Miller Algebra 2

Illustrative Mathematics

# Unit 1 Lesson 7 Cumulative Practice Problems

1. Here is the recursive definition of a sequence: $f(1) = 10, f(n) = f(n-1) - 1.5$ for $n \geq 2$.

   a. Is this sequence arithmetic, geometric, or neither?

   b. List at least the first five terms of the sequence.

   c. Graph the value of the term $f(n)$ as a function of the term number $n$ for at least the first five terms of the sequence.

2. An arithmetic sequence $k$ starts 12, 6, . . .

   a. Write a recursive definition for this sequence.

   b. Graph at least the first five terms of the sequence.

3. An arithmetic sequence $a$ begins 11, 7, . . .

   a. Write a recursive definition for this sequence using function notation.

   b. Sketch a graph of the first 5 terms of $a$.

   c. Explain how to use the recursive definition to find $a(100)$. (Don't actually determine the value.)

(From Unit 1, Lesson 6.)


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4. A geometric sequence $g$ starts 80, 40, . . .

   a. Write a recursive definition for this sequence using function notation.

   b. Use your definition to make a table of values for $g(n)$ for the first 6 terms.

   c. Explain how to use the recursive definition to find $g(100)$. (Don't actually determine the value.)

(From Unit 1, Lesson 6.)

5. Match each recursive definition with one of the sequences.

   A. $h(1) = 1, h(n) = 2 \cdot h(n-1) + 1$ for $n \geq 2$

   B. $p(1) = 1, p(n) = 2 \cdot p(n-1)$ for $n \geq 2$

   C. $a(1) = 80, a(n) = \frac{1}{2} \cdot a(n-1)$ for $n \geq 2$

   1. 80, 40, 20, 10, 5

   2. 1, 2, 4, 8, 16

   3. 1, 3, 7, 15, 31

(From Unit 1, Lesson 5.)

6. For each sequence, decide whether it could be arithmetic, geometric, or neither.

   a. 25, 5, 1, . . .

   b. 25, 19, 13, . . .

   c. 4, 9, 16, . . .

   d. 50, 60, 70, . . .

   e. $\frac{1}{2}$, 3, 18, . . .

   For each sequence that is neither arithmetic nor geometric, how can you change a single number to make it an arithmetic sequence? A geometric sequence?

(From Unit 1, Lesson 3.)


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# Unit 1 Lesson 5 Cumulative Practice Problems

1. Match each sequence with one of the definitions. Note that only the part of the definition showing the relationship between the current term and the previous term is given so as not to give away the solutions.

| | |
|---|---|
| A. 6, 12, 18, 24 | 1. $a(n) = 7 \cdot a(n-1)$ |
| B. 2, 14, 98, 686 | 2. $b(n) = \frac{1}{2} \cdot b(n-1)$ |
| C. 160, 80, 40, 20 | 3. $c(n) = c(n-1) + 6$ |

2. Write the first five terms of each sequence. Determine whether each sequence is arithmetic, geometric, or neither.

   a. $a(1) = 7, a(n) = a(n-1) - 3$ for $n \geq 2$.

   b. $b(1) = 2, b(n) = 2 \cdot b(n-1) - 1$ for $n \geq 2$.

   c. $c(1) = 3, c(n) = 10 \cdot c(n-1)$ for $n \geq 2$.

   d. $d(1) = 1, d(n) = n \cdot d(n-1)$ for $n \geq 2$.

3. The first 5 terms of some sequences are given. State a rule that each sequence could follow.

   a. 2, 4, 6, 8, 10

   b. 5, 7, 9, 11, 13

   c. 50, 25, 0, -25, -50

   d. $\frac{1}{3}$, 1, 3, 9, 27

(From Unit 1, Lesson 1.)


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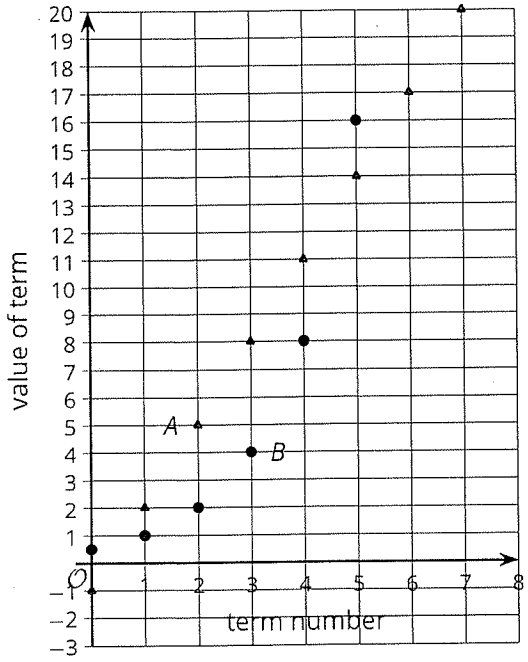
4. Function $f$ is defined by $f(x) = 2x - 7$ and $g$ is defined by $g(x) = 5^x$.

   a. Find $f(3)$, $f(2)$, $f(1)$, $f(0)$, and $f(-1)$.

   b. Find $g(3)$, $g(2)$, $g(1)$, $g(0)$, and $g(-1)$.

