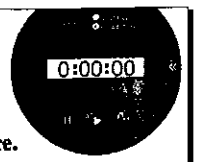
Check Skills You'll Need



Find the common difference of each sequence.

1. 1, 3, 5, 7, . . .
   2
2. 19, 17, 15, 13, . . .
   −2
3. 1.3, 0.1, −1.1, −2.3, . . .
4. 18, 21.5, 25, 28.5, . . .
   3.5

Use inductive reasoning to find the next two numbers in each pattern.

5. 2, 4, 8, 16, . . .
   32, 64
6. 4, 12, 36, . . .
   $\frac{12}{4} = 3$ 108, 324
7. 0.2, 0.4, 0.8, 1.6, . . . ×by2
   3.2, 6.4
8. 200, 100, 50, $\frac{25}{2}$, . . .
   $\frac{36}{12} = 3$
   $= 12.5$
   $= 6.25$

Day 70

Lesson 8-6 Geometric Sequences

Lesson Objectives	NAEP 2005 Strand: Algebra
▼ Form geometric sequences ▼ Use formulas when describing geometric sequences	Topic: Patterns, Relations, and Functions Local Standards: _____

Vocabulary and Key Concepts

Geometric Sequence	Rule	Geometric Sequence

$$A(n) = a \cdot r^{n-1}$$

$A(n)$: nth term; a: first term; r: common ratio; n: term number

A geometric sequence has a ratio between consecutive terms is constant.

A common ratio is the ratio between the consecutive terms.

Arithmetic: add/subtract to get the next term
3, 5, 7, 9, . . . $d = 2$

Geometric: multiply or ÷ to get the next term
10, 20, 40, 80, . . . $r = 2$

$r = \frac{20}{10} = 2$ $r = \frac{40}{20} = 2$

1 Finding the Common Ratio Find the common ratio of each sequence.

a. 3, −15, 75, −375, . . .

1 2 3 4 — $\frac{2}{1}$ $\frac{3}{2}$ $\frac{4}{3}$

3 → −15 → 75 → −375

× (−5) × (−5) × (−5)

$\frac{-15}{3} = -5$ $\frac{75}{-15} = -5$ $\frac{-375}{75} = -5$

The common ratio is -5.

$r = -5$

1 Finding the Common Ratio Find the common ratio of each sequence.

1 2 3

b. $3, \frac{3}{2}, \frac{3}{4}, \frac{3}{8}, \ldots$

3 → $\frac{3}{2}$ → $\frac{3}{4}$ → $\frac{3}{8}$

× $\frac{1}{2}$ × $\frac{1}{2}$ × $\frac{1}{2}$

The common ratio is $\frac{1}{2}$.

3rd ÷ 2nd

$\frac{3}{2} \div \frac{3}{1}$ $\frac{3}{4} \div \frac{3}{2}$

$\frac{3}{2} \cdot \frac{1}{3}$ $\frac{3}{4} \cdot \frac{2}{3}$

$\frac{1}{2}$ $\frac{2}{4} = \frac{1}{2}$

1. Find the common ratio of each sequence.

a. 750, 150, 30, 6, . . . $r = \frac{1}{5}$

$\frac{150}{750} \div 5 \div 5 = \frac{3}{15} = \frac{1}{5}$

$\frac{30}{150} = \frac{1}{5}$

$\frac{6 \div 6}{30 \div 6} = \frac{1}{5}$

b. −3, −6, −12, −24, . . . $r = 2$

$\frac{-6}{-3} = 2$ $\frac{-12}{-6} = 2$ $\frac{-24}{-12} = 2$

c. 4, 6, 9, 13.5, . . . $r = 1.5$ $r = \frac{3}{2}$

$\frac{6}{4} = 1.5 = \frac{3}{2}$ $\frac{9}{6} = \frac{3}{2}$

2 Arithmetic or Geometric Sequence Determine whether each sequence is arithmetic or geometric.

a. 162, 54, 18, 6, . . . $\frac{54}{162} = .3 = \frac{1}{3}$

162 → 54 → 18 → 6 $\frac{18}{54} = \frac{1}{3}$

× $\frac{1}{3}$ × $\frac{1}{3}$ × $\frac{1}{3}$

The sequence has a ratio of $\frac{1}{3}$

~~ratio~~. The sequence is geometric.

