

What is a geometric sequence?

- An ordered pattern where each subsequent value increases or decreases by a specific factor.
- Each subsequent term in a geometric sequence is obtained by multiplying the common ratio, 'r', (the result you get when dividing any term from its previous term) to the previous term.

The most important thing to remember is that:

- Arithmetic sequences ADD/SUB a constant (common difference, 'd')
- Geometric sequences MULT/DIV by a factor (common ratio, 'r')

**Example 1:** Determine the common ratio for each geometric sequence.

a. 2, 6, 18, ...	b. $3, \frac{3}{2}, \frac{3}{4}, \dots$	c. $6, -4, \frac{8}{3}, -\frac{16}{9}, \dots$
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Once we know the common ratio, we can find the value of any term in any geometric sequence. The quickest way to obtain the answer is by looking for patterns.

Start with a number for any geometric sequence and call it 'a'. To get the number in the next term, multiply by the common ratio, 'r' (can be a fraction to represent division), then continue the same pattern for every subsequent term.

Term value	_____	_____	_____	_____	_____	...	_____
Term #	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>		n <sup>th</sup>

Using the following variables and any pattern you see, can you develop a general formula to determine the value of any term in any geometric sequence?

'a' = value of 1 <sup>st</sup> term in sequence	'n' = number of terms in sequence
'r' = common ratio	't <sub>n</sub> ' = value of n <sup>th</sup> term in sequence



**Example 2:** Determine the value of the  $n^{\text{th}}$  term for each geometric sequence.

a) 3, -12, 48, -192, ..., $t_{11}$	b) $75, -37\frac{1}{2}, 18\frac{3}{4}, \dots, t_6$
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**Example 3:** Apply the general formulas.

a) Insert 2 numbers between 5 and 320, to form a geometric sequence.	b) Given $t_4 = 72$ and $t_6 = 32$ , find the common ratio and the 1 <sup>st</sup> term.
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**Example 4:** Sports Junkies is a consignment store that uses the idea of a Dutch auction. It will take 10% off the cost of an item each week until the item is sold. Determine the cost of a \$375 item 9 weeks from now.

**Example 5:** Each year, the value of a car depreciates to 70% of the value from the previous year. A car was bought new for \$67000.

a) What is the value of the car after 7 years?	b) Write the general term after 'n' years
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**Example 6:** A ball is dropped from a height of 2 m. After each bounce, it rises to 75% of its previous height.

a) What height does the ball reach after the 9 <sup>th</sup> bounce?	b) After how many bounces will the ball reach a height of 20 cm?
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Homework: