# CONTINUE A NON-LINEAR SEQUENCE

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

**KEY IDEA**

**Some sequences do not add the same amount each time.**

Doubling: multiply by 2 each time.

1 → × 2 → 2 → × 2 → 4 → × 2 → 8

**1** Double or halve (divide by 2) to continue each sequence.

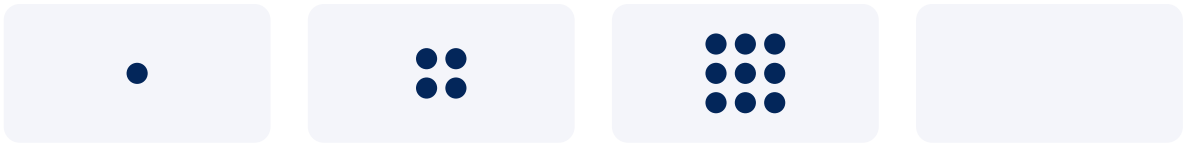
a) 1, 2, 4, ☐, ☐

b) 3, 6, 12, ☐, ☐

c) 64, 32, 16, ☐, ☐

d) 80, 40, 20, ☐, ☐

**2** Here is a sequence of square dot patterns.

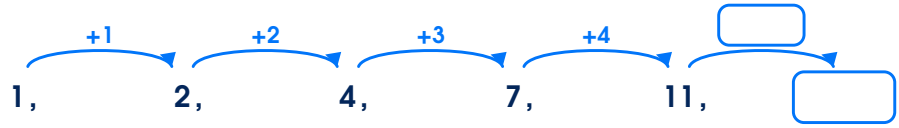


Pattern 1 | Pattern 2 | Pattern 3 | Pattern 4

a) Draw pattern 4.

b) Number of dots: 1, 4, 9, ☐

**3** The jumps grow by 1 each time. Fill in the missing jump and term.




**4** Add the two terms before to get the next term.

a) 1, 3, 4, 7, 11, ☐, ☐

b) 7, 7, 14, 21, ☐, ☐

# CONTINUE A NON-LINEAR SEQUENCE

SUPPORT

NAME _____ CLASS _____ DATE _____

| KEY IDEA | | |
|---|---|---|
| GEOMETRIC | multiply or divide by the same number | 4, 8, 16, 32 (× 2) |
| CHANGING JUMPS | the differences change in a pattern | 1, 2, 4, 7 (+1, +2, +3) |
| FIBONACCI | add the two previous terms | 1, 1, 2, 3, 5 |

**1** These are geometric sequences. Write the next two terms and the rule.

a) 9, 18, 36, ☐, ☐ rule: ☐

b) 10, 30, 90, ☐, ☐ rule: ☐

c) 2000, 200, 20, ☐, ☐ rule: ☐

d) 81, 27, 9, ☐, ☐ rule: ☐

**2** Fill in the jumps. Then write the next two terms.

a) 1, ☐ 2, ☐ 4, ☐ 7, ☐ 11, ☐, ☐

b) 30, ☐ 29, ☐ 27, ☐ 24, ☐, ☐

**3** Both sequences start at 3. Write the first five terms of each.

A add 4 to the previous term 3, ☐, ☐, ☐, ☐

B multiply the previous term by 2 3, ☐, ☐, ☐, ☐

a) Which sequence is non-linear? (A) (B)

b) Which sequence will reach 100 first? (A) (B)

**4** Add the two previous terms to write the next two terms.

a) 2, 7, 9, ☐, ☐

b) 1, 6, 7, ☐, ☐

# CONTINUE A NON-LINEAR SEQUENCE

CORE

NAME _____ CLASS _____ DATE _____

**KEY IDEA**

Geometric: divide a term by the one before to find the multiplier. Other non-linear sequences have differences that change in a pattern, or add the two previous terms (Fibonacci-type).