(From Unit 1, Lesson 3.)

5. Here is the graph of two sequences.




| term number | Sequence A | Sequence B |
|---|---|---|
| 0 | -1 | $\frac{1}{2}$ |
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |

   a. Complete the table for each sequence.

   b. For Sequence A, describe a way to produce a new term from the previous term.

   c. For Sequence B, describe a way to produce a new term from the previous term.

   d. Which of these is a geometric sequence? Explain how you know.

(From Unit 1, Lesson 3.)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# Unit 1 Lesson 4 Cumulative Practice Problems

1. *Technology required.* Open a blank spreadsheet. In A1, type 2 and enter.

   a. What should you type into cell A2 to generate the sequence 2, 4, 8, 16, 32, . . . when you fill down the column?

   b. What should you type into cell A2 to generate the sequence 2, 4, 6, 8, 10, . . . when you fill down the column?

2. *Technology required.* Open a blank spreadsheet. In A1, type 400 and enter.

   a. What should you type into cell A2 to generate the sequence 400, 200, 100, 50, 25, . . . when you fill down the column?

   b. What should you type into cell A2 to generate the sequence 400, 325, 250, 175, 100, . . . when you fill down the column?

3. *Technology required.* Open a blank spreadsheet.

   a. If cell A1 = 5 and cell A2 = A1 * 3 + 2, what are the first 5 terms of the sequence?

   b. If cell A1 = 1 and cell A2 = (A1 + 2) * 3, what are the first 5 terms of the sequence?

   c. If cell A1 = 2 and cell A2 = (A1 + 2) * 3, what are the first 5 terms of the sequence?

4. *Technology required.* Open a blank spreadsheet.

   a. Find the first 5 terms of a geometric sequence that starts with -5 and has a growth factor of -1.

   b. Find the first 5 terms of a geometric sequence that starts with -20 and has a growth factor of 0.5.

   c. Find the first 5 terms of an arithmetic sequence that starts with -20 and has an rate of change of 5.

   d. Find the first 5 terms of an arithmetic sequence that starts with 43 and has an rate of change of -7.


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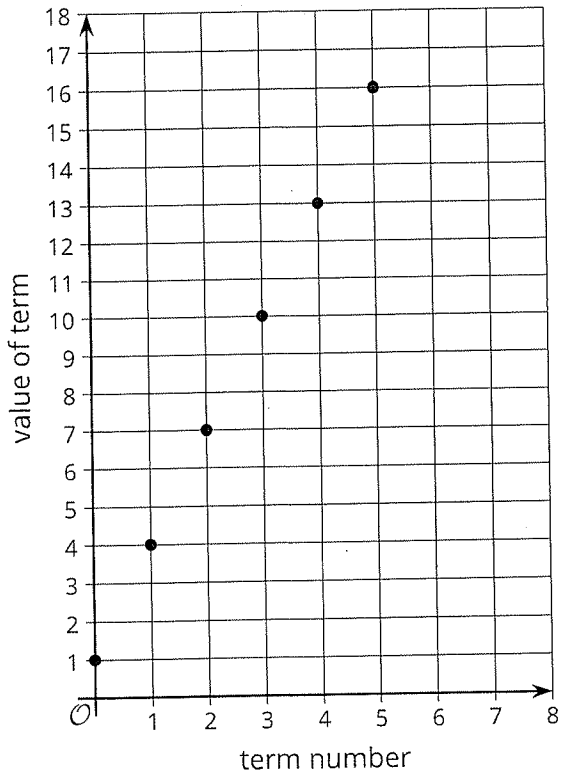
5. Here is the graph of a sequence.




a. Explain how you know this sequence is arithmetic.

b. Explain how you know this sequence is not geometric.

(From Unit 1, Lesson 3.)

6. The first two terms of a geometric sequence are 6 and 3.

a. Explain why there is only one geometric sequence with these first two terms.

b. What are the next 3 terms of this geometric sequence?

(From Unit 1, Lesson 2.)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# Unit 1 Lesson 3 Cumulative Practice Problems

1. Here are the first two terms of some different arithmetic sequences:

   a. -2, 4

   b. 11, 111

   c. 5, 7.5

   d. 5, -4

   What are the next three terms of each sequence?

2. For each sequence, decide whether it could be arithmetic, geometric, or neither.

   a. 200, 40, 8, . . .

   b. 2, 4, 16, . . .

   c. 10, 20, 30, . . .

   d. 100, 20, 4, . . .

   e. 6, 12, 18, . . .

