Quick Review

Here is a number pattern: 1, 2, 5, 10, 17
A pattern rule is:
Start at 1. Add 1. Increase the number you add by 2 each time.

Here is another number pattern: 2, 4, 7, 9, 12
A pattern rule is:
Start at 2. Alternately add 2, then add 3.

Here is another number pattern: 4, 8, 7, 11, 10
A pattern rule is:
Start at 4. Alternately add 4, then subtract 1.

Try These

1. Write the next 5 terms in each pattern.
   a) 25, 29, 30, 34, 35, _____, _____, _____, _____, _____
   b) 3, 4, 6, 9, 13, _____, _____, _____, _____, _____
   c) 16, 19, 17, 20, 18, _____, _____, _____, _____, _____

2. Write the first 4 terms of each pattern.
   a) Start at 6. Add 7 each time.
      _____, _____, _____, _____
   b) Start at 2. Alternately add 6, then subtract 2.
      _____, _____, _____, _____

Copyright © 2009 Pearson Education Canada. The right to reproduce this page is restricted to the purchasing school.
Practice

Use a calculator when it helps.

1. Write the next 4 terms in each pattern. Write each pattern rule.
   a) 100, 125, 120, 145, 140, ______, ______, ______, ______
      Pattern rule: ____________________________________________
   b) 85, 81, 90, 86, 95, ______, ______, ______, ______
      Pattern rule: ____________________________________________
   c) 36, 72, 144, 288, 576, ______, ______, ______, ______
      Pattern rule: ____________________________________________

2. Write the 6th term of each pattern.
   a) Start at 500. Alternately add 50, then subtract 15. ________________
   b) Start at 85. Add 7. Increase the number you add by 3 each time. ________________
   c) Start at 763. Subtract 13 each time. ________________
   d) Start at 97. Alternately subtract 9, then add 2. ________________

3. Start at 999. Write the first 7 terms of a pattern.
   Write the pattern rule.
   Pattern: ____________________________________________
   Pattern rule: ____________________________________________

Stretch Your Thinking

Write the first 5 terms of as many different patterns as you can that start with the terms 19, 24, …
Chapter 1
Lesson 1
Modelling Patterns

GOAL
Use models to represent, extend, and make predictions about number patterns.

You will need toothpicks and pennies.

1. Rebecca made a pattern using toothpicks and pennies. Then she started a number table.

   ![Pattern Diagram]

   a) Fill in the shaded cells of Rebecca’s number table.

<table>
<thead>
<tr>
<th>Number of triangles</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of toothpicks</td>
<td>3</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Number of pennies</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   b) Use toothpicks and pennies to extend Rebecca’s pattern up to four triangles. Sketch your model.

c) What is the pattern rule for the number of toothpicks?
   
   Pattern rule: ____________________________

   What is the pattern rule for the number of pennies?
   
   Pattern rule: ____________________________

d) Predict the number of pennies needed for five triangles.
   
   ______ pennies

   Make a model to check. Sketch your model.

e) Extend the pattern for up to seven triangles.
   Then complete the number table above.
Chapter 1
Lesson 2
Extending Increasing Patterns

Describe and extend increasing number patterns.

1. What is a pattern rule for each pattern?
   a) 1, 3, 5, 7, ...
      Pattern rule: ______________________
   b) 5, 10, 15, ...
      Pattern rule: ______________________
   c) 12, 22, 32, ...
      Pattern rule: ______________________

2. Fill in the next three numbers in each pattern.
   a) 2, 3, 4, _____, _____, _____
   b) 20, 25, 30, _____, _____, _____
   c) 3, 6, 9, _____, _____, _____

3. Kate made a table to show the ingredients for chocolate macaroons.
   a) Extend Kate’s pattern for up to five batches. Fill in the table.

<table>
<thead>
<tr>
<th>Number of batches</th>
<th>Butter (mL)</th>
<th>Chocolate squares</th>
<th>Coconut (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>5</td>
<td>250</td>
</tr>
<tr>
<td>2</td>
<td>200</td>
<td>10</td>
<td>500</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   b) Write each pattern rule.
      Pattern rule for butter: ______________________
      Pattern rule for chocolate squares: ______________________
      Pattern rule for coconut: ______________________
Extending Decreasing Patterns

1. What is a pattern rule for each pattern?
   a) 10, 8, 6, ...
      Pattern rule: _____________________________
   b) 15, 14, 13, ...
      Pattern rule: _____________________________
   c) 90, 85, 80, ...
      Pattern rule: _____________________________

2. Fill in the next three numbers in each pattern.
   a) 77, 76, 75, _____, _____, _____
   b) 1000, 900, 800, _____, _____, _____
   c) 24, 20, 16, _____, _____, _____

3. Owen is packing his collection of 150 comic books into boxes. 10 comics fit in each box. Owen created a pattern to show the number of boxes he needs. His pattern is 150, 140, 130, ....
   a) Why do the numbers in Owen’s pattern decrease by 10 each time?
      __________________________________________
   b) What is Owen’s pattern rule? _________________________________
   c) How many boxes does Owen need? _______ boxes

4. Jay bought 47 jelly beans. Starting the next day, he ate 5 jelly beans every day. How many days did it take for Jay to eat all the jelly beans?
   ________________________________________________
Quick Review

Look at the pattern and the table.

