

NAME \_\_\_\_\_

SCORE \_\_\_\_\_

### *Application of Matrices*

*Situation:* Five branch offices of a corporation send and receive materials as described in the following statements. Office 1 ships to Offices 2, 3 and 5. Office 2 ships only to Office 3. Office 3 ships to Offices 1, 2 and 5. Office 4 ships to Offices 1 and 3. Office 5 ships only to Office 4.

Use this situation for the following exercises.

1. Draw the communication network that describes this situation.
2. Write the communication matrix that describes this situation.
3. Write the matrix that shows the number of ways a package can be sent from one office to another using exactly one relay.
4. For which offices is it impossible to ship from one to another with exactly one relay?
5. Write the matrix that shows the number of ways a package can be sent from one office to another using at most one relay.
6. The Research Offices are able to ship to all the others using at most one relay. Which offices are the Research Offices?
7. Write the matrix that shows the number of ways a package can be sent from one office to another using exactly two relays.
8. Write the matrix that shows the number of ways a package can be sent from one office to another using at most two relays.
9. The normal messenger carrying materials directly from Office 3 to Office 2 did not get to work. How many other choices are available for the delivery, if at most two relays are allowed?
10. In computing  $A^3$  for Exercise 7, it is possible to find  $A \cdot A^2$  or  $A^2 \cdot A$ . Explain how this can occur if matrix multiplication is not commutative.