NEGATIVE POWERS OF 10

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

KEY IDEA

Dividing by 10 moves each digit one place to the right.

$1 \div 10 = 0.1$

$0.1 \div 10 = 0.01$

$0.01 \div 10 = 0.001$

Ones	Tenths	Hundredths	Thousandths
1			
0	1		
0	0	1	
0	0	0	1

÷ 10 each time: the 1 moves one place right

1 Work out each calculation.

a) $1 \div 10$ ☐

b) $1 \div 100$ ☐

c) $0.1 \div 10$ ☐

d) $1 \div 1000$ ☐

2 Each term is the previous term divided by 10. Write the next three terms.

÷ 10 ÷ 10 ÷ 10 ÷ 10 ÷ 10 ÷ 10

3000, 300, 30, 3, ☐, ☐, ☐

3 Write each fraction as a decimal.

a) $\frac{1}{10} =$ ☐

b) $\frac{1}{100} =$ ☐

c) $\frac{1}{1000} =$ ☐

4 Circle the greater number in each pair.

a) −2 or −4

b) −1 or −5

c) 0 or −3

NEGATIVE POWERS OF 10

SUPPORT

NAME _____ CLASS _____ DATE _____

KEY IDEA

Power	Calculation	Number
10^1	10	10
10^0	10 ÷ 10	1
10^{-1}	1 ÷ 10	0.1

Each time the index goes down by 1, divide by 10.

$10^0 = 1$, not 0

1 Complete the table.

Power of 10	Calculation	Decimal
10^{-2}		
10^{-3}		
10^{-4}		

2 Write each power of 10 as a fraction, or each fraction as a power of 10

a) $10^{-1} = \frac{1}{\square}$

b) $10^{-2} = \frac{1}{\square}$

c) $\frac{1}{1000} = 10^{\square}$

d) $\frac{1}{10000} = 10^{\square}$

3 Write each number as a power of 10

a) 0.01 _____

b) 0.1 _____

c) 0.00001 _____

d) 1 _____

4 Is each statement true or false? Circle your answer.

a) $10^0 = 0$ TRUE FALSE

b) $10^{-2} = -100$ TRUE FALSE

c) $10^{-1} = 0.1$ TRUE FALSE

d) $10^{-3} = 1 \div 1000$ TRUE FALSE

NEGATIVE POWERS OF 10

CORE

NAME _____ CLASS _____ DATE _____

KEY IDEA

10^{-n} means 1 divided by 10, n times: $10^{-3} = 1 \div 10 \div 10 \div 10 = 0.001$

A negative index gives a small positive number, not a negative number. Ten to the power 0 is 1.

FLUENCY

1 Write each power of 10 as a decimal.

a) 10^{-5} ☐ b) 10^{-6} ☐

c) 10^{-2} ☐ d) 10^{0} ☐

2 Write each number as a power of 10

a) **0.0001** ☐ b) **one millionth** ☐

c) $\frac{1}{1000}$ ☐ d) **$1 \div 10 \div 10$** ☐

REASONING

3 Write <, > or = in each box.

a) 10^{-4} ☐ 10^{-2} b) 10^{-1} ☐ 0.1

c) 10^{0} ☐ 10^{-1} d) 10^{-3} ☐ 0

4 Read what Kim says.

Kim says, "$10^{-3} = -1000$". Explain Kim's mistake.

NEGATIVE POWERS OF 10

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) 10^{-n} is a negative number. ALWAYS SOMETIMES NEVER

b) 10^{-n} as a decimal has exactly n decimal places. ALWAYS SOMETIMES NEVER

c) Multiplying by 10^{-1} makes a number smaller. ALWAYS SOMETIMES NEVER

PROBLEM SOLVING

2 Write the missing index in each box.

a) $10^{-2} \times 10^{\square} = 10^{-5}$ **b)** $10^{3} \times 10^{\square} = 10^{0}$

3 Here are some approximate sizes.

grain of sand ≈ 10^{-3} m **human hair ≈ 10^{-4} m** **atom ≈ 10^{-10} m**

a) Write the width of the hair as a decimal. ☐

b) How many times longer is the grain of sand than the hair is wide? ☐

c) How many atoms in a row would be 1 mm (10^{-3} m) long? ☐

★ CHALLENGE FOR ALL

4 Here are six numbers.

10^{-2} 0.005 10^{-3} 0.2 10^{0} 10^{-1}

a) Write the numbers in ascending order.

☐, ☐, ☐, ☐, ☐, ☐

smallest greatest

b) Write a number between 10^{-4} and 10^{-3} ☐

c) How many times greater is 10^{-1} than 10^{-4}? ☐

NEGATIVE POWERS OF 10

ANSWERS

BUILDING BLOCKS

1 a) 0.1 · b) 0.01 · c) 0.01 · d) 0.001

2 0.3, 0.03, 0.003

3 a) 0.1 · b) 0.01 · c) 0.001

4 a) –2 · b) –1 · c) 0

SUPPORT

1 10^{-2}: 1 ÷ 10 ÷ 10, 0.01 · 10^{-3}: 1 ÷ 10 ÷ 10 ÷ 10, 0.001 · 10^{-4}: 1 ÷ 10 ÷ 10 ÷ 10 ÷ 10, 0.0001

2 a) 1/10 · b) 1/100 · c) 10^{-3} · d) 10^{-4}

3 a) 10^{-2} · b) 10^{-1} · c) 10^{-5} · d) 10^{0}

4 a) False (1) · b) False (0.01) · c) True · d) True

CORE

1 a) 0.00001 · b) 0.000001 · c) 0.01 · d) 1

2 a) 10^{-4} · b) 10^{-6} · c) 10^{-3} · d) 10^{-2}

3 a) < · b) = · c) > · d) >

4 The negative index does not make the number negative. 10^{-3} means 1 ÷ 10 ÷ 10 ÷ 10 = 0.001, a small positive number

GREATER DEPTH

1 a) Never (it is always a positive number less than or equal to 1) · b) Always (for whole numbers n, e.g. 10^{-4} = 0.0001) · c) Sometimes, e.g. 5 × 0.1 = 0.5 is smaller, but 0 × 0.1 = 0 is not

2 a) –3 · b) –3

3 a) 0.0001 m · b) 10 times · c) 10^{7} (10 000 000) atoms

★ a) 10^{-3}, 0.005, 10^{-2}, 10^{-1}, 0.2, 10^{0} · b) any number between 0.0001 and 0.001, e.g. 0.0005 · c) 1000 times (10^{3})