

Lesson 2: Multiplication of Numbers in Exponential Form

Classwork

In general, if x is any number and m, n are positive integers, then

$$x^m \cdot x^n = x^{m+n}$$

because

$$x^m \times x^n = \underbrace{(x \cdots x)}_{m \text{ times}} \times \underbrace{(x \cdots x)}_{n \text{ times}} = \underbrace{(x \cdots x)}_{m+n \text{ times}} = x^{m+n}.$$

Exercise 1

$14^{23} \times 14^8 = 14^{23+8} = 14^{31}$

$14 \times \dots \times 14 \times 14 \times \dots \times 14$
 23 times + 8

Exercise 2

$(-72)^{10} \times (-72)^{13} = (-72)^{10+13} = (-72)^{23}$

Exercise 3

$5^{94} \times 5^{78} =$

94
 $+78$

 172

Exercise 4

$(-3)^9 \times (-3)^5 =$

Exercise 5

Let a be a number.

$a^{23} \cdot a^8 =$

Exercise 6

Let f be a number.

$f^{10} \cdot f^{13} =$

Exercise 7

Let b be a number.

$b^{94} \cdot b^{78} = b^{94+78} = b^{172}$

Exercise 8

Let x be a positive integer. If $(-3)^9 \times (-3)^x = (-3)^{14}$, what is x ?

$(-3)^{9+x} = (-3)^{14}$

$x = 5$

$9 + x = 14$
 $9 + (5) = 14$

What would happen if there were more terms with the same base? Write an equivalent expression for each problem.

Exercise 9

$$9^4 \times 9^6 \times 9^{13} = 9^{4+6+13} = 9^{23}$$

Exercise 10

$$2^3 \times 2^5 \times 2^7 \times 2^9 =$$

Can the following expressions be simplified? If so, write an equivalent expression. If not, explain why not.

Exercise 11

$$6^5 \times 4^9 \times 4^3 \times 6^{14} =$$

Handwritten work: $6^{5+14} \times 4^{9+3} = 6^{19} \times 4^{12}$

Exercise 14

$$2^4 \times 8^2 = 2^4 \times 2^6 = 2^{10}$$

Handwritten work: $8 \times 8 = 64$, $2^4 \times 2^6 = 2^{10}$

Exercise 12

$$(-4)^2 \cdot 17^5 \cdot (-4)^3 \cdot 17^7 =$$

Exercise 15

$$3^7 \times 9 = 3^7 \times 3^2 =$$

Exercise 13

$$15^2 \cdot 7^2 \cdot 15^1 \cdot 7^4 =$$

Handwritten work: $15^{2+1} \times 7^{2+4} = 15^3 \times 7^6$

Exercise 16

$$5^4 \times 2^{11} =$$

Exercise 17

Let x be a number. Simplify the expression of the following number:

$$(2x^3)(17x^7) =$$

Handwritten work: $34x^{10}$

Exercise 18

Let a and b be numbers. Use the distributive law to simplify the expression of the following number:

$$a(a + b) =$$