POWERS OF 10

BUILDING BLOCKS

NAME _____ CLASS _____ DATE _____

KEY IDEA

10^2 means 10 × 10 = 100

The small number (the index) tells you how many 10s are multiplied together.

$5^2 = 5 \times 5 = 25$ $2^3 = 2 \times 2 \times 2 = 8$

1 Work out each calculation.

a) **10 × 10** ☐ b) **10 × 10 × 10** ☐

c) **3^2** ☐ d) **2^3** ☐

2 Multiply each number by 10.

a) **40 × 10** ☐ b) **600 × 10** ☐

c) **1000 × 10** ☐ d) **10 000 × 10** ☐

3 Write each number as 10s multiplied together. The first one has been done for you.

a) **100 = 10 × 10**

b) **1000 =** ☐

c) **10 000 =** ☐

4 Answer each question.

a) How many times greater is 1000 than 10? ☐

b) How many times greater is 100 000 than 1000? ☐

POWERS OF 10

SUPPORT

NAME _____ CLASS _____ DATE _____

KEY IDEA

Power	Calculation	Number
10^1	10	10
10^2	10 × 10	100
10^3	10 × 10 × 10	1000

The index tells you how many 10s are multiplied.

10^2 is not 10 × 2

1 Complete the table.

Power of 10	Calculation	Number
10^4		
	10 × 10 × 10 × 10 × 10	
		1 000 000

2 Write each number as a power of 10

a) 100 ____ b) 10 000 ____

c) 1 000 000 000 ____ d) 10 ____

3 Write each power of 10 as an ordinary number.

a) 10^3 ____ b) 10^5 ____

c) 10^7 ____ d) 10^1 ____

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

a) $10^2 = 20$ TRUE FALSE

b) $10^3 = 10\,000$ TRUE FALSE

c) 10^6 = one million TRUE FALSE

d) $10^4 = 10 \times 10 \times 10 \times 10$ TRUE FALSE

POWERS OF 10

CORE

NAME _____ CLASS _____ DATE _____

KEY IDEA

10^n means n tens multiplied together, so it is 1 followed by n zeros: $10^5 = 100\,000$

Each time the index goes up by 1, the number is 10 times greater. Check with the power button on a calculator.

FLUENCY

1 Write each number as a power of 10

a) **100 000** ☐

b) **one billion** ☐

c) **10 × 10 × 10 × 10 × 10 × 10** ☐

d) **ten million** ☐

2 Write each answer as an ordinary number.

a) 10^6 ☐ b) 10^8 ☐

c) $10^4 \times 10$ ☐ d) $10^3 \times 10^3$ ☐

REASONING

3 Write <, > or = in each box.

a) 10^5 ☐ **50** b) 10^3 ☐ **10 × 3**

c) 10^6 ☐ **one million** d) 10^4 ☐ **1000**

4 Ali writes ten to the power of four as 100 000, because he writes 10 and then four zeros. Explain Ali's mistake.

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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) When $n \geq 0$, 10^n written in full has exactly n zeros. ALWAYS SOMETIMES NEVER

b) 10^n is greater than n^{10} ALWAYS SOMETIMES NEVER

c) Doubling the index doubles the number. ALWAYS SOMETIMES NEVER

PROBLEM SOLVING

2 Answer each question. Give each answer as a power of 10

a) How many times greater is 10^7 than 10^4? ☐

b) $10^5 \div 10^2 =$ ☐

c) ☐ $\times 10^3 = 10^8$

3 A computer can do one billion calculations each second.

a) How many calculations can it do in 10 seconds? Give a power of 10 ☐

b) How many in 100 seconds? ☐

c) How many seconds would it take to do 10^{12} calculations? ☐

★ CHALLENGE FOR ALL

4 In computing, a kilobyte is 1000 bytes. Use these prefixes.

kilo = 10^3 **mega = 10^6** **giga = 10^9**

a) How many kilobytes are there in 1 gigabyte? ☐

b) A memory stick holds 2 gigabytes. How many bytes is this? ☐

c) How many megabytes are there in 5 gigabytes? ☐

POWERS OF 10

ANSWERS

BUILDING BLOCKS

1 a) 100 · b) 1000 · c) 9 · d) 8

2 a) 400 · b) 6000 · c) 10 000 · d) 100 000

3 b) 10 × 10 × 10 · c) 10 × 10 × 10 × 10

4 a) 100 times · b) 100 times

SUPPORT

1 10^4: 10 × 10 × 10 × 10, 10 000 · 10^5: 100 000 · 10^6: 10 × 10 × 10 × 10 × 10 × 10

2 a) 10^2 · b) 10^4 · c) 10^9 · d) 10^1

3 a) 1000 · b) 100 000 · c) 10 000 000 · d) 10

4 a) False (100) · b) False (1000) · c) True · d) True

CORE

1 a) 10^5 · b) 10^9 · c) 10^6 · d) 10^7

2 a) 1 000 000 · b) 100 000 000 · c) 100 000 · d) 1 000 000

3 a) > · b) > (1000 > 30) · c) = · d) > (10 000 > 1000)

4 10^4 = 10 × 10 × 10 × 10 = 10 000, which is 1 followed by 4 zeros. Writing 10 and then four more zeros gives 5 zeros, which is 10^5

GREATER DEPTH

1 a) Always (e.g. 10^0 = 1 has 0 zeros, 10^3 = 1000 has 3 zeros) · b) Sometimes, e.g. n = 1: 10 > 1, but n = 2: 100 < 1024 · c) Never, e.g. 10^2 = 100 but 10^4 = 10 000, which is 100 times greater

2 a) 10^3 (1000 times) · b) 10^3 · c) 10^5

3 a) 10^{10} · b) 10^{11} · c) 1000 seconds (10^3)

★ a) 10^6 = 1 000 000 · b) 2 000 000 000 · c) 5000