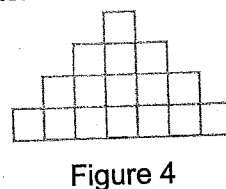
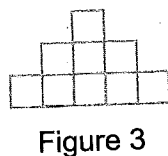
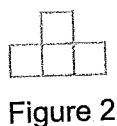


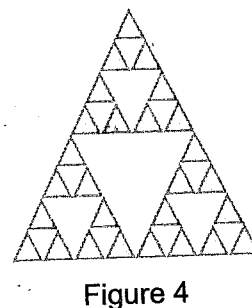
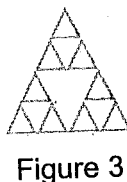
PA7-4 Patterns (Advanced)

1. Draw a T-table to predict the number of shaded parts in Figure 5 of each pattern.

a)

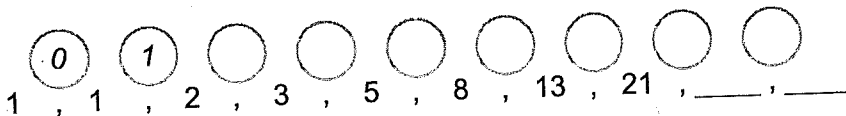


b)



2. One of the most famous sequences in mathematics is the **Fibonacci sequence**.

a) In the circles, write the amount added between the terms of the Fibonacci sequence. Then use the pattern in the steps to continue the sequence.



b) Complete the table by writing whether each number in the sequence is even (E) or odd (O).

Number	1	1	2	3	5	8	13	21		
Even or Odd	O	O	E	O						

- Describe the odd-even pattern in the Fibonacci sequence.
- Is the 38th term in the Fibonacci sequence even or odd? Explain.
- Add the first four odd Fibonacci numbers. Then add the first two even Fibonacci numbers. What do you notice?
- Add the first six odd Fibonacci numbers. Then add the first three even Fibonacci numbers. What do you notice?

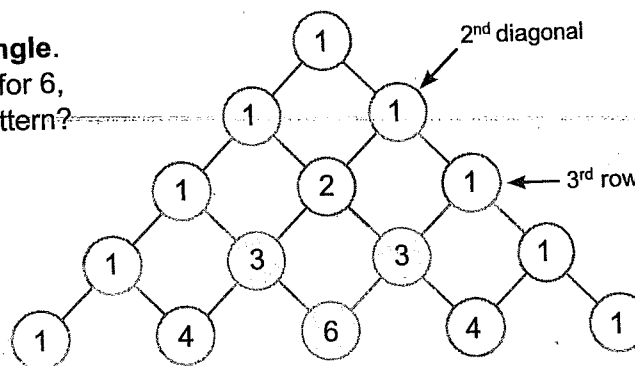
3. a) Pick any number greater than 1 on **Pascal's Triangle**.

Add the two numbers directly above it. (Example: for 6, add 3 + 3.) Repeat several times. Do you see a pattern?

b) Create Pascal's Triangle up to 7 rows. Use the pattern you found in part a).

c) What is the third number in the 9th row of Pascal's Triangle? Hint: Extend the pattern in the 3rd diagonal.

d) Describe any other patterns you see in the triangle.

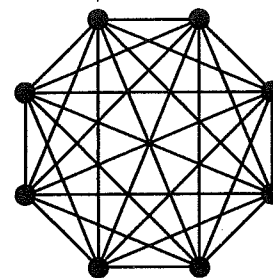


INVESTIGATION ▶ There are 8 dots in the figure at right.

Each pair of dots is joined by exactly 1 line segment (● — ●).

How can you find out how many line segments there are without counting every line?

Start with fewer dots and use a pattern to make a prediction.



A. For each set of dots, use a ruler to join every pair of dots with a straight line.

Write the number of lines in the blank.



1 dot

___ lines



2 dots

___ lines



3 dots

___ lines



4 dots

___ lines

B. Write the numbers of lines from Question A on the blanks. Find the gaps between the numbers and write your answers in the circles.

a)

1 dot

b)



2 dots

c)



3 dots

d)



4 dots

C. Predict the gaps and numbers in the sequence. Write your predictions below.

1 dot



2 dots



3 dots



4 dots



5 dots



6 dots

D. Test your predictions by joining the dots in each figure. Were you right?



5 dots



6 dots

E. a) Extend the pattern to calculate the number of line segments in the figure at the top of the page (8 dots).

b) How many lines would you need to join every pair of dots in a set of 10 dots?