

**3.2 Exponent Laws**Warm Up: In the expression  $3^4$ , 3 represents the \_\_\_\_\_ and 4 represents the \_\_\_\_\_

1. Write each expression as a single power. Then, evaluate.

	Repeated Multiplication	Single Power
a) $2^4 \times 2^4$	$(2 \times 2 \times 2 \times 2) \times (2 \times 2 \times 2 \times 2)$	$2^8$
b) $(-4)^2 \times (-4)^2$	$(-4)(-4) \times (-4)(-4)$	$(-4)^4$
c) $6^2 \times 6$	$(6 \times 6) \times 6$	$6^3$
d) $9^3 \times 9^3$	$(9 \times 9 \times 9)(9 \times 9 \times 9)$	$9^6$
e) $b \times b^3$	$b \times (b \times b \times b)$	$b^4$

2. Write each expression as a product of two powers, then as a single power.

	Product of Powers	Single Power
a) $(3 \times 3 \times 3 \times 3)(3 \times 3)$	$3^4 \times 3^2$	$3^6$
b) $(5 \times 5 \times 5 \times 5)(5 \times 5 \times 5 \times 5 \times 5 \times 5)$	$5^4 \times 5^6$	$5^{10}$
c) $(8 \times 8 \times 8 \times 8 \times 8 \times 8)(8 \times 8 \times 8 \times 8 \times 8)$	$8^6 \times 8^5$	$8^{11}$
d) $(11 \times 11 \times 11)(11 \times 11)$	$11^3 \times 11^2$	$11^5$
e) $(x \cdot x)(x \cdot x \cdot x \cdot x)$	$x^2 \cdot x^4$	$x^6$

3. Write each expression as a single power. Then, evaluate.

	Single Power	Evaluate
a) $3^4 \div 3^2$ Quotient	$3^2$	9
b) $(-5)^3 \times (-5)^2$ Product	$(-5)^5$	-3125
c) $[(-2)^2]^3$ Power	$(-2)^6$	64
d) $8^2 \div 8^2$ Quotient	$8^0$	1
e) $(-y)^4 (-y)^3$ Product	$(-y)^7$	$-y^7$
f) $(-b)^4 (-b)^2$ Product	$(-b)^6$	$b^6$

4. Does  $-8^2 = (-8)^2$ ? Justify your answer. $-8^2$  means  $-1 \times 8 \times 8$   
 $= -64$  $(-8)^2$  means  $(-8)(-8)$   
 $= 64$  $-1$  is the coefficient  
 $8$  is the base $-8$  is the base

5. Arrange the powers in order from smallest value to largest value.

 $(-4)^2, (2)^3, (-4)^3, (-1)^5$   
 $-64, -1, 8, 16$ 

5. Write each expression as a quotient of two powers, then as a single power.

	Quotient of Powers	Single Power	Evaluate
a) $(5 \times 5 \times 5 \times 5) \div (5 \times 5)$	$5^4 \div 5^2$	$5^2$	25
b) $(7 \times 7 \times 7 \times 7) \div (7 \times 7 \times 7)$	$7^3 \div 7^3$	$7^0$	1
c) $\frac{8 \times 8 \times 8 \times 8 \times 8 \times 8 \times 8}{8 \times 8 \times 8 \times 8}$	$8^7 \div 8^4$	$8^3$	512
d) $\frac{(2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2)}{(2 \times 2 \times 2 \times 2 \times 2)}$	$2^6 \div 2^5$	$2^1$	2

5. Write each expression as a quotient of two powers, then as a single power. Evaluate

	Quotient of Powers	Single Power	Evaluate
a) $(5 \times 5 \times 5 \times 5) \div (5 \times 5)$	$5^4 \div 5^2$	$5^2$	<u>25</u>
b) $(7 \times 7 \times 7) \div (7 \times 7 \times 7)$	$7^3 \div 7^3$	$7^0$	<u>1</u>
c) $\frac{8 \times 8 \times 8 \times 8 \times 8 \times 8}{8 \times 8 \times 8 \times 8}$	$8^7 \div 8^4$	$8^3$	<u>512</u>
d) $\frac{(2 \times 2 \times 2 \times 2 \times 2 \times 2)}{(2 \times 2 \times 2 \times 2 \times 2)}$	$2^6 \div 2^5$	$2^1$	<u>2</u>
e) $\frac{b \times b \times b \times b}{b \times b \times b}$	$b^4 \div b^3$	$b^1$	<u>b</u>

7. Write each expression as a single power with a coefficient, then evaluate

	Single Power with Coefficient	Evaluate
a) $3 \times (-2)(-2)(-2)(-2)$	$3(-2)^4$	$3 \times 16 = 48$
b) $2(5)^4 \times (5)^3$	$2(5)^7$	$2 \times 78125 = 156250$
c) $12(-1)^8 \times (-1)^4$	$12(-1)^{12}$	$12 \times 1 = 12$
d) $(15 \times 2^3) \div (5 \times 2^3)$	$3(2^3)$	$3 \times 8 = 24$

6. Complete the table.

Expression	Repeated Multiplication	Powers
a) $[3 \times (-4)]^2$	$[-12 \times -12]$ or $3 \times 3 \times -4 \times -4$	$(-12)^2$ or $3^2 \times (-4)^2$
b) $(4 \times 6)^2$	$(24)(24)$ or $4 \times 4 \times 6 \times 6$	$24^2$ or $4^2 \times 6^2$
c) $\left(\frac{2}{3}\right)^5$	$\left(\frac{2}{3}\right)\left(\frac{2}{3}\right)\left(\frac{2}{3}\right)\left(\frac{2}{3}\right)\left(\frac{2}{3}\right)$	$\frac{2^5}{3^5}$ or $\left(\frac{2}{3}\right)^5$
d) $(x \cdot y)^3$	$x \cdot x \cdot x \cdot y \cdot y \cdot y$	$x^3 y^3$

#### Multiple Choice Questions

7. In the equation  $(-2)^5 = -32$ , which number represents the base of the power?

- A -32      B -2      C -1      D 2

8. Which expression is equivalent to  $(-2) \times (-2) \times (-2) \times (-2) \times (-2)$ ?

- A  $2^5$       B 32      C  $(-2)^5$       D  $-(-2)^5$