GUESS AND CHECK

One way to solve a problem is to guess the answer and then check to see whether it is correct. If it is not, you can keep guessing and checking until you get the right answer.

When a ball is dropped onto the ground, it rebounds to a certain percent of its original height. As the ball continues to bounce, the height of each rebound is the same percent of the height of the previous rebound.

For example, if a ball that rebounds to 70% of its original height is dropped from a height of 150 cm, the height of the first rebound is $0.7 \times 150$ or 105 cm. The height of the second rebound is $0.7 \times 105$ or 73.5 cm.

If a ball that rebounds to 75% of its original height is dropped from a height of 2 m, or 200 cm, the height, $h$ centimetres, of the $n$th rebound is given by the following equation.

$$h = 200(0.75)^n$$

Which rebound has a height of about 20 cm?

1. What information are you given?
2. What are you asked to find?
3. Do you need an exact or an approximate answer?

Set up a table. Guess at the value of $n$. Use the guess to calculate the height of the $n$th rebound. If the calculated height is not about 20 cm, make another guess at the value of $n$ and calculate the height again.

<table>
<thead>
<tr>
<th>guess</th>
<th>calculation of $h$</th>
<th>is $h$ about 20 cm?</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>$200(0.75)^5 \approx 47$</td>
<td>h too high</td>
</tr>
<tr>
<td>10</td>
<td>$200(0.75)^{10} \approx 11$</td>
<td>h too low</td>
</tr>
<tr>
<td>9</td>
<td>$200(0.75)^9 \approx 20$</td>
<td>h too low</td>
</tr>
<tr>
<td>8</td>
<td>$200(0.75)^8 \approx 20$</td>
<td>20 checks!</td>
</tr>
</tbody>
</table>

The eighth rebound has a height of about 20 cm.

Does the answer seem reasonable?

Is there a way to solve the problem graphically?
1. Guess a possible answer.
2. Use the answer to check against a known fact.
3. If necessary, adjust your guess and check again.

Apply, Solve, Communicate

Write your guess for each of questions 1–4. Compare your answer with a classmate’s. Then, use your research skills to find the correct value.

1. **Lake** What is the area, in square kilometres, of the largest lake entirely in Canada?

2. **Students** How many students are enrolled in Grade 11 in Ontario?

3. **Trail** The Trans Canada Trail is the longest trail of its kind in the world.
   a) How long is it?
   b) What is the length of the trail in Ontario?

4. **Airports**
   a) How many airports are there in Canada?
   b) How many have paved runways?

5. **Number puzzle** Copy the diagram shown below. Place five of the digits from 1 to 9 in the circles so that at least one of the two-digit numbers formed by each pair of numbers joined by a line segment is divisible by 13 or 7. The digits can be paired in either order.

6. **Cereal box** The area of the front of a cereal box is 532 cm$^2$, the area of each side is 140 cm$^2$, and the area of the bottom is 95 cm$^2$. What is the volume of the box?

7. **Finding digits** What are the digits A, B, and C if the following equation is true?
   \[(AA)^2 = BBCC\]

8. **Number puzzle** Copy the diagram. Place the numbers from 1 to 9 in the circles so that each line of three numbers adds to 18. The 6 and the 1 have been placed for you.

9. **Word puzzle** Each letter represents a different digit in this addition. Find the values of O, N, E, and T.

   \[
   \begin{align*}
   & \text{ONE} \\
   + & \text{ONE} \\
   \hline
   & \text{TEN}
   \end{align*}
   \]
10. **True sentence**  Copy the figure. Replace each ■ with a spelled-out number to make the sentence true.

In this triangle, there are ■ f’s, ■ h’s, and ■ t’s.

11. **Fire stations**  A county has 35 towns, as shown in the diagram. Each of the shortest line segments represents a road 10 km long. Regional planners are suggesting fire stations in some towns, so that no town is more than 10 km by road from a fire station. What is the minimum number of fire stations that must be built?

12. **Magic square**  In a magic square, the sum of the numbers in each row, column, and diagonal is the same, in this case 15. Rearrange the numbers so that the sums for each row, column, and diagonal are all different, and none of the sums is 15.

<table>
<thead>
<tr>
<th>6</th>
<th>1</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>4</td>
</tr>
</tbody>
</table>

13. **Writing expressions**  By replacing each ■, use each digit from 0 to 9 once in three correct expressions of the form shown. Replace each ● with a symbol chosen from \( \times, \div, +, \) or \(-\).

14. **Whole numbers**  A, B, C, and D are whole numbers. The same number results when 4 is added to A, 4 is subtracted from B, C is divided by 4, and D is multiplied by 4. If A, B, C, and D add to 100, what are the values of A, B, C, and D?

15. **Number sets**  The digits from 1 to 9 have been used to write three numbers, where the second number is twice the first number, and the third number is three times the first number.

\[
\begin{align*}
1 & 9 & 2 \\
3 & 8 & 4 \\
5 & 7 & 6 \\
\end{align*}
\]

a) Another set of three numbers that satisfies the same conditions can be found by rearranging the digits in the three given numbers. What is the set of numbers?

b) There are two other sets of three numbers that satisfy the same conditions. One set is a rearrangement of the digits of the other set. What are the two sets of numbers?

16. **Formulating problems**  Write a problem that can be solved using the guess and check strategy. Have a classmate solve your problem.