❷ Arithmetic or Geometric Sequence Determine whether each sequence is arithmetic or geometric.

b. 98, 101, 104, 107, . . .

101 − 98 = 3 104 − 101 = 3

98 → 101 → 104 → 107

+3 +3 +3

d = 3

The sequence has a common difference difference. The sequence is Arithmetic.

❸ Finding Terms of a Sequence Find the first, fifth, and tenth terms of the sequence that has the rule $A(n) = -3(2)^{n-1}$.

first term: $A(1) = -3(2)^{1-1} = -3(2)^0 = -3(1) = -3$

fifth term: $A(5) = -3(2)^{5-1} = -3(2)^4 = -3(16) = -48$

tenth term: $A(10) = -3(2)^{10-1} = -3(2)^9 = -3(512) = -1536$

$-3(2^9)$

-6^9

Quick Check

2. Determine whether each sequence is arithmetic or geometric. (d = r =)

a. 2, 4, 6, 8, . . . A d = +2

b. 2, 4, 8, 16, . . . G R = 2

c. 1, 3, 5, 7, . . . A d = +2

3. Find the first, sixth, and twelfth terms of each sequence.

a. $A(n) = 4 \cdot 3^{n-1}$ First: 4 ✓ Sixth: 972 ✓ twelfth:

b. $A(n) = -2 \cdot 5^{n-1}$

$4 \cdot 3^{1-1} =$

$4 \cdot 3^0 = 4 \cdot 1 = 4$

$4 \cdot 3^{6-1} = 4 \cdot 3^5$

$4 \cdot 3^{12-1} = 4 \cdot 3^{11}$

2 meters = 200 cm

$A(n) = a \cdot r^{n-1}$

$A(n) = 200(.75)^{n-1}$

$r = 75\% = .75$ $A(3) = 200(.75)^{3-1}$

$= 200(.75)^2$

$= 112.5$

1 Find the common ratio of each sequence.

a. 750, 150, 30, 6, . . . **b.** −3, −6, −12, −24, . . .

c. 4, 6, 9, 13.5, . . .

2 Find the next three terms of each sequence.

a. 1, 3, 9, 27, . . . **b.** 120, −60, 30, −15, . . .

c. 1.1, 2.2, 4.4, 8.8, . . .

3 Determine whether each sequence is arithmetic or geometric.

a. 2, 4, 6, 8, . . . **b.** 2, 4, 8, 16, . . . **c.** 1, 3, 5, 7, . . .

4 Find the first, sixth, and twelfth terms of each sequence.

a. $A(n) = 4 \cdot 3^{n-1}$ **b.** $A(n) = -2 \cdot 5^{n-1}$

$A(n) = a \cdot r^{n-1}$ a_1

Write a rule and find the given term in each geometric sequence described below.

25. What is the fifth term when the first term is 6 and the common ratio is 0.5?

$A(5) = 6 \cdot (.5)^{5-1}$

26. What is the tenth term when the first term is −6 and the common ratio is 2?

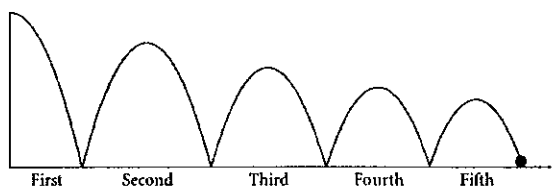
a_1

$A(10) = -6 \cdot (2)^{10-1}$

27. What is the fourth term when the first term is 7 and the common ratio is 1.1?

Sports You drop a rubber ball from a height of 1 meter and it bounces back to lower and lower heights. Each curved path has 80% the height of the previous path. Write a rule for the height of each successive path. What height will the ball reach at the top of the fifth path?

Draw a diagram to help understand the problem.



The height of the first path is 100 cm. So the height is 100 cm for the first term, with $n = 1$. The height of the fifth path is given by the term $n = 5$. The common ratio is 80%, or 0.8.

A rule for the sequence is $A(n) = 100 \cdot 0.8^{n-1}$.

$A(n)$	$= 100 \cdot 0.8^{n-1}$	**Use the sequence to find the height of the fifth path.**
$A(5)$	$= 100 \cdot 0.8^{5-1}$	**Substitute 5 for *n*.**
	$= 100 \cdot 0.8^{4}$	**Simplify exponents.**
	$= 100 \cdot 0.4096$	**Evaluate powers.**
	$= 40.96$	**Simplify.**

The height of the fourth bounce will be 40.96 cm.

