

# Index Laws

Lesson 19 Worksheet

Name \_\_\_\_\_

Date \_\_\_\_\_

Class \_\_\_\_\_

## Section 1 — Skill Practice

**Q1.** Simplify using the multiplication law ( $a^m \times a^n = a^{m+n}$ ).

(a)  $2^3 \times 2^4$  (b)  $5^2 \times 5^5$  (c)  $x^4 \times x^3$

(d)  $10^6 \times 10^2$  (e)  $a^7 \times a$  (f)  $3^5 \times 3^0$

**Q2.** Simplify using the division law ( $a^m \div a^n = a^{m-n}$ ).

(a)  $2^6 \div 2^2$  (b)  $10^8 \div 10^3$  (c)  $x^9 \div x^4$

(d)  $7^5 \div 7^5$  (e)  $a^3 \div a$  (f)  $5^4 \div 5^0$

**Q3.** Simplify using the power of a power law ( $(a^m)^n = a^{mn}$ ).

(a)  $(2^3)^2$  (b)  $(5^2)^3$  (c)  $(10^4)^2$

(d)  $(x^3)^4$  (e)  $(a^2)^5$  (f)  $(3^0)^{10}$

**Q4.** Simplify fully.

(a)  $2^3 \times 2^4 \div 2^2$  (b)  $(3^2)^3 \div 3^4$  (c)  $x^5 \times x^3 \div x^4$

(d)  $(a^4)^2 \times a^3$  (e)  $10^7 \div (10^2 \times 10^3)$

## Section 2 — Problem Solving

**Q5.** A scientist measures a bacteria population as  $2^{12}$  cells. After treatment, the population is reduced to one-quarter of its original size.

(a) Write the new population as a power of 2. **1 mark**

(b) If the population then doubles, what is it now? Write as a single power of 2. **1 mark**

Q6. Show that  $8^2 \times 4^3$  can be written as a single power of 2. **2 marks**

### Section 3 — Extended Response

Q7. A student claims that  $a^m + a^n = a^{m+n}$ .

(a) Test this claim with  $a = 2$ ,  $m = 2$ ,  $n = 3$ . **1 mark**

(b) Is the claim true? Explain. **2 marks**

(c) Write a general rule for when  $a^m \times a^n = a^{m+n}$  and explain why addition does not work the same way. **2 marks**

#### ► Answer Key