

Level 1 → All linear

Yellow → 8 20 32 ...

$\underbrace{\hspace{10em}}_{12}$ $\underbrace{\hspace{10em}}_{12}$ $\boxed{12n-4}$

Blue → 10, 21 32 $\boxed{11n-1}$

$\underbrace{\hspace{10em}}_{11}$ $\underbrace{\hspace{10em}}_{11}$

Green → 3 10 12 24 $\boxed{7n-4}$

$\underbrace{\hspace{10em}}_7$ $\underbrace{\hspace{10em}}_7$ $\underbrace{\hspace{10em}}_7$

Red → 0 2 4 6 $\boxed{2n-2}$

$\underbrace{\hspace{10em}}_2$ $\underbrace{\hspace{10em}}_2$ $\underbrace{\hspace{10em}}_2$

Level 2

Yellow → 7 9 13 19 27

$\underbrace{\hspace{10em}}_2$ $\underbrace{\hspace{10em}}_4$ $\underbrace{\hspace{10em}}_6$ $\underbrace{\hspace{10em}}_8$

$\frac{2}{2}n^2$

7 9 13 19 27

$\boxed{n^2}$

1 4 9 16 25

therefore:

$\boxed{n^2 - n + 7}$

6 5 4 3 2

$\underbrace{\hspace{10em}}_{-1}$ $\underbrace{\hspace{10em}}_{-1}$ $\underbrace{\hspace{10em}}_{-1}$ $\underbrace{\hspace{10em}}_{-1}$

$\boxed{-n+7}$

Blue ≠ Red (same sequence)

(n) position:

1 st	2 nd	3 rd	4 th	5 th
0	1	4	9	16

↳ square numbers, but zero counts, so

$(n-1)^2$ → example: $n=5 \rightarrow (5-1)^2 = 16 \checkmark$

active,
level changes,
so does
equation.

Green \rightarrow 6 17 28 39

$\underbrace{\hspace{10em}}$ $\underbrace{\hspace{10em}}$ $\underbrace{\hspace{10em}}$
 " " "

$11n - 5$

here 3

n 1 2 3 4 5

Green \rightarrow 1 3 5 7 9

$\underbrace{\hspace{10em}}$ $\underbrace{\hspace{10em}}$ $\underbrace{\hspace{10em}}$ $\underbrace{\hspace{10em}}$
 2 2 2 2

$2n - 1$ (odd).

Red \rightarrow (Part 1) 2 12 26 44 66

$\underbrace{\hspace{10em}}$ $\underbrace{\hspace{10em}}$ $\underbrace{\hspace{10em}}$ $\underbrace{\hspace{10em}}$
 10 14 18 22

$\frac{4}{2} = n = 2$

	1	2	3	4	5	(n)
(Part 2)	0	2	8	18	32	(There are) $2n^2$

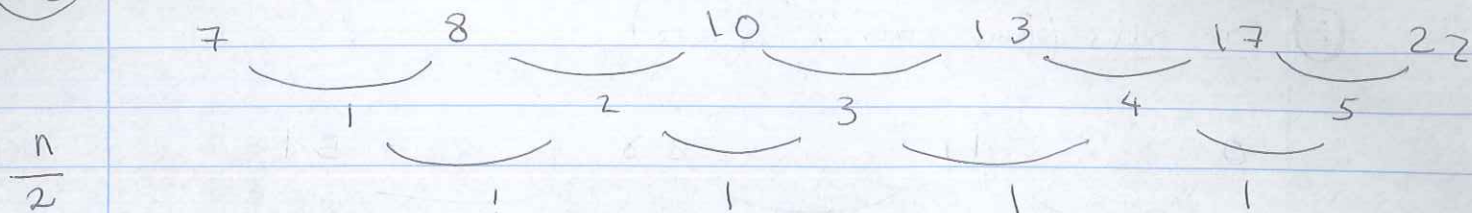
So, real sequence - $2n^2$ is

2	12	26	44	66
-	2	8	18	32
0	4	8	12	16
$\underbrace{\hspace{10em}}$	$\underbrace{\hspace{10em}}$	$\underbrace{\hspace{10em}}$	$\underbrace{\hspace{10em}}$	
4	4	4	4	

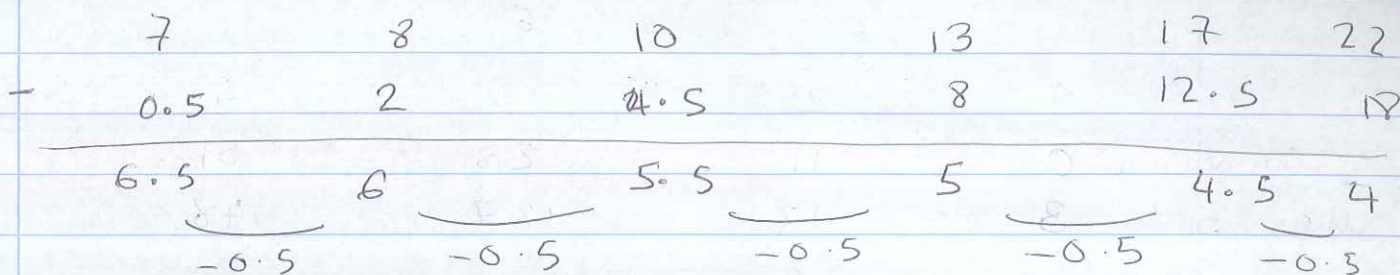
We now substitute in $2n^2 + 4n + x$ to get x.

