Vocabulary

● Review

Use the multiplication *table* at the right for Exercises 1–3.

1. Write the number in the third row, second column.

2. Write the number in the fifth row, first column.

3. Name the row and column for the number 9.

5 columns

×	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25
6	6	12	18	24	30

6 rows

● Vocabulary Builder

matrix (noun) MAY **triks**

The plural of **matrix** is **matrices**, pronounced MAY-truh-seez.

Related Words: row, column, element

Main Idea: A **matrix** is a rectangular arrangement of numbers positioned in rows and columns. **Matrices** can contain numbers, words, or variables. Each entry in a **matrix** is called an *element*.

Usage: **Matrices** are used in computer graphics, chemistry, calculus, probability and statistics, and many other fields.

● Use Your Vocabulary

Write the number of rows and columns for each *matrix*. Then write the element in the described location for each *matrix*.

4. $\begin{bmatrix} -2 & 1 & 0 & 0 \\ 5 & 1 & 3 & -8 \\ 2 & 1 & 6 & 0 \end{bmatrix}$

rows: columns:

row 2, column 3:

5. $\begin{bmatrix} a & x \\ b & u \\ i & y \\ k & t \end{bmatrix}$

rows: columns:

row 3, column 2:

You can add or subtract matrices that have the same number of rows and columns.
The sum is a matrix with the same number of rows and columns.

6. Write the number of rows and columns in each of the missing matrices.

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} + \blacksquare = \blacksquare \qquad \begin{bmatrix} l \\ m \\ n \end{bmatrix} + \blacksquare = \blacksquare \qquad \begin{bmatrix} 11 & 4 & -8 \\ -5 & 3 & 8 \end{bmatrix} + \blacksquare = \blacksquare$$

rows: ☐   rows: ☐   rows: ☐

columns: ☐   columns: ☐   columns: ☐

Problem 1 Adding and Subtracting Matrices

Got It? What is the sum $\begin{bmatrix} 5 \\ 3.2 \\ -4.9 \end{bmatrix} + \begin{bmatrix} -9 \\ -1.7 \\ -11.1 \end{bmatrix}$?

7. Add the corresponding elements to add the matrices. Fill in the missing numbers.

$$\begin{bmatrix} 5 \\ 3.2 \\ -4.9 \end{bmatrix} + \begin{bmatrix} -9 \\ -1.7 \\ -11.1 \end{bmatrix} = \begin{bmatrix} 5 + (-9) \\ \boxed{} + (-1.7) \\ -4.9 + \boxed{} \end{bmatrix}$$

$$= \begin{bmatrix} \boxed{} \\ \boxed{} \\ \boxed{} \end{bmatrix}$$

You can multiply a matrix by a real-number factor called a **scalar.** Multiplying a matrix by a scalar is called **scalar multiplication.** To use scalar multiplication, multiply each element in the matrix by the scalar.

Problem 2 Multiplying a Matrix by a Scalar

Got It? What is the product $-2\begin{bmatrix} -3 & 7.1 & 5 \end{bmatrix}$?

