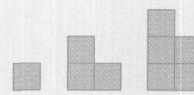# 4.20 – Questions Handout #s 4-6, 9-11 & 15

Key Ideas

- Some patterns are based on geometric shapes or lines.

- Other patterns are based on number operations.

- To identify a pattern:
  - Find the first shape or number.
  - Describe how new shapes or numbers are generated.
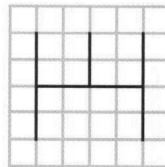 - Look for repeated sets of operations.

> Add ▢ to the bottom to find the next shape.

Communicate the Ideas

1. Use words and numbers to describe one pattern in Pascal's triangle.
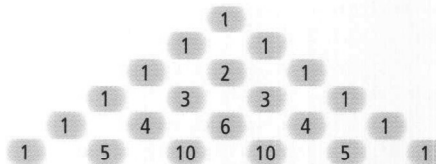
2. Is this a fractal tree? Explain.

3. a) Create a fractal tree. Show the first three stages. Explain how you know it is a fractal.
   **b)** Challenge a classmate to identify a pattern in your fractal tree and to draw the next stage.

## Check Your Understanding

Practise

4. Describe each number pattern.

   a) 2, 6, 18, 54, ...
   b) 110, 90, 70, 50, ...

5. Malina can bring up to four CDs on a car ride. How many different ways can she bring no CDs? one CD? two CDs? three CDs? four CDs?

6. During a graduation barbecue, students can choose up to five condiments for their burgers.

   - ketchup
   - mustard
   - relish
   - barbecue sauce
   - steak sauce

   How many different ways can students put condiments on their burgers?

7. Copy the fractal tree onto triangle dot paper. Describe how new branches are created. Extend the branches to one more stage.
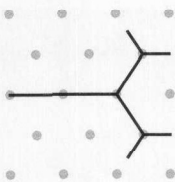
8. Look at the stages of the Sierpinski triangle fractal.
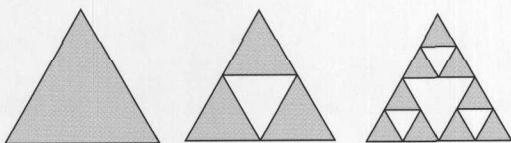
a) Explain how to extend the pattern.
b) Copy the fractal and draw the next stage.

9. Describe each sequence.

a) 14, 17, 20, 23, …
b) $\dfrac{3}{2}, \dfrac{5}{2}, \dfrac{7}{2}, \dfrac{9}{2}, …$
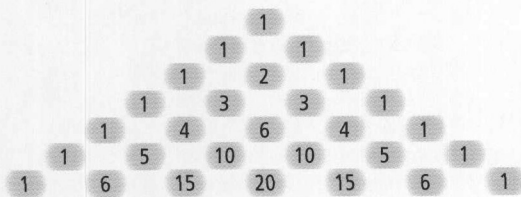
10. Write the next three numbers for each sequence in question 9.

11. What operation is used to extend each sequence? Write the next two numbers.

a) 1, 5, 25, 125, …
b) 243, 81, 27, 9, …
c) 2, 16, 30, 44, …

Apply

For questions 12 and 13, use Pascal's triangle.

```
            1
          1   1
        1   2   1
      1   3   3   1
    1   4   6   4   1
  1   5  10  10   5   1
1   6  15  20  15   6   1
```
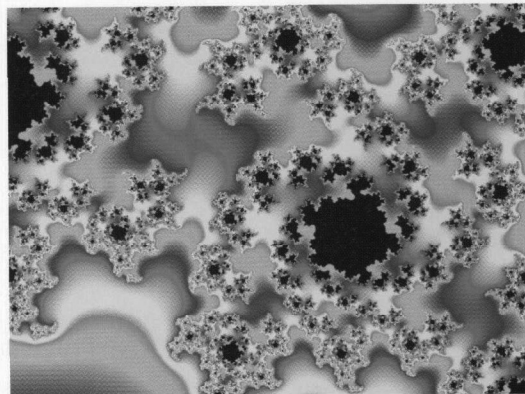
12. Identify a pattern for finding the numbers in each row. Extend Pascal's triangle for three more rows.

13. a) Add the first three terms in the third diagonal (1 + 3 + 6). Where can you find this sum in Pascal's triangle?
b) Does this pattern happen on other diagonals? If so, how can you extend the pattern?

14. Look at the computer-generated fractal in this picture.

Try This!

a) Describe a pattern of colours and shapes.
b) Design your own fractal. Challenge a classmate to identify your pattern.

Internet Connect

Go to **www.mcgrawhill.ca/links/math8** and follow the links to explore some interesting fractal patterns.

Extend

15. a) Copy and complete the table.

Number	Sum Up To the Number	Result
1	1	
2	1 + 2	
3	1 + 2 + 3	
4		
5		
6		

b) Can you find each number and the sum up to that number in Pascal's triangle?
c) How can you use Pascal's triangle to find the sum of numbers up to any number?