$\rightarrow \boxed{2n^2 + 4n - 4}$

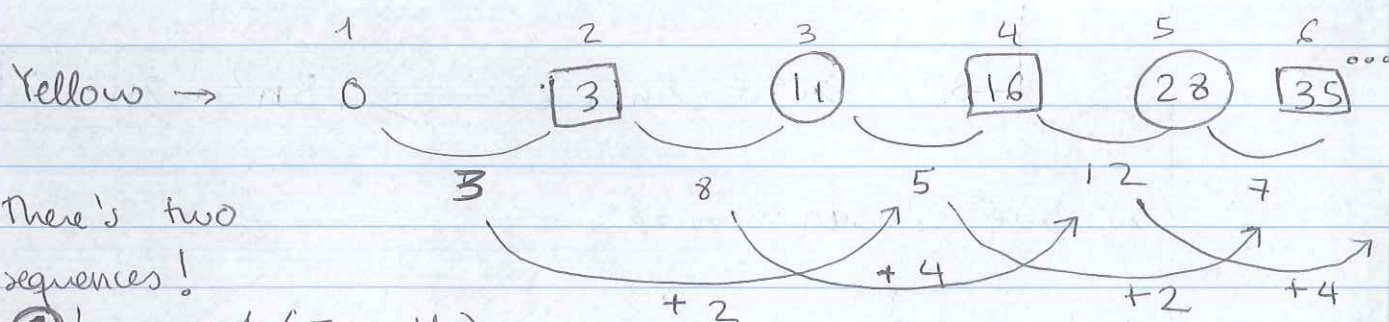
(L3) Blue →



∴ original sequence - $\frac{1}{2}$ (square numbers):

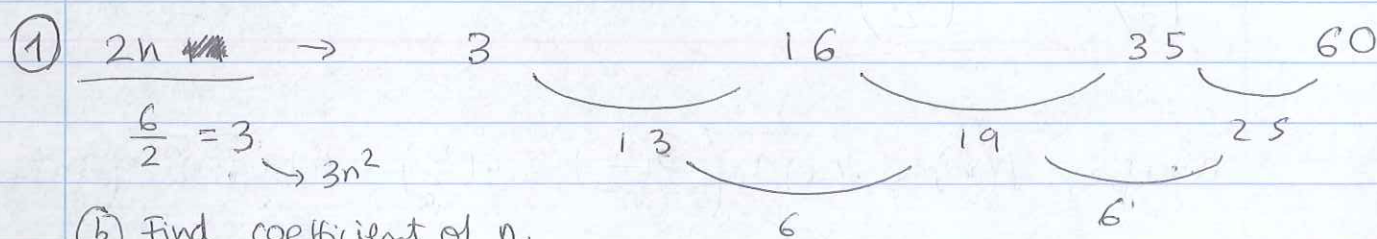


↳ $0.5n^2 - 0.5n + 7$

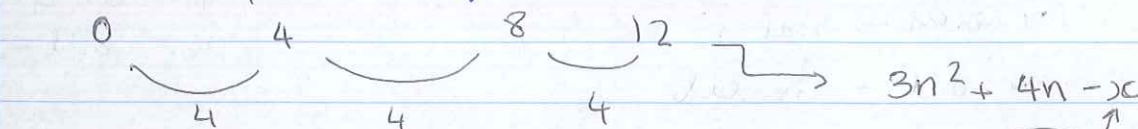


There's two sequences!

- ② $2n + 1$ (For odds)
- ① $2n$ (For evens)



① $2n$ → $\frac{6}{2} = 3 \rightarrow 3n^2$



try any point

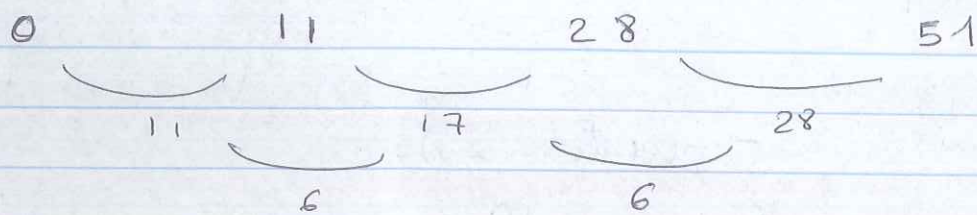
★ By trial and error, we spotted that for any value of n the ~~even~~ formula is

$3\left(\frac{n}{2}\right)^2 + 4\left(\frac{n}{2}\right) - 4$

example: when $n=2 \rightarrow$ it should according to the sequence, be = 3.

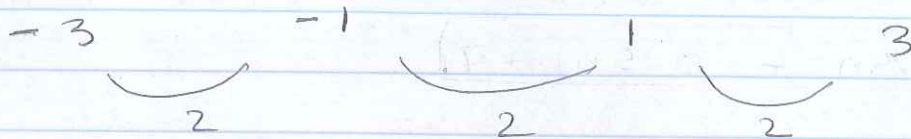
$3 \times \left(\frac{2}{2}\right)^2 + 4\left(\frac{2}{2}\right) - 4 = 3 \checkmark$

② For odds (from our ^{first} sequence)



1 2 3 4

Our sequence	0	11	28	51
when $3n^2$	3	12	27	48



$\rightarrow 3n^2 + 2n + x \Rightarrow \boxed{3n^2 + 2n - 5}$

We have 2 sequences \Rightarrow

$3n^2 + 2n - 5$ and

$3\left(\frac{n}{2}\right)^2 + 4\left(\frac{n}{2}\right) - 4$

Therefore, $f(x) = \underbrace{\sqrt{(-1)^n}} \times \left(3\left(\frac{n}{2}\right)^2 + 4\left(\frac{n}{2}\right) - 4 \right) + \underbrace{\sqrt{(-1)^{n+1}}}} \times (3n^2 + 2n - 5)$

For even \rightarrow real n^2

For odd \rightarrow not real

For even \rightarrow not real n^2

For odd \rightarrow real