

11.3. Geometric Sequences

Last time • Arithmetic sequences

$$\{a_1, a_1 + d, a_1 + 2d, a_1 + 3d, \dots\}$$

$$a_n = a_1 + (n-1)d$$

Geometric Sequences

E.g. Invest \$1000 to an account with an annual return of 7%.

$$\$1000, \$1000 \cdot (1.07), 1000 \cdot (1.07)^2, 1000 \cdot (1.07)^3$$

$\times 1.07$ $\times 1.07$ $\times 1.07$
 common ratio

An example of a geometric sequence.

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A geometric sequence is a sequence in which the ratio of a term and the previous term is a constant. This constant is called the common ratio of the sequence.

In general, a geometric sequence has the form

$$\{a_1, a_1 \cdot r, a_1 \cdot r^2, a_1 \cdot r^3, a_1 \cdot r^4, \dots\}$$

$a_1; a_2 = a_1 \cdot r; a_3 = a_1 \cdot r^2; a_4 = a_1 \cdot r^3$
 $a_n = a_1 \cdot r^{n-1}$

General term

$$a_n = a_{n-1} \cdot r$$

← recursive formula

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Write the first five terms of the geometric sequence, given any two terms:

$a_7 = 192, a_{10} = 1536$

$a_1 = 3$ ✓
 $a_2 = 6$ ✓
 $a_3 = 12$ ✓
 $a_4 = 24$ ✓
 $a_5 = 48$ ✓

Additional Materials

- eBook
- Geometric Sequences
- Learn by Example

$a_7 = a_1 r^6 = 192$
 $a_{10} = a_1 r^9 = 1536$
 $\frac{a_1 r^9}{a_1 r^6} = \frac{1536}{192} = 8$
 $r^3 = 8$
 $r = 2$
 $a_1 \cdot (2^6) = 192$
 $a_1 = \frac{192}{64} = 3$

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