

Exponents and Roots

Properties of Exponents, Part I

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4.1.1 Product and Power Properties of Exponents

Simplify.

1. 3^3

2. $(-4)^2$

3. -4^2

4. $\left(-\frac{3}{5}\right)^2$

5. $6 \cdot 6^2 \cdot 6^3 \cdot 6^2$

6. $(2^3)^3$

7. $(b^4)^6 \cdot b$

8. $(3x)^3$

9. $(5w^8)^2$

10. $(-4x^3)^4$

11. $-(4x^3)^4$

12. $(p^4q^2)^7$

4.1.2 Integer Exponents

13. **Biology** One of the smallest bats is the northern blossom bat, which is found from Southeast Asia to Australia. This bat weighs about 2^{-1} ounce. Simplify this expression.

Simplify.

14. 8^0

15. -9^{-2}

16. $\left(\frac{2}{5}\right)^0$

17. 13^{-2}

18. $(-3)^{-1}$

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19. $(-4)^2$

20. $\left(\frac{1}{2}\right)^{-2}$

21. -7^{-1}

22. $a^5 \cdot a^0 \cdot a^{-5}$

23. $b \cdot (a^3)^4 \cdot (b^{-2