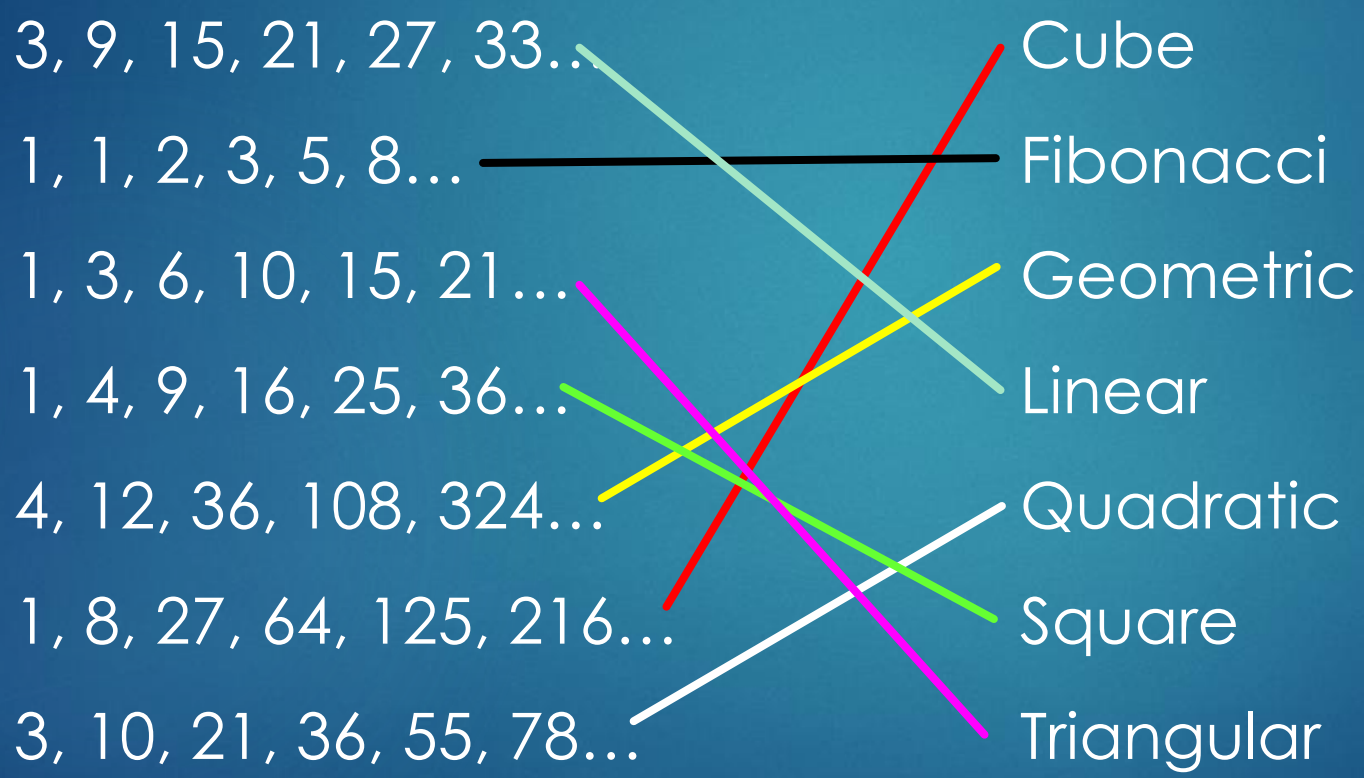
Starter

- Match the following sequences to their names:



Recurrence Relations

09/06/2017

- Know the names of the different types of sequence
- Understand the subscript notation of a recurrence relation
- Able to generate terms of a sequence given the nth term

Recurrence Relations

- Recurrence Relations describe the relationship between consecutive terms in a sequence

- Example: A sequence is defined by the nth term:

$$U_n = 2U_{n-1}$$

Given that $U_1 = 2$ write down the first four terms of the sequence

Recurrence Relations

U is used here to represent a term

n is the term number

- Example: A sequence is defined by the nth term:

$$U_n = 2U_{n-1}$$

U_1 means the 1st term of the sequence

Given that $U_1 = 2$ write down the first four terms of the sequence

- $U_1 = 2$

$$U_2 = 2 \times U_{2-1}$$
$$= 2 \times U_1$$
$$= 2 \times 2$$
$$= 4$$

$$U_3 = 2 \times U_{3-1}$$
$$= 2 \times U_2$$
$$= 2 \times 4$$
$$= 8$$

$$U_4 = 2 \times U_{4-1}$$
$$= 2 \times U_3$$
$$= 2 \times 8$$
$$= 16$$

$\therefore 2, 4, 8, 16 \ldots$

Recurrence Relations

- Example: A sequence is defined by the nth term:

$$U_{n+1} = U_n{}^2 - 8U_n + 17$$

Current term

Previous term

Given that $U_1 = 4$ find U_2 and U_3

- $U_1 = 4$

$$U_2 = U_1{}^2 - 8U_1 + 17$$
$$= 4^2 - 8(4) + 17$$
$$= 16 - 32 + 17$$
$$= 1$$

$$U_3 = U_2{}^2 - 8U_2 + 17$$
$$= 1^2 - 8(1) + 17$$
$$= 1 - 8 + 17$$
$$= 10$$

Extension: Given, instead, that $U_1 = 2$, find U_2, U_3 and U_{100}

Recurrence Relations

09/06/2017

- For each of the following, find $U_2, U_3, \ and \ U_4$

a)	$U_n = 10U_{n-1}$	$U_1 = 4$	$U_2 = 40$	$U_3 = 400$	$U_4 = 4000$
b)	$U_n = 5U_{n-1} + 3$	$U_1 = 2$	$U_2 = 13$	$U_3 = 68$	$U_4 = 343$
c)	$U_n = \frac{1}{2}U_{n-1} - 2$	$U_1 = 6$	$U_2 = 1$	$U_3 = -1.5$	$U_4 = -2.75$
d)	$U_{n+1} = 4U_n + 7$	$U_1 = 1$	$U_2 = 11$	$U_3 = 51$	$U_4 = 211$
e)	$U_{n+1} = {U_n}^2 - 2U_n$	$U_1 = 1$	$U_2 = -1$	$U_3 = 3$	$U_4 = 3$
f)	$U_{n+1} = 2 - \frac{4}{U_n}$	$U_1 = 4$	$U_2 = 1$	$U_3 = -2$	$U_4 = 4$

Extension: Given, instead, that $U_1 = 3$ in e) and f), find U_{100}