## Discussion Points and Possible Answers

**Tech Tip:** Press (esc) to hide the entry line if students accidentally click the chevron.

**Move to page 1.2.**

Suppose you have decided to rent your beach condo to vacationers during the year. The rental prices you have decided on vary according to the day of the week and season. To encourage weekly rentals, you also offer a special weekly rate. During the summer, the condo is only available to rent on a weekly basis. Page 1.3 and the table below show all the rental rates for the beach condo.

| | Weeknight | Weekend | Weekly |
|---|---|---|---|
| Spring | $150 | $175 | $1,000 |
| Summer | | | $1,300 |
| Fall | $150 | $175 | $1,000 |
| Winter | $100 | $150 | $700 |

1.  Represent the rental rates for the condo using a 4 × 3 matrix. Keep the seasons in the same order as on page 1.3. Name the matrix *A*.

    **Answer:** $A = \begin{bmatrix} 150 & 175 & 1{,}000 \\ 0 & 0 & 1{,}300 \\ 150 & 175 & 1{,}000 \\ 100 & 150 & 700 \end{bmatrix}$

**Teacher Tip:** Students may need a reminder that a 4 × 3 matrix has 4 rows and 3 columns. The rows in the matrix will represent the seasons, because there are 4 different seasons. The 3 different rate categories will represent the columns.

**Move to page 1.6.**

2.  Use the up/down arrows on page 1.6 to check your answer to Question 1. What do the two zeros in the matrix represent?

$A = \begin{bmatrix} 150 & 175 & 1{,}000 \\ 0 & 0 & 1{,}300 \\ 150 & 175 & 1{,}000 \\ 100 & 150 & 700 \end{bmatrix}$

**Answer:** The two zeros represent the weeknight rate and the weekend rate during the summer. The zeros are used as placeholders in the matrix because during the summer, the condo only rents by the week.

**Move to page 1.7.**

The information shows the numbers of weeknights, weekend nights, and weeks the beach condo was rented in each season during the first year.

| | Weeknight | Weekend | Weekly |
|---|---|---|---|
| Spring | 15 | 14 | 3 |
| Summer | | | 8 |
| Fall | 12 | 10 | 4 |
| Winter | 9 | 6 | 2 |

3. Create a 3 × 4 matrix representing the rental data on page 1.8. Keep the seasons in the same order as on page 1.8. Name the matrix *B*.

**Answer:** $B = \begin{bmatrix} 15 & 0 & 12 & 9 \\ 14 & 0 & 10 & 6 \\ 3 & 8 & 4 & 2 \end{bmatrix}$

**Teacher Tip:** Students will need to rearrange the data on page 1.8 to fit a 3 × 4 matrix. Students should also keep the column headings "Weeknight," "Weekend," and "Weekly" in the same order.

**Move to page 1.11.**

4. Use the up/down arrows on page 1.11 to check your answer to Question 3. What do the columns and rows represent?

$B = \begin{bmatrix} 15 & 0 & 12 & 9 \\ 14 & 0 & 10 & 6 \\ 3 & 8 & 4 & 2 \end{bmatrix}$

**Answer:** The rows in the matrix represent the numbers of weeknights, weekend nights, and weeks the condo was rented. The columns represent the four seasons: spring, summer, fall, and winter.

5. Is it possible to multiply matrices *A* and *B*? How can you tell?

**Answer:** It is possible to multiply the two matrices together because matrix *A* has 4 rows and matrix *B* has 4 columns.

6. If matrix *A* was multiplied by matrix *B*, what would be the dimensions of the resulting matrix? Explain.

**Answer:** The resulting matrix would be 4 × 4 because matrix *A* has 4 rows and matrix *B* has 4 columns.
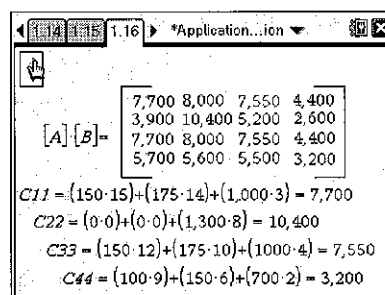
7. Find $[A] \cdot [B]$. Show your work below.

**Answer:**

$$[A] \cdot [B] = \begin{bmatrix} 150 & 175 & 1{,}000 \\ 0 & 0 & 1{,}300 \\ 150 & 175 & 1{,}000 \\ 100 & 150 & 700 \end{bmatrix} \cdot \begin{bmatrix} 15 & 0 & 12 & 9 \\ 14 & 0 & 10 & 6 \\ 3 & 8 & 4 & 2 \end{bmatrix} = [C]$$

$$[C] = \begin{bmatrix} 7{,}700 & 8{,}000 & 7{,}550 & 4{,}400 \\ 3{,}900 & 10{,}400 & 5{,}200 & 2{,}600 \\ 7{,}700 & 8{,}000 & 7{,}550 & 4{,}400 \\ 5{,}700 & 5{,}600 & 5{,}500 & 3{,}200 \end{bmatrix}$$

**Move to page 1.16.**

8. Use the up/down arrows on page 1.16 to check your answer to Question 7. How would you label each of the rows and columns?



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 🖑
              ┌ 7,700 8,000  7,550  4,400 ┐
              │ 3,900 10,400 5,200  2,600 │
 [A]·[B]=     │ 7,700 8,000  7,550  4,400 │
              └ 5,700 5,600  5,500  3,200 ┘
 C11 = (150·15)+(175·14)+(1,000·3) = 7,700
  C22 = (0·0)+(0·0)+(1,300·8) = 10,400
   C33 = (150·12)+(175·10)+(1000·4) = 7,550
    C44 = (100·9)+(150·6)+(700·2) = 3,200
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**Answer:** The rows and the columns could be labeled the same: spring, summer, fall, and winter.

9. What numbers in the matrix on page 1.16 represent the amount of rent collected in each of the four seasons?

|  | Spring | Summer | Fall | Winter |
|---|---|---|---|---|
| Spring | 7,700 | 8,000 | 7,550 | 4,400 |
| **Answer:** Summer | 3,900 | 10,400 | 5,200 | 2,600 |
| Fall | 7,700 | 8,000 | 7,550 | 4,400 |
| Winter | 5,700 | 5,600 | 5,500 | 3,200 |

The numbers highlighted represent the amount of rent collected in each of the seasons.

10. What was the total amount of rent collected during the first year?

**Answer:** To find the total amount of rent collected during the first year, add the amounts collected in the four seasons. The total amount collected during the first year was $28,850.

**Extension:** Suppose a 3% tax must be paid on all rental income. Students can be asked to perform scalar multiplication on matrix $A$ to determine how much tax should be charged in addition to the rental rate.