3. Complete each arithmetic sequence with its missing terms, then state the rate of change for each sequence.

   a. -3, -2, ___, ___, 1

   b. ___, 13, 25, ___, ___

   c. 1, .25, ___, -1.25, ___

   d. 92, ___, ___ ,___, 80


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4. A sequence starts with the terms 1 and 10.

   a. Find the next two terms if it is arithmetic: 1, 10, ___, ___.

   b. Find the next two terms if it is geometric: 1, 10, ___, ___.

   c. Find two possible next terms if it is neither arithmetic nor geometric: 1, 10, ___, ___.

5. Complete each geometric sequence with the missing terms. Then find the growth factor for each.

   a. ___, 5, 25, ___, 625

   b. -1, ___, -36, 216, ___

   c. 10, 5, ___, ___, 0.625

   d. ___, ___, 36, -108, ___

   e. ___, 12, 18, 27, ___

(From Unit 1, Lesson 2.)

6. The first term of a sequence is 4.

   a. Choose a growth factor and list the next 3 terms of a geometric sequence.

   b. Choose a *different* growth factor and list the next 3 terms of a geometric sequence.

(From Unit 1, Lesson 2.)


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7. Here is a rule that can be used to build a sequence of numbers once a starting number is chosen: Each number is two times three less than the previous number.

   a. Starting with the number 0, build a sequence of 5 numbers.

   b. Starting with the number 3, build a sequence of 5 numbers.

   c. Can you choose a starting point so that the first 5 numbers in your sequence are all positive? Explain your reasoning.

(From Unit 1, Lesson 1.)


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# Unit 1 Lesson 2 Cumulative Practice Problems

1. Here are the first two terms of a geometric sequence: 2, 4. What are the next three terms?

2. What is the growth factor of each geometric sequence?

   a. 1,1,1,1,1

   b. 256, 128, 64

   c. 18, 54, 162

   d. 0.8, 0.08, 0.008

   e. 0.008, 0.08, 0.8

3. A person owes $1000 on a credit card that charges an interest rate of 2% per month.

   Complete this table showing the credit card balance each month if they do not make any payments.

| month | total bill in dollars |
|---|---|
| 1 | 1,000 |
| 2 | 1,020 |
| 3 | 1,040.40 |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |


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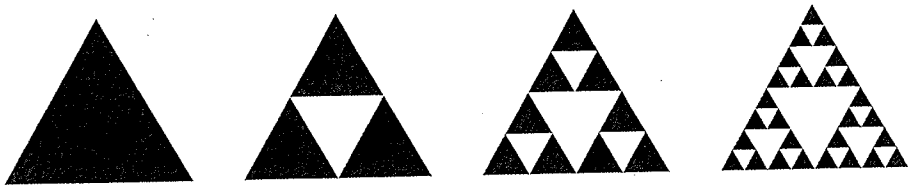
4. A Sierpinski triangle can be created by starting with an equilateral triangle, breaking the triangle into 4 congruent equilateral triangles, and then removing the middle triangle. Starting from a single black equilateral triangle with an area of 256 square inches, here are the first four steps:



a. Complete this table showing the number of shaded triangles in each step and the area of each triangle.

| step number | number of shaded triangles | area of each shaded triangle in square inches |
|---|---|---|
| 0 | 1 | 256 |
| 1 | 3 | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |

b. Graph the number of shaded triangles as a function of the step number, then separately graph the area of each triangle as a function of the step number.

c. How are these graphs the same? How are they different?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5. Here is a rule to make a list of numbers: Each number is 4 less than 3 times the previous number.

   a. Starting with the number 10, build a sequence of 5 numbers.

   b. Starting with the number 1, build a sequence of 5 numbers.

   c. Select a different starting number and build a sequence of 5 numbers.

(From Unit 1, Lesson 1.)

6. A sequence starts 1, -1, . . .

   a. Give a rule the sequence could follow and the next 3 terms.

   b. Give a *different* rule the sequence could follow and the next 3 terms.

(From Unit 1, Lesson 1.)


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# Unit 1 Lesson 1 Cumulative Practice Problems

1. Here is a rule to make a list of numbers: Each number is the sum of the previous two numbers. Start with the numbers 0 and 1, then follow the rule to build a sequence of 10 numbers.

2. A sequence starts $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \ldots$

   a. Give a rule that the sequence could follow.

   b. Follow your rule to write the next 3 terms in the sequence.

3. A sequence of numbers follows the rule: multiply the previous number by -2 and add 3. The fourth term in the sequence is -7.

   a. Give the next 3 terms in the sequence.

   b. Give the 3 terms that came before -7 in the sequence.

4. A sequence starts 0, 5, . . .

   a. Give a rule the sequence could follow and the next 3 terms for that rule.

   b. Give a *different* rule the sequence could follow and the next 3 terms for that rule.


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