Linear Sequences

Example 1

3 6 9 12 15 18

2, 5, 8, 11, 14, 17

i) Find rule Add 3

ii) Find next two terms 14, 17

iii) Find formula for n^{th} term

iv) Find 10th term

v) Find 25th term

iii) n^{th} term $= 3n - 1$

iv) 10th term $= 3 \times 10 - 1 = 29$

v) 25th term $= 3 \times 25 - 1 = 74$

Ex 2

2 4 6 8

8, 10, 12, 14, 16, 18

i) Rule Add 2

ii) Next two terms 16, 18

iii) n^{th} term $= 2n + 6$

iv) 10th term $= 2 \times 10 + 6 = 26$

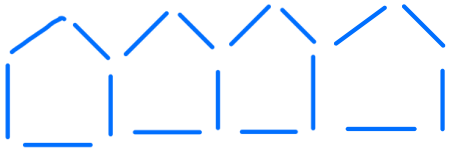
v) 25th term $= 2 \times 25 + 6 = 56$

Matchstick Patterns

5 9 13

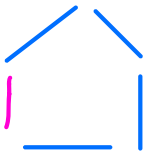
Draw next pattern

How many matchsticks in n^{th} pattern



17

n^{th} pattern has $4n+1$ matchsticks



Adding  each time

+1 is the left wall of first pattern

Decreasing Linear Sequences

Ex1 51, 48, 45, 42, 39, 36

n^{th} term $= 54 - 3n$

Ex2 46, 42, 38, 34

n^{th} term $= 50 - 4n$

Exercise Find the nth term formula

1) 99, 98, 97, 96

n^{th} term $= 100 - n$

2) 21, 16, 11, 6

n^{th} term $= 26 - 5n$

3) 99, 88, 77, 66

n^{th} term $= 110 - 11n$

4) $-1, -5, -9, -13$

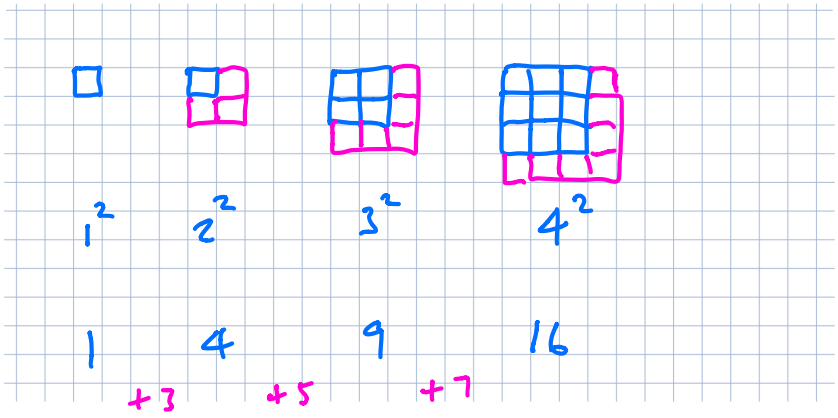
n^{th} term $= 3 - 4n$

5) $6\frac{1}{2}, 5, 3\frac{1}{2}, 2, \frac{1}{2}$

n^{th} term $= 8 - 1.5n$

or $8 - \frac{3n}{2}$

Lead in to Quadratic Sequences



$1^2 = 1 = 1$

$2^2 = 1 + 3 = 4$

$3^2 = 1 + 3 + 5 = 9$

$4^2 = 1 + 3 + 5 + 7 = 16$

$5^2 = 1 + 3 + 5 + 7 + 9 = 25$

$6^2 = 1 + 3 + 5 + 7 + 9 + 11 = 36$

$7^2 = 1 + 3 + 5 + 7 + 9 + 11 + 13 = 49$

$8^2 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 = 64$

2nd difference		2	2	2	2	2	2	
1st diff		3	5	7	9	11	13	15
Sequence	1	4	9	16	25	36	49	64

If 2nd differences are all 2 then the nth term has n^2 in the formula.

Example

2nd diff		2	2	2	2	
1st diff	3	5	7	9	11	
	7	10	15	22	31	42
n^2	1	4	9	16	25	36

$+6 \qquad 6 \qquad 6 \qquad 6 \qquad 6 \qquad 6 \qquad 6$

n^{th} term $= n^2 + 6$