## FLUENCY

**1** Write the next two terms. Then circle the type of sequence.

a) 2, 8, 32, 128, ☐, ☐ — GEOMETRIC FIBONACCI OTHER

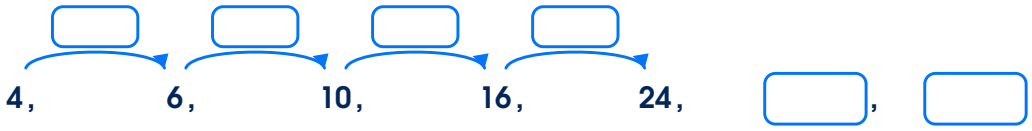
b) 4, 7, 11, 18, ☐, ☐ — GEOMETRIC FIBONACCI OTHER

c) 3, 4, 7, 12, 19, ☐, ☐ — GEOMETRIC FIBONACCI OTHER

d) 400, 200, 100, ☐, ☐ — GEOMETRIC FIBONACCI OTHER

e) 5, 7, 10, 14, ☐, ☐ — GEOMETRIC FIBONACCI OTHER

**2** Fill in the differences. Use the pattern to find the next two terms.




## REASONING

**3** Sequence A starts at 10 and adds 100 each time. Sequence B starts at 10 and doubles each time.

a) Which term number of A is the first to be over 1000? ☐

b) Which term number of B is the first to be over 1000? ☐

**4** Ravi says, "Every non-linear sequence has a multiplier." Give an example to show Ravi is wrong.

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# CONTINUE A NON-LINEAR SEQUENCE

GREATER DEPTH

NAME _____ CLASS _____ DATE _____

## REASONING

**1** Is each statement always, sometimes or never true? Circle your answer.

If it is sometimes true, give an example of when it is true and when it is not.

**a)** A geometric sequence increases. ALWAYS SOMETIMES NEVER

**b)** In a non-linear sequence, the differences increase. ALWAYS SOMETIMES NEVER

**c)** After the 2nd term, a Fibonacci-type sequence of positive numbers increases. ALWAYS SOMETIMES NEVER

**d)** The difference between two consecutive square numbers is even. ALWAYS SOMETIMES NEVER

**2** Each sequence is geometric. Fill in the missing terms.

**a)** 2, ☐, 18, ☐, 162 **b)** ☐, 12, 3, 0.75

## PROBLEM SOLVING

**3** A sheet of paper is folded in half again and again: 1 fold gives 2 layers, 2 folds give 4.

**a)** After how many folds will there be more than 100 layers? ☐

**b)** The paper is 0.1 mm thick. How thick is it after 7 folds? ☐ mm

## ★ CHALLENGE FOR ALL

**4** The rule is "multiply by 2, then subtract 1". The 1st term is 3.

**a)** Write the first seven terms. 3, ☐, ☐, ☐, ☐, ☐, ☐

**b)** Is the sequence linear? Explain. _____

**c)** Find a 1st term that makes every term the same. ☐

# CONTINUE A NON-LINEAR SEQUENCE – ANSWERS

## ANSWERS

### BUILDING BLOCKS

1 a) 8, 16 · b) 24, 48 · c) 8, 4 · d) 10, 5

2 a) a 4 by 4 square of dots · b) 16

3 +5; 16

4 a) 18, 29 · b) 35, 56

### SUPPORT

1 a) 72, 144; × 2 · b) 270, 810; × 3 · c) 2, 0.2; ÷ 10 · d) 3, 1; ÷ 3

2 a) +1, +2, +3, +4; 16, 22 · b) −1, −2, −3; 20, 15

3 A: 3, 7, 11, 15, 19 · B: 3, 6, 12, 24, 48 · a) B · b) B

4 a) 16, 25 · b) 13, 20

### CORE

1 a) 512, 2048; geometric · b) 29, 47; Fibonacci · c) 28, 39; other · d) 50, 25; geometric · e) 19, 25; other

2 differences 2, 4, 6, 8; next terms 34, 46

3 a) the 11th term (1010) · b) the 8th term (1280)

4 e.g. 1, 4, 9, 16 or 1, 1, 2, 3, 5: neither has a multiplier

### GREATER DEPTH

1 a) Sometimes · b) Sometimes · c) Always · d) Never (the differences are 3, 5, 7, 9, ..., which are all odd)

2 a) 6, 54 · b) 48

3 a) 7 folds (128 layers) · b) 12.8 mm

4 a) 3, 5, 9, 17, 33, 65, 129 · b) No: the differences are 2, 4, 8, 16, ... · c) 1