## Level 1 → All linear

cktime,
vel changes,
so does
e
quation.

Yellow → 8 20 32 ... $\boxed{12n-4}$

12 12

Blue → 10, 21 32 $\boxed{11n-1}$

11 11

Green → 3 10 12 24 $\boxed{7n-4}$

7 7 7

Red → 0 2 4 6 $\boxed{2n-2}$

2 2 2

## Level 2

Yellow → 7 9 13 19 27

2 4 6 8

2 2 2

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

7 9 13 19 27

− $\boxed{n^2}$ 1 4 9 16 25

6 5 4 3 2

−1 −1 −1 −1

therefore:

→ $\boxed{n^2-n+7}$

$\boxed{-n+7}$

Blue & Red (same sequence)

| | | | | | |
|---|---|---|---|---|---|
| n) position: | 1st | 2nd | 3rd | 4rd | 5th. |
| | 0 | 1, | 4 | 9 | 16 |

↳ square numbers, but zero counts, so

$(n-1)^2$ → example: n = 5 ↳ $(5-1)^2 = 16$ ✓

Green → 6 17 28 39

11 11 11

$\boxed{11n - 5}$

Level 3

n 1 2 3 4 5

Green → 1 3 5 7 9

2 2 2 2

$\boxed{2n-1}$ (odd).

Red → Part 1 2 12 26 44 66

10 14 18 22

4 4 4

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

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

So, real sequence − $2n^2$ is

| | | | | | |
|---|---|---|---|---|---|
| | 2 | 12 | 26 | 44 | 66 |
| − | 2 | 8 | 18 | 32 | 50 |
| | 0 | 4 | 8 | 12 | 16 |

4 4 4 4

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

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

Ⓛ3 Blue →

7 8 10 13 17 22

1 2 3 4 5

$\frac{n}{2}$ 1 1 1 1

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

| | | | | | | |
|---|---|---|---|---|---|---|
| | 7 | 8 | 10 | 13 | 17 | 22 |
| − | 0.5 | 2 | 4.5 | 8 | 12.5 | 18 |
| | 6.5 | 6 | 5.5 | 5 | 4.5 | 4 |

−0.5 −0.5 −0.5 −0.5 −0.5

↳ $\boxed{0.5n^2 - 0.5n + 7}$

1 2 3 4 5 6

Yellow → 0 $\boxed{3}$ ⑪ $\boxed{16}$ (28) $\boxed{35}$ ...

3 8 5 12 7

+2 +4 +2 +4

There's two sequences!

② ↳ 2n + 1 (For odds)

① ↳ 2n (For evens).

① 2n → 3 16 35 60

13 19 25

6 6

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

ⓑ Find coefficient of n.

0 4 8 12

4 4 4

→ $3n^2 + 4n - x$

try any point for

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

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

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

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

② For odds (from our first sequence)

0 11 28 51

11 17 28

6 6

| | | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Our sequence | 0 | 11 | 28 | 51 |
| − when $3n^2$ | 3 | 12 | 27 | 48 |
| | −3 | −1 | 1 | 3 |

2 2 2

$$\hookrightarrow \quad 3n^2 + 2n + x \Longrightarrow \boxed{3n^2 + 2n - 5}$$

We hae 2 seqences ⇒

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

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

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

For even → real n°
For odd → not real

For even → not real n°.
For odd → real.