Denis and Nayana are helping to organize a school trip for 260 students to Regina.

- Swift Buses charges $7 per student.
- Zim Buses charges $6 per student, plus $500.

Denis and Nayana decide to calculate the charge for each company.

Which company charges less?

**Example 1 | Evaluating an expression in one step**

Create an expression to represent what Swift charges for any number of students. Determine the charge for 260 students using your expression.

**Denis’s Solution**

I used \( n \) to represent the number of students.

\[ 7n \]

\[ = 7(260) \]

\[ = 1820 \]

Swift will charge $1820 for 260 students.
Example 2  Evaluating an expression in two steps

Create an expression to represent what Zim charges for any number of students. Determine the charge for 260 students using your expression.

Nayana’s Solution

<table>
<thead>
<tr>
<th>Number of students</th>
<th>Zim’s charge ($)</th>
<th>Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>500</td>
<td>500 + 0(6)</td>
</tr>
<tr>
<td>1</td>
<td>506</td>
<td>500 + 1(6)</td>
</tr>
<tr>
<td>2</td>
<td>512</td>
<td>500 + 2(6)</td>
</tr>
<tr>
<td>3</td>
<td>518</td>
<td>500 + 3(6)</td>
</tr>
<tr>
<td>4</td>
<td>524</td>
<td>500 + 4(6)</td>
</tr>
</tbody>
</table>

I created a table of values for Zim’s charges. Then, I looked for a pattern in the values. I saw that the table started at 500 and the value increased by 6 with each row. Each value is 500 more than 6 times the number of students.

I used \( n \) to represent the number of students.

\[
\begin{align*}
500 + 6n &= 500 + 6(260) \\
       &= 1820 \\
       &= 2060 \\
\end{align*}
\]

Zim will charge $2060 for 260 students. $1820 is less than $2060, so Swift will charge less.

Communication Tip

- Use brackets when you substitute a number for a variable. This will prevent you from running numbers together. For example, to evaluate \( 2a \) for \( a = 10 \), write \( 2(10) \).
- Write each step in a calculation directly under the previous step. Line up the equal signs. This makes the calculation easier to read and check. For example,

\[
\begin{align*}
2a + 5 &= 2(10) + 5 \\
       &= 20 + 5 \\
       &= 25 \\
\end{align*}
\]
Reflecting

A. Each company’s charge was described in words. How else did Denis and Nayana describe the relation between the charge and the number of students?

B. Why was Denis able to evaluate his expression with just one arithmetic operation, while Nayana needed two operations?

WORK WITH the Math

Example 3 | Solving a patterning problem

Jasmin made a pattern using blue pattern blocks. How many blocks are in figure 20?

Solution

Each figure starts with 2 blocks at the bottom.
Figure 1 has 3 blocks.
Figure 2 has 4 blocks.
Figure 3 has 5 blocks.
Each figure has 2 more blocks than its figure number.

Use $n$ to represent the figure number.

\[ n + 2 \]
\[ = (20) + 2 \]
\[ = 22 \]

Substitute 20 for $n$.

There are 22 blocks in figure 20.
**A Checking**

1. Evaluate each expression for \( d = 5 \).
   a) \( 6d \)  
   b) \( 5d - 1 \)  
   c) \( d + 1 \)  
   d) \( 3(d + 2) \)

2. Write an expression to represent the cost to rent a sled for a base fee of $35, plus $12 per hour.

**B Practising**

3. Evaluate each expression for \( a = 3 \) and \( b = 5 \).
   a) \( 3a \)  
   b) \( 8b \)  
   c) \( 9a \)  
   d) \( 2(b - 1) \)

4. Aisha did \( t \) sets of weightlifting, except the last time when she stopped 2 reps from the end of the last set. There are 8 reps in each set.
   a) Write an expression to represent how many reps Aisha did.
   b) Suppose that \( t = 4 \). Calculate how many reps she did.

5. Evaluate the expression \( 6(b - 1) + 3 \) for \( b = 4 \). Show and explain all the steps.

6. Write an expression for each cost.
   a) $4 to sharpen each pair of skates for a class skating party
   b) hamburgers at $3 each
   c) $2 per hour plus $5 to rent skates
   d) hats on sale for $10 each

7. Each figure in the pattern is made from green, blue, purple, and yellow tiles. Each expression tells the number of tiles of one colour in a figure. Match each expression to its colour.
   **A.** \( 2n \)  
   **B.** \( 2n + 4 \)  
   **C.** \( 2n - 1 \)  
   **D.** \( n + 2 \)

- **figure 1**
- **figure 2**
- **figure 3**
- **figure 4**
8. Samantha works in the snack bar at a community centre. She earns $8 an hour. One weekend, she was paid a bonus of $50.
   a) Write an expression to represent her total earnings for \( h \) hours.
   b) On that weekend, she worked for 15 h. Calculate how much she earned. Show your work.

9. Jerry sells wool caps at a booth. He earns $25 a day, plus $2 for each cap that he sells. On Monday, he sold 17 caps.
   a) Create a table of values to show Jerry’s daily earnings when he sells 0, 1, 2, 3, 4, and 5 caps.
   b) Write an expression to describe Jerry’s daily earnings.
   c) Calculate how much money Jerry earned on Monday.

10. A box of DVDs costs $56. Winnie can use $3 coupons to reduce the price.
    a) Write an expression to describe the amount that Winnie would pay if she used \( c \) coupons.
    b) Suppose that Winnie has 5 coupons. How much will she pay?

11. a) Complete the table.

<table>
<thead>
<tr>
<th>Term number (figure number)</th>
<th>Picture</th>
<th>Term value (number of stars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>⭐⭐⭐⭐⭐⭐</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>⭐⭐⭐⭐⭐⭐</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>⭐⭐⭐⭐⭐⭐</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) Write a rule for this pattern. Use \( n \) for the term number in your expression.

c) Predict the value of term 8.

12. A banquet hall charges a flat rate of $1000, plus $30 per guest. Suppose that there is a party at the banquet hall every night. Why would the owner of the banquet hall find it useful to create an algebraic expression to calculate the bill for each party?