

## QUADRATIC SEQUENCES

10 MARCH 2014



### Lesson Description

In this lesson we:

- Revise how we identify a quadratic sequence.
- Revise determining the general term of a quadratic pattern



### Summary

$$T_n = an^2 + bn + c$$

$$\text{First first difference} = 3a + b$$

$$\text{Constant second difference} = 2a$$

$$\text{First term} = a + b + c$$



### Test Yourself

#### Question 1

In each case decide whether the following sequences are quadratic. Write yes or no next to each one.

- 4 ; 6 ; 8 ; 10 ; 12 ; ....
- 17 ; 26 ; 37 ; 50 ; 65 ; ...
- 22 ; 27 ; 37 ; 48 ; 59 ; ....
- 2 ; -2 ; -4 ; -8 ; -14 ; ....

#### Question 2

These are all quadratic sequences find the next term each time.

- 3 ; 11 ; 21 ; 33 ; 47 ; 63 ; \_\_\_\_\_
- 9 ; 12 ; 17 ; 24 ; 33 ; 44 ; \_\_\_\_\_
- 63 ; 48 ; 35 ; 24 ; 15 ; 8 ; \_\_\_\_\_

#### Question 3

The pattern: 0 ; 5 ; 12 ; 21

- linear
- exponential
- quadratic
- recursive

#### Question 4

The formula for the general term is of the pattern: 0 ; 5 ; 12 ; 21 is

- $T_n = 5n$
- $T_n = 5^{n-1}$
- $T_n = n^2 + 2n - 3$
- $T_n = T_{n+1} - T_{n-1}$

**Question 5**

1; 8; 19; 34; 53; ..

Determine the  $n$ th term of the above sequence

- A.  $T_n = n^2 + 4n - 4$
- B.  $T_n = 2n^2 + n - 2$
- C.  $T_n = 3n^2 - 2n$
- D.  $T_n = 4n^2 - 5n + 2$

**Question 6**

The sequence 3; 9; 17; 27; ... is a quadratic sequence. The next term is .....

- A. 33
- B. 35
- C. 37
- D. 39

**Question 7**

Determine the  $n$ th term of the sequence 3; 9; 17; 27; ...

- A.  $T_n = n^2 + 3n - 1$
- B.  $T_n = n^2 - 3n - 1$
- C.  $T_n = n^2 + 3n + 1$
- D.  $T_n = n^2 - 3n + 1$

**Question 8**

Using the formula we found in **number 7** for the  $n$ th term of sequence 3; 9; 17; 27.

Which term has a value greater than 269?

- A.  $T_{10}$
- B.  $T_{11}$
- C.  $T_{12}$
- D.  $T_{13}$

**Question 9**

A sequence with the general term  $T_n = an^2 + bn + c$  is given. The first term of the sequence is 5. The value of the first difference of the sequence is 6. The second difference is 4 and is also constant.

- A.  $a = 4; b = -6; c = 7$
- B.  $a = 2; b = 0; c = 3$
- C.  $a = 5; b = -9; c = 4$
- D.  $a = 3; b = -3; c = 4$



**Improve your Skills**

**Question 1**

The following sequence of numbers forms a quadratic sequence:

-2; -3; -6; -11; ...

- a.) Determine an expression for the  $n^{\text{th}}$  term of the quadratic sequence.
- b.) Explain why the sequence of numbers will never contain a positive term.

**Question 2**

Determine the formula for the  $n^{\text{th}}$  term of the sequence -3; -1; 3; 9 ...

**Question 3**

The sequence 3;9;17;27;..... forms a quadratic sequence.

- a.) Write down the next term.
- b.) If  $T_n = an^2 + bn + c$ , determine the values of a, b and c.

**Question 4**

The following sequence represents triangular numbers

3 ; 6 ; 10 ; 15 ; .....

- a.) Write down the next two numbers in the sequence.
- b.) Find the formula of the general term (the nth term).
- c.) If any two consecutive numbers are added what do you notice.
- d.) Can you prove c) .

**Question 5**

Looking at the following pattern

Figure 1



Figure 2



Figure 3

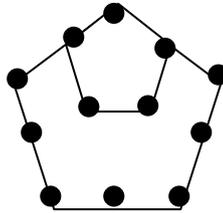
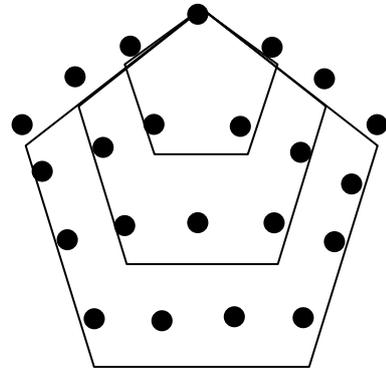


Figure 4



$T_n$  represents the total number of dots in the nth figure.  $T_1 = 1$  and  $T_2 = 5$  . If the pattern continues in the same way find the

- a.)  $T_5$
- b.)  $T_{50}$