

Sum of the series

Pg 293 Q2

$$3 + 7 + 11 + 15 + \dots$$

↖ ↗  
+4 +4

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$a = 3$$

$$d = 4$$

$$S_n = \frac{n}{2} [2(3) + (n-1)4]$$

$$\frac{n}{2} [6 + 4n - 4]$$

$$\frac{n}{2} (4n + 2)$$

$$S_{20} = \frac{20}{2} (4(20) + 2)$$

[Pg 293  
Q3 → 10]

$$10(80 + 2)$$

$$10(82)$$

$$= 820$$

Q3)  $S_n$

$$1+4+7+10+\dots$$

↙  
+3

$$a=1$$

$$d=3$$

$$S_n = \frac{n}{2} (2(1) + (n-1)3)$$

$$= \frac{n}{2} (2 + 3n - 3)$$

$$S_n = \frac{n}{2} (3n - 1) \Rightarrow \frac{3n^2 - n}{2}$$

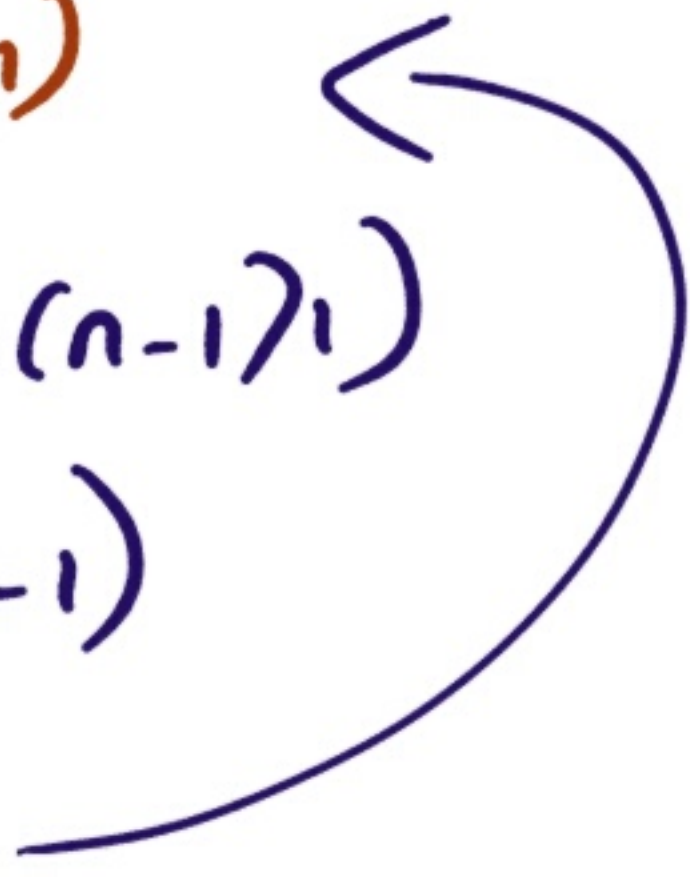
$$S_{16} = \frac{16}{2} (3(16) - 1) = 376$$



$$7) \quad 1+2+3+\dots+\frac{n}{2}(n+1)$$

$$a=1 \quad S_n = \frac{n}{2}(2(1) + (n-1)1)$$

$$d=1 \quad = \frac{n}{2}(2+n-1)$$

$$\frac{n}{2}(n+1)$$


$$S_{100} = \frac{100}{2}(100+1)$$

$$S_{100} = 5050$$

## Quadratic Sequences

A quadratic pattern will have a first and a second difference. If the second difference is constant the pattern is quadratic

Eg) Find the next two terms of the quadratic sequence

	$T_1$	$T_2$	$T_3$	$T_4$	$T_5$	$T_6$	$T_7$
	3	4	6	9	13	18	24
First diff		+1	+2	+3	+4	+5	+6
Second diff			+1	+1	+1		

not constant  
not linear

Second diff is constant.  
 $\therefore$  quadratic

Eg 2) Find the first five terms  
of the  $n$ th term

$$T_n = n^2 + 4$$

		First diff	Second diff
First term :	$T_1 = (1)^2 + 4 = 5$	3	2
2 <sup>nd</sup> term	$T_2 = (2)^2 + 4 = 8$		
	$T_3 = (3)^2 + 4 = 13$	5	2
	$T_4 = (4)^2 + 4 = 20$	7	2
	$T_5 = (5)^2 + 4 = 29$	9	2

Linear pattern

$$T_n = an + b$$

$$T_n = a + (n-1)d$$

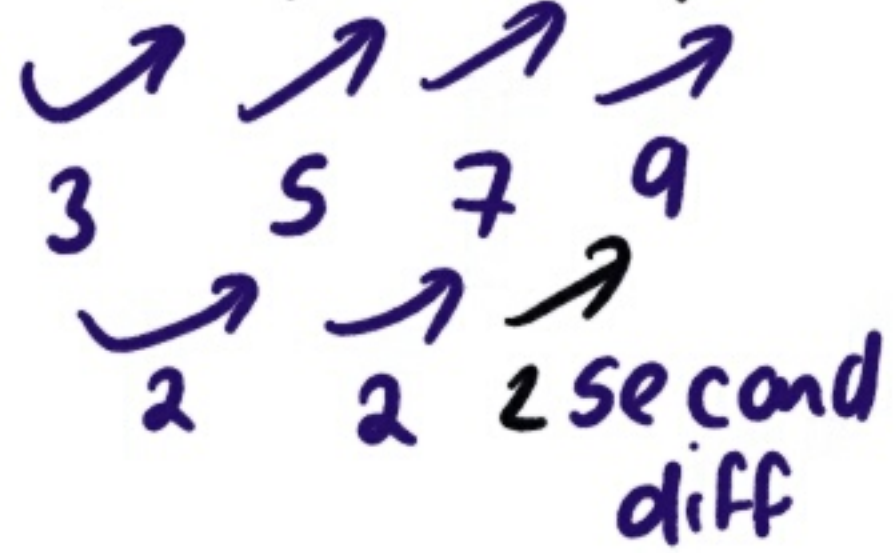
Quadratic

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

where  $a, b$  and  $c \in \mathbb{Z}$

Eg 1 Find an expression for the  $n^{\text{th}}$  term of the sequence.

$T_1$   $T_2$   
7, 10, 15, 22, 31, ...



Note:  $a = 1/2$  the second difference

$$a = 2 / 1/2 = 1$$

$$a = 1$$

$$a = 1$$

$$b = 0$$

$$c = 6$$

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

$$T_1 \Rightarrow (1)^2 + b(1) + c = 7$$

make equation

$$1 + b + c = 7$$

$$-1 \mid b + c = 6 \mid -1$$

$$T_2 \Rightarrow (2)^2 + b(2) + c = 10$$

$$4 + 2b + c = 10$$

$$-4 \mid 2b + c = 6 \mid -4$$

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

$$T_n = n^2 + 6$$

Simultaneous Equation

$$\textcircled{1} \quad b + c = 6 \quad (-1)$$

$$2b + c = 6$$

$\Rightarrow$

$$-b - c = -6$$

$$2b + c = 6$$

$$\hline b = 0$$

Find c

$$b + c = 6$$

$$b = 0$$

$$(0) + c = 6$$

$$c = 6$$

Pg 297

Q6