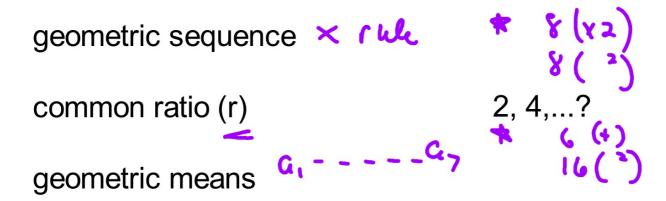
Precalc 12.2

Find the nth term and geometric means of a sequence

Find the sum of n terms of a geometric series



geometric series

Geometric Sequence A geometric sequence is a sequence in which each term after the first, a_1 , is the product of the preceding term and the common ratio, r. The terms of the sequence can be represented as follows, where a_1 is

$$a_{1}r a_{1}r^{2}a_{1}r^{3}a_{1}r^{4}$$
 $a_{1}b = G_{1}r^{2}a_{1}r^{4}$
 $a_{2}b = G_{1}r^{2}a_{2}r^{4}$
 $a_{3}b = G_{1}r^{2}$
 $a_{4}a = a_{1}r^{2}$
 $a_{n}a = G_{1}r^{2}$
 $a_{n}a = G_{1}r^{2}$

$$a_{10} = G_1 r^{q}$$
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The following sequence is an example of a geometric sequence.

10, 2, 0.4, 0.08, 0.016, ... *Can you find the next term?*



Think in terms of mult (not division)



Determine the common ratio and find the next three terms in each sequence.

sequence.
$$\frac{1}{2} = \frac{1}{2} = \frac{1}{2}$$

a.
$$1, -\frac{1}{2}, \frac{1}{4}, \dots$$

$$\frac{a_n}{a_{n-1}}$$

$$1(?) = -1/2$$
 $-1/2(?) = 1/4$

b.
$$r-1$$
, $-3r+3$, $9r-9$,

 $q_1 = -27r + 27$
 $q_2 = 8/r - 8/r$
 $q_3 = 8/r - 8/r$
 $q_4 = -27r + 27$
 $q_5 = 8/r - 8/r$
 $q_6 = -243r + 243$
 $q_7 = 9/r$
 $q_7 = 9/r$

The nth Term of a Geometric Sequence

The *n*th term of a geometric sequence with first term a_1 and common ratio r is given by $a_n = a_1 r^{n-1}$.

Example 2 Find an approximation for the 23rd term in the sequence 256. -179.2. 125.44. ...

$$Q = 4, r$$

$$= 256(-0.7)$$

0.100

Geometric sequences can represent growth or decay.

- For a common ratio greater than 1, a sequence may model growth.
 Applications include compound interest, appreciation of property, and population growth.
- For a positive common ratio less than 1, a sequence may model decay.
 Applications include some radioactive behavior and depreciation.



Write a sequence that has two geometric means between 48 and −750.

This sequence will have the form $48, \frac{-120}{42}, \frac{300}{43}, \frac{-750}{43}$.

$$a_{y} = a_{1}r_{3}$$
 $-750 = 48r_{3}$
 $-15.625 = r_{3}$
 $-2.5 = r_{3}$

A geometric series is the indicated sum of the terms of a geometric sequence. The lists below show some examples of geometric sequences and their corresponding series.

Geometric Sequence

3, 9, 27, 81, 243
16, 4, 1,
$$\frac{1}{4}$$
, $\frac{1}{16}$

$$a_1, a_2, a_3, a_4, ..., a_n$$

Geometric Series

Sum of a Finite Geometric Series The sum of the first n terms of a finite geometric series is given by $S_n = \frac{a_1 - a_1 r^n}{1 - r}$.

Might be more helpful (later) to use the factored form instead:

Example 5 Find the sum of the first ten terms of the geometric series $16 - 48 + 144 - 432 + \cdots$.

$$\frac{\left(S_{10} = a_{1}(1-r^{2})\right)}{1-r} = \frac{16(1-(-3)^{2})}{1-(-3)}$$

$$= \frac{16(1-(-3)^{2})}{1-(-3)}$$

$$= -236,192$$

Lesson 12-1 (Pages 759–765)

Find the next four terms in each arithmetic sequence.

- **1**. 7, 3, −1, ...
- **2**. 0.5, -1, -2.5, ...
- **4.** 3, 2.8, 2.6, ...
- 5. 4x, -x, -6x, ...

2,4 ...



7. Find the 16th term in the sequence for which $a_1 = 2$ and d = 5.

10. Find d for the sequence in which $a_1=7$ and $a_{13}=30$.

12. Find the sum of the first 12 terms in the series $2 + 2.8 + 3.6 + \cdots$

Lesson 12-2 (Pages 766–773)

Determine the common ratio and find the next three terms of each geometric sequ

1. 14, 7, 3.5, ...

2. -2, 4, -8, ...

3. $\frac{2}{3}, \frac{1}{2}, \frac{3}{8}, \dots$ 6. a^{10}, a^8, a^6, \dots

4. 10, -5, 2.5, ...

5. $8, 8\sqrt{2}, 16, \dots$

For Exercises 7–11, assume that each sequence or series is geometric.

7. Find the sixth term of a sequence whose first term is 9 and common ratio is 2.

8. If r=4 and $a_8=100$, what is the first term of the sequence?

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10. Write a sequence that has two geometric means between 4 and 256.	

11. What is the sum of the first six terms of the series $3+9+27+\cdots$?	