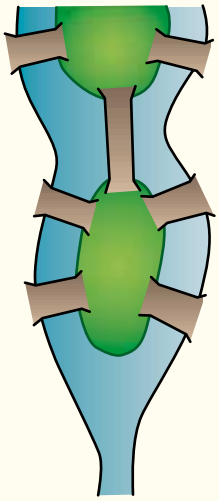
Chapter 6 Wrap-Up

EXTRA PRACTICE

1. Thailand Gourmet Sauces pays its employees $11.50/h for any hours worked per week up to 40 h. For over 40 h of work per week, an employee receives overtime pay at the rate of 1.5 times the regular hourly rate. Construct a flow chart that describes the process by which an employee's weekly pay is calculated.

2. The manager, Adnan Omar, received complaints about employees not returning clients' phone calls. After a brainstorming session, the following list of possible causes was created: line was busy, employee was on another line, employee forgot to return the call, call was sent to the wrong extension, call came in before or after office hours, employee chose not to return the call, employee was at lunch, switchboard staff lost the call, call was directed to the wrong employee, employee was at a meeting, phone message server was full, and employee did not know how to pick up the call.

The group studying the problem then developed the following broad categories for the causes: technical problems, employee error, directory/database error, and employee judgement. Construct a cause-and-effect chart to organize and present the results of the cause–effect analysis.



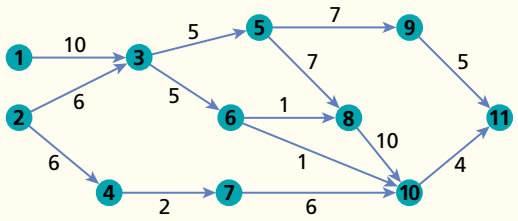
3. In 1736, Leonhard Euler solved the following problem and invented the branch of mathematics now known as Graph Theory. The people of Konigsberg loved to walk about their town and particularly enjoyed the bridges that crossed the river, which flowed through the town. Euler wondered if it was possible to traverse each bridge exactly once on a stroll through town. Create a graph that shows each bridge as an edge to represent the town and use your graph to determine if it is possible to cross each bridge only once.

4. Use the matrices below to answer the questions that follow.

$$A = \begin{bmatrix} 1 & 2 & 5 \end{bmatrix} \qquad B = \begin{bmatrix} -1 \\ 2 \\ 10 \end{bmatrix} \qquad C = \begin{bmatrix} 1 & 2 & 4 \\ 4 & 5 & 1 \\ 0 & 1 & 3 \end{bmatrix} \qquad D = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix}$$

(a) State the dimensions of A, B, and C.
(b) Calculate $C + D$.
(c) Calculate $C - D$.
(d) Calculate $2C$.
(e) Calculate $-3B$.
(f) Calculate AC.
(g) Calculate BC and CB.
(h) Explain why the product AC is possible but the product CA is not.
(i) Show that $A(D + C) = AD + AC$.

5. The following project graph indicates the duration (in days) of a project that has already been broken down into tasks numbered 1 to 11. Create a task table, and identify the project's critical path and earliest completion time.



6. Consider the following task table.

Task	Description	Duration (in days)	Prerequisite Task(s)
A	Decide on date for party	1	none
B	Reserve karaoke machine	1	A
C	Send invitations	4	A
D	Receive replies	21	C
E	Buy toys and balloons	2	D
F	Buy food	3	D
G	Blow up balloons	1	E
H	Prepare food	3	F
I	Decorate room	1	H, G
J	Pick up karaoke machine	1	B
K	Have party	1	J, I
L	Clean up	1	K
M	Return karaoke machine	1	K
N	Send out thank-you letters	3	L
O	Give extra food to food bank	1	K

Your class has decided to hold a surprise birthday party for your mathematics teacher. This task table represents the results of your planning.

(a) Draw a project graph for this party and the subsequent clean-up.
(b) Determine the critical path.
(c) Use the critical path to determine the earliest completion time.