

INVESTIGATION

Consider the linear number pattern : 5;8;11;14;17; ...

The **first term** T_1 is 5.

The pattern is formed by adding 3 to each new term.

We say that the **common difference** between the terms is 3.

$$T_1 = 5$$

$$T_2 = 5 + 3$$

$$T_3 = 5 + 3 + 3 = 5 + 2 \cdot 3$$

$$T_4 = 5 + 3 + 3 + 3 = 5 + 3 \cdot 3$$

$$T_5 = 5 + 3 + 3 + 3 + 3 = 5 + 4 \cdot 3$$

$$T_6 = 5 + 3 + 3 + 3 + 3 + 3 = 5 + 5 \cdot 3$$

1. Find the next three terms and the general term of the pattern.

$$T_7 =$$

$$T_8 =$$

$$T_9 =$$

$$T_n =$$

2. Using technology, plot the relation between n - the term number and T_n - the n^{th} term in the pattern. Describe what you notice from the plot.
3. Use any 2 points on the graph to find the slope of the line joining these two points.
4. Repeat step 3 for more sets of points.
5. What do you notice about the relationship between the slope and the common difference?
6. Change the first term in the previous pattern and keep the common difference as 3. What do you notice about this graph ? Give 2 examples.
7. What quantity do you need to change in the pattern to change the slope of the graph ?

The first term of the new linear number pattern is 2 and the common difference is 5.

- a. Calculate the first six terms. Show calculations.
- b. Calculate the sum of the first 6 terms. Show calculations.
- c. Complete the table

T_1	T_2	T_3	T_4	T_5	T_6

- d. Calculate $T_1 + T_6$
- e. Calculate $T_2 + T_5$
- f. Calculate $T_3 + T_4$
- g. Use the pattern you have seen in the last 3 sections of this problem to find the sum of the first 6 terms.
- h. Calculate the sum of the first 10 terms of this pattern. Show calculations.
- i. Find the sum of the first 7 terms .