What's Going On?

Checking In

Minds on   What's next?

Action!   Arithmetic Sequences

Consolidation   Tipsy Questions

Learning Goal - I will be able to solve problems involving geometic sequences.

LGL

The 5th term of an arithmetic sequence is 45 and the 8th term is -6.
Determine the 20th term. $(8-5)$

The sequence decreases 3 times and the total decrease is $(-6-45 = -51)$

The difference, d, is $\frac{-51}{3} = -17$

To get from 8th term to 20th term, we decrease by 17, 12 times.

20th term $= -6 + (12)(-17)$

$= -6 - 204$

$= -210$

8th term   number of decreases to 20th term   difference

Minds on

What's next?

$\times 2$ $\times 2$ $\times 2$

9, 18, 36, 72

Minds on

What's the tenth term?

1   2   3   10

9, 18, 36, ... 4608

Minds on

What's the nth term?

n	1	2	3
term	9, 18, 36, ...		

n	1	2	3	10
term	9	9×2	$9 \times 2 \times 2$	9×2^9

✱ starts at 9
doubles each time

n	1	2	3	10
term	9×2^0	9×2^1	9×2^2	9×2^9

Action!

Geometric Sequences

New Term

Geometric Sequence: A sequence that has the same ratio, **common ratio**, between any pair of consecutive terms.

Examples: 4, 8, 16, 32, 64 … $r = 2$

2000, 1000, 500, 250, 125 … $r = \dfrac{1}{2}$ or 0.5

$$t_n = a \times r^{n-1}$$

Action!

Geometric Sequences

9, 18, 36, ...

The General Term

$$t_n = a \times r^{n-1}$$

The Recursive Formula

$$t_1 = a, \; t_n = r \times t_{n-1}, \text{ where } n > 1$$

Action!

Geometric Sequences

9, 18, 36, ...

The General Term

$$t_n = a \times r^{n-1}$$

$$t_n = 9 \times 2^{n-1}$$

Action!

Geometric Sequences

9, 18, 36, ...

The Recursive Formula

$$t_1 = a, \; t_n = r \times t_{n-1}, \text{ where } n > 1$$

$$t_1 = 9, \; t_n = 2 \times t_{n-1}$$

Sequence	~~General Term~~ Ratio	~~Expanded~~ General Term	Recursive Formula	10th Term
5, 15, 45, 135 …	$\frac{15}{5} = 3$	$t_n = 5 \times 3^{n-1}$	$t_1 = 5$ $t_n = 3 \times t_{n-1}$	98,415
10 125, 6 750, 4 500 …	$\frac{6750}{10125} = \frac{2}{3}$ 0.67	$t_n = 10125 \times \frac{2}{3}^{n-1}$	$t_1 = 10125$ $t_n = \frac{2}{3} \times t_{n-1}$	~263.4
125, 50, 20, 8 …	$\frac{50}{125} = 0.4$	$t_n = 125 \times 0.4^{n-1}$	$t_1 = 125$ $t_n = 0.4 \times t_{n-1}$	0.032768
15, -60, 240 …	$\frac{-60}{15} = -4$	$t_n = 15 \times (-4)^{n-1}$	$t_1 = 15$ $t_n = (-4) \times t_{n-1}$	-3932160

Consolidation

Tipsy Questions

1. A company has 3 kg of radioactive material that must be stored until it becomes safe to the environment.

After one year, 95% of the material remains.

How much material will be left after 100 years?

$$a = 3$$

$$r = 0.95$$

$$t_n = a \times r^{n-1}$$

$$t_{100} = 3 \times 0.95^{100-1}$$

$$= 3 \times 0.95^{99}$$

$$= 0.0197 \text{ kg}$$

19.7 g remain

Consolidation

Tipsy Questions

3 terms between

2. The 5th term in a geometric sequence is 45, and the 8th term is 360. Determine the 20th term.

Over three terms, we have increased by a factor of

$$\frac{360}{45} = 8$$

n	5	6	7	8
term	45			360

$\times 8$

$r = 2$

$$t_{20} = 45 \times 2^{15}$$

OR

$$t_{20} = 360 \times 2^{12}$$