

1.5 The Exponent Rules

MATHPOWER™ Nine, pp. 20–21

To multiply powers with the same base, add the exponents.

$$y^m \times y^n = y^{m+n}$$

To divide powers with the same base, subtract the exponents.

$$y^m \div y^n = y^{m-n}$$

To raise a power to a power, multiply the exponents.

$$(y^m)^n = y^{m \times n}$$

Simplify.

1. $4^4 \times 4^2$ 2. $3^5 \times 3^3$ 3. $2^2 \times 2^3$

4. $10^3 \times 10$ 5. $5^4 \times 5^3$ 6. 6×6^4

7. $x^2 \times x^5$ 8. $y^3 \times y^3$ 9. $z^3 \times z^2$

Find the missing exponent.

10. $3^2 \times 3^{\square} = 3^4$ 11. $5^{\square} \times 5^4 = 5^7$ _____

12. $8^3 \times 8^{\square} = 8^5$ 13. $7^{\square} \times 7^3 = 7^4$ _____

14. $y^5 \times y^{\square} = y^8$ 15. $b^{\square} \times b^5 = b^9$ _____

16. $x \times x^9 = x^{\square}$ 17. $s^6 \times s^{\square} = s^7$ _____

Simplify.

18. $5^4 \div 5^2$ 19. $4^6 \div 4^3$ 20. $3^3 \div 3^2$

21. $9^5 \div 9^2$ 22. $7^4 \div 7^3$ 23. $2^6 \div 2^4$

24. $x^7 \div x^5$ 25. $y^8 \div y^6$ 26. $a^5 \div a^4$

Find the missing exponent.

27. $2^5 \div 2^{\square} = 2^3$ 28. $3^4 \div 3^{\square} = 3^2$ _____

29. $4^{\square} \div 4^2 = 4^4$ 30. $5^{\square} \div 5^3 = 5$ _____

31. $n^4 \div n^{\square} = n^2$ 32. $c^{\square} \div c^4 = c^3$ _____

33. $y^{\square} \div y^2 = y^2$ 34. $z^9 \div z^{\square} = z$ _____

Simplify.

35. $(3^2)^3$ 36. $(2^4)^2$ 37. $(7^3)^4$

38. $(6^2)^4$ 39. $(5^3)^2$ 40. $(4^5)^3$

41. $(x^3)^3$ 42. $(s^2)^2$ 43. $(r^5)^2$

Find the missing exponent.

44. $(3^3)^{\square} = 3^9$ 45. $(2^5)^{\square} = 2^{10}$ _____

46. $(5^{\square})^2 = 5^8$ 47. $(4^{\square})^3 = 4^{12}$ _____

48. $(g^2)^{\square} = g^6$ 49. $(m^3)^{\square} = m^9$ _____

50. $(s^{\square})^5 = s^{20}$ 51. $(t^{\square})^2 = t^6$ _____

Find the value of each expression.

Replace the blanks with the corresponding letter or symbol to decode the message.

52. $2^3 \times 2^2$ C 53. $2^9 \div 2^2$ R

54. $2^4 \div 2^3$ A 55. $(2^3)^2$ O

56. $2^{13} \div 2^3$ C 57. $(2^6)^2$!

58. 2×2 L 59. $(2^4)^2$ R

60. $2^2 \times 2^2$ * 61. $2^2 \times 2$ L

62. $(2^3)^3$ E 63. $2^{12} \div 2$ T

2¹ 2² 2³ 2⁴ 2⁵ 2⁶ 2⁷ 2⁸ 2⁹ 2¹⁰ 2¹¹ 2¹²

1.8 Working with Exponents

MATHPOWER™ Nine, pp. 26–29

To multiply powers with the same integral base, add the exponents.

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

To divide powers with the same integral base, subtract the exponents.

$$x^m \div x^n = x^{m-n}$$

To raise a power with an integral base to a power, multiply the exponents.

$$(x^m)^n = x^{m \times n}$$

Complete the table.

	Exponential Form	Base	Exponent	Standard Form
1.	$(-2)^3$			
2.		3	1	
3.	5			
4.				-27
5.		-2	5	
6.				49

Complete the table.

	Exponential Form	Repeated Multiplication	Standard Form
7.	$(-3)^2 \times (-3)^2$		
8.		$(-4) \times (-4) \times (-4)$	
9.			-125
10.		$\frac{(-4) \times (-4) \times (-4)}{(-4)}$	
11.	$(+5)^4 \div (+5)^2$		
12.		$\frac{(+5) \times (+5) \times (+5)}{(+5) \times (+5)}$	
13.	$(-3)^5 \div (-3)^2$		
14.		$(-2) \times (-2) \div (-2)$	

Write in standard form.

15. $3^2 \times 3^3$ _____ 16. $(-2)^3 \times (-2)^2$ _____
 17. $(5)^4(5)^3$ _____ 18. $(3.2)^2(3.2)^2$ _____
 19. $((y)^2)^3$ _____ 20. $(3)^4 \div (3)^2$ _____
 21. $((-4.5)^2)^5$ _____ 22. $(-5)^3 \div (-5)$ _____
 23. $\frac{3^5}{3^3}$ _____ 24. $\frac{(-7)^3}{(-7)^2}$ _____

Is each statement true or false?

25. $3^3 = 81$ _____ 26. $6(-2)^3 = 48$ _____
 27. $(-4)^2 \times (-4)^2 = -64$ _____
 28. $y^2 \times y^4 = y^6$ _____
 29. $(-a)^4 \div (-a)^2 = a^2$ _____
 30. $(-5)^3 \div (-5)^2 = 5$ _____

Evaluate for $s = -3$ and $t = 2$.

31. t^3 _____ 32. $\frac{6}{s^2}$ _____
 33. $s^3 + t^2$ _____ 34. $2s^3 \div 3t$ _____
 35. $-3st$ _____ 36. $-2s^2 - 4t$ _____

37. The formula for the volume, V , of a sphere is $V = 4.19r^3$, where r is the radius. Complete the table.

Radius (m)	Volume (m^3)
4	
7	
2	
2.3	
10	

38. If the base of a power is negative and the exponent is five, the standard form of the number is negative. Explain. _____

39. The standard forms of the following terms are not the same. Explain why this is true.

$$(-2)^4 \qquad -2^4$$