<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Number of Squares</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4 = 1 + 3</td>
</tr>
<tr>
<td>2</td>
<td>5 = 2 + 3</td>
</tr>
<tr>
<td>3</td>
<td>6 = 3 + 3</td>
</tr>
<tr>
<td>4</td>
<td>7 = 4 + 3</td>
</tr>
<tr>
<td>5</td>
<td>8 = 5 + 3</td>
</tr>
</tbody>
</table>

The number of squares is 3 more than the figure number.
Let the variable $f$ represent any figure number:
Number of squares: $f + 3$
$f + 3$ is an expression. It represents the pattern in the number of squares.

Try These

1. For the pattern below:
   a) Complete the table.

<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Number of Squares</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   b) Write an expression to represent the pattern in the numbers of squares.
Practice

1. For the pattern below:
   a) Complete the table.

<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Number of Squares</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

   b) Write an expression to represent the pattern in the number of squares.

   c) Find the number of squares in the 10th figure.

2. For each table, write an expression for the number of dots in any figure.

   a)
<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Number of Dots</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
</tr>
</tbody>
</table>

   b)
<table>
<thead>
<tr>
<th>Figure Number</th>
<th>Number of Dots</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

3. a) Write an expression for the number pattern.
   11, 12, 13, 14, 15, 16, ... __________________________

   b) Write the next 5 terms in the pattern. __________________________

Stretch Your Thinking

Find the 50th term in each pattern in question 2 above.

a) __________________________  b) __________________________
Quick Review

One box holds 15 books.

- How many books will 2 boxes hold? 3 boxes? 4 boxes?
  Make a table.
  Two boxes hold 30 books.
  Three boxes hold 45 books.
  Four boxes hold 60 books.

- Predict how many books 10 boxes will hold.

To predict the number of books 10 boxes will hold, multiply:

\[ 10 \times 15 = 150 \]
Ten boxes will hold 150 books.

Try These

1. One concert ticket costs $11.
   a) Complete the table to find the cost of 7 tickets.
   b) Write a pattern rule for the cost.
   c) Predict the cost of 10 tickets.
   d) Extend the pattern. How many tickets can you buy with $155?
Practice

1. Ivo practises the guitar 25 minutes every day.
   a) Make a table to show how many minutes Ivo practises in one week.
   b) How many minutes does Ivo practise in 10 days?
   c) How many minutes will Ivo practise in November? How many hours is that?
   d) How many days will it take Ivo to practise a total of 15 hours?

2. One minibus holds 18 students.
   a) Make a table to show how many students can ride in 6 minibuses.
   b) Write a pattern rule for the number of students.
   c) How many students can ride in 10 minibuses?

Stretch Your Thinking

Think about the minibuses in question 2 above.
   a) How many students can ride in 25 minibuses?
   b) How many minibuses are needed for 170 students?
Chapter 1
Lesson 5

Solving Problems Using Patterns

GOAL
Identify patterns to solve problems.

1. Owen is counting his penny collection. He arranged the pennies in a triangle.
   a) What is the sum of the top and bottom rows? _______ pennies
   b) How can you use a pattern to count the pennies?
   c) How many pennies does Owen have?

2. What is the sum of the numbers in the pattern 2, 4, 6, 8, 10, 12, 14, 16? Sydney calculates $2 + 16 = 18$. Use a pattern to finish Sydney’s work.

3. Calculate the sum of the numbers in each pattern.
   a) 5, 10, 15, 20, 25, 30
   Sum: __________________________
   b) 10, 9, 8, 7, 6, 5, 4, 3, 2, 1
   Sum: __________________________
Use variables in expressions.

1. Brandon is going to visit his grandparents in 7 days from today. He wrote an expression for the date he is leaving: $t + 7$.
   a) What does the $t$ represent?
   b) Why is the number 7 in the expression?

2. Write an expression for each student’s age. The first one is done for you.
   a) Jolie is 5 years older than her brother. 
      __________
   b) Tyler is 1 year older than his sister. _______
   c) Beth is 10 years older than her sister. _______
   d) Matthew is 2 years younger than his brother. _______

3. What does each expression mean?
   a) $b + 1$ ________________
   b) $p + 3$ ________________
   c) $m - 5$ ________________
   d) $10 + f$ ________________

4. Rose has $15$ more than Jon.
   a) Write an expression for the amount of money Rose has. Use addition. ______
   b) Write an expression for the amount of money Jon has. Use subtraction. ______
1. Shanti, Kate, and Mateo are playing a number pattern game on a 100 chart. Shanti moves 2 spaces each turn. Kate moves 5 spaces each turn. Mateo moves 3 spaces each turn. The person who passes 100 first wins the game.

a) Shanti starts at 10. What number is she on after 3 turns? _________

b) Kate starts at 2. What number is she on after 3 turns? _________

c) Mateo starts at 4. What number is he on after 3 turns? _________

d) Write a pattern rule for each player.
   Shanti’s pattern rule: ____________________________________________
   Kate’s pattern rule: ____________________________________________
   Mateo’s pattern rule: ____________________________________________

e) Predict who will win the game. Explain your thinking.

f) Model the game. Who wins? ______________________________________