8. The number ☐ is the scalar in the multiplication problem.

9. How is scalar multiplication similar to the Distributive Property?

_____

_____

_____

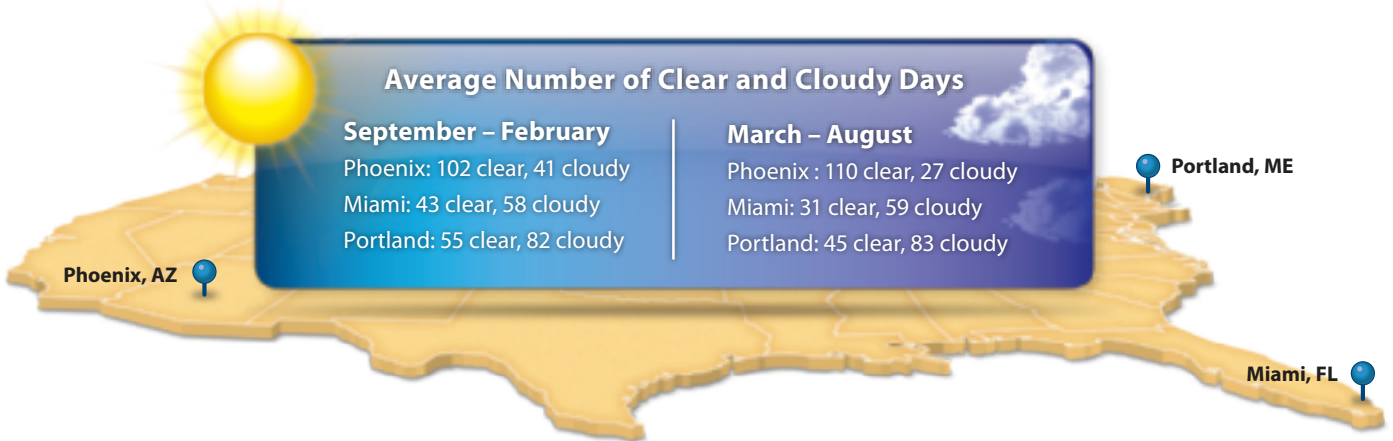**10.** Complete the multiplication.

$$-2\begin{bmatrix} -3 & 7.1 & 5 \end{bmatrix} = \begin{bmatrix} (\boxed{})(-3) & (\boxed{})(7.1) & (\boxed{})(5) \end{bmatrix}$$

$$= \begin{bmatrix} \boxed{} & \boxed{} & \boxed{} \end{bmatrix}$$

Lesson 12-1

Got It? Use the weather chart below. Which city has the greatest average number of cloudy days in a full year?

Average Number of Clear and Cloudy Days

September – February
Phoenix: 102 clear, 41 cloudy
Miami: 43 clear, 58 cloudy
Portland: 55 clear, 82 cloudy

March – August
Phoenix : 110 clear, 27 cloudy
Miami: 31 clear, 59 cloudy
Portland: 45 clear, 83 cloudy

Portland, ME

Phoenix, AZ

Miami, FL

11. Write matrices to organize the information.

September–February

	Clear	Cloudy
Phoenix		
Miami		
Portland		

March–August

	Clear	Cloudy
Phoenix		
Miami		
Portland		

12. Underline the correct word to complete the sentence.

To find the average number of clear and cloudy days for a full year you must
add / subtract the matrices.

13. Use the matrices to write and simplify an expression to find the average number of clear and cloudy days in a full year.

14. Underline the correct word to complete each sentence.

The sum of the matrices represents the number of clear and cloudy days for a
month / year for each city.

The first / second column of the matrix represents the average number of cloudy days in a full year for each city.

Phoenix / Miami / Portland is the city with the greatest average number of cloudy days in a full year.

Error Analysis A student added two matrices as shown at the right. Describe and correct the mistake.

$$\begin{bmatrix} 3 & -4 \\ 5 & 0 \end{bmatrix} + \begin{bmatrix} -2 \\ -6 \end{bmatrix} = \begin{bmatrix} -3 \\ -1 \end{bmatrix}$$

Complete the number sentences for Exercises 15 and 16.

15. $3 + (-4) + (-2) = $ ☐

16. $5 + 0 + (-6) = $ ☐

17. How do the number sentences in Exercises 15 and 16 relate to the numbers in the matrices added by the student?

_____

_____

_____

18. Circle the sentence(s) below that describe the student's error(s).

The student added across all of the rows.	The student made an error when adding positive and negative integers.	The student added matrices of different dimensions.

19. Circle the way(s) the student can correct the mistakes.

Do not add matrices of different dimensions.	Add only corresponding elements of each matrix.	Add all elements in each column together.

✓ **Math Success**

Check off the vocabulary words that you understand.

☐ matrix   ☐ element   ☐ scalar   ☐ scalar multiplication

Rate how well you can *organize data in a matrix.*

| Need to review | 0   2   4   6   8   10 | Now I get it! |