Name
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wkbk p.399 (8.6)

1.

2.

3.

4.

5.

6.

11.

12.

13.

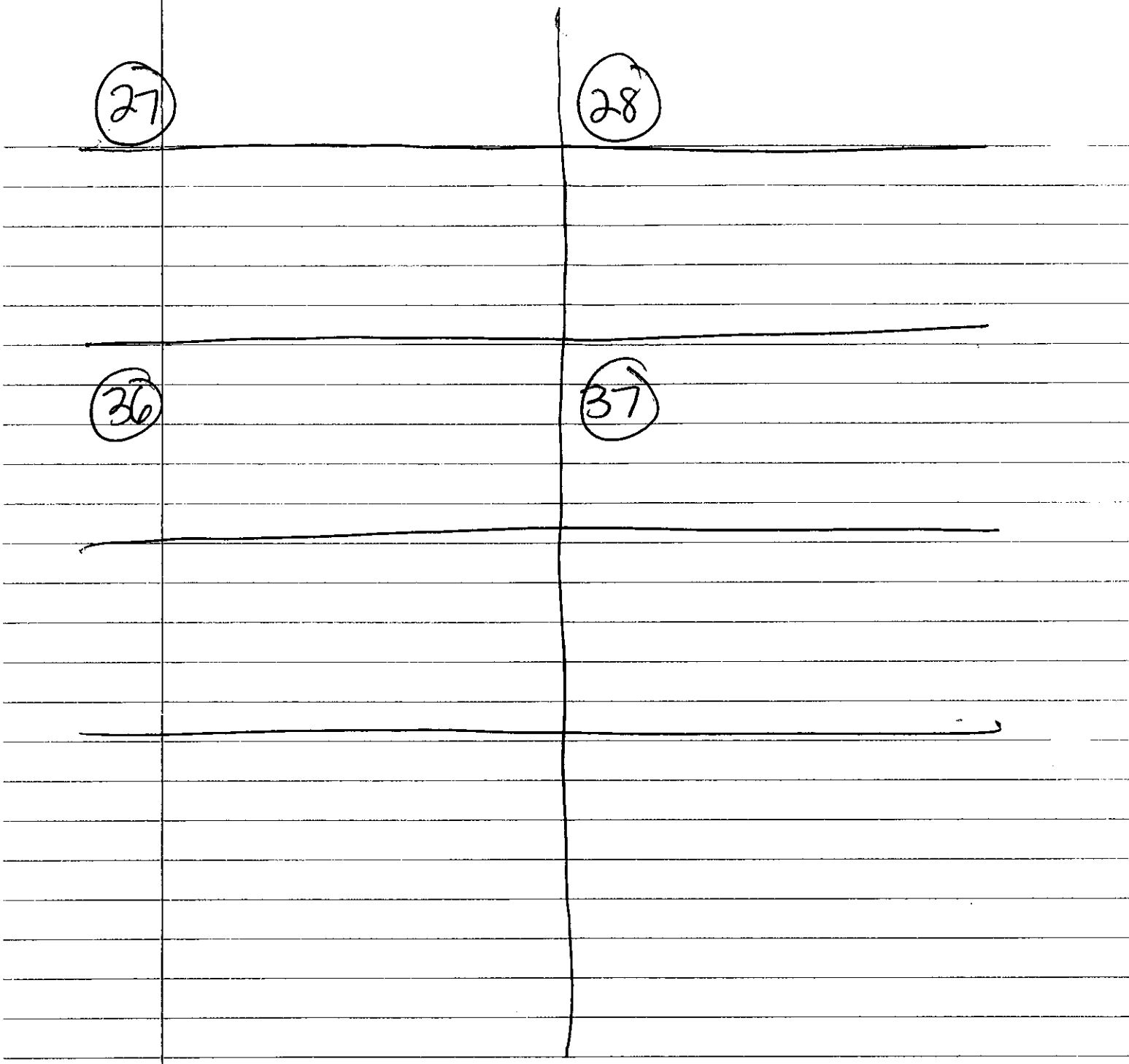
14.

15.

16.

17.

18.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