

The n th Term of a Quadratic Sequence *extend*

ANSWERS

1



Find the n th term of

1.5 5 9.5 15 21.5

second difference 1, so $\frac{1}{2}n^2$

what is left: 1, 3, 5, ... = $2n - 1$

Answer $\frac{1}{2}n^2 + 2n - 1$

2



A quadratic sequence has 1st term 4,
3rd term 22 and 5th term 56.
Find its n th term.

subtract: $8a + 2b = 18$,
 $16a + 2b = 34$

$8a = 16$: $a = 2$, $b = 1$, $c = 1$

Answer $2n^2 + n + 1$

3



Find the n th term of

$\frac{2}{3}$ $\frac{6}{5}$ $\frac{12}{7}$ $\frac{20}{9}$

tops 2, 6, 12, 20: $n^2 + n$

bottoms 3, 5, 7, 9: $2n + 1$

Answer $\frac{n^2 + n}{2n + 1}$

4



The first four terms of a quadratic
sequence are a , $2a + 3$, $3a + 9$, 30.
Find a and the n th term.

differences $a + 3$, $a + 6$, $21 - 3a$

second differences $3 = 15 - 4a$, $a = 3$

Answer $a = 3$, $\frac{3}{2}n^2 + \frac{3}{2}n$

5



Sequence A has n th term
 $2n^2 + 3n - 1$. Sequence B has n th
term $n^2 + 4n + 11$. From which term
on is the term of A bigger than the
term of B?

$n^2 - n - 12 > 0$, $(n - 4)(n + 3) > 0$

$n > 4$: the 4th terms are equal, 43

Answer from the 5th term on

6



Sam works out the first ten terms of
 $n^2 + n + 41$ and finds that they are
all prime. Show that not every term of
the sequence is prime.

$n = 41$: $41^2 + 41 + 41$

$= 41(41 + 1 + 1) = 41 \times 43$

Reason the 41st term is 41×43

7



The n th triangle number is $\frac{n(n+1)}{2}$.

Prove that the sum of any two
triangle numbers next to each other is
a square number.

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

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

Proof $(n+1)^2$

8



Prove that the second difference of
the sequence with n th term
 $an^2 + bn + c$ is always $2a$.

term $n + 1$ minus term n : $2an + a + b$

next difference minus this one: $2a$

Proof the second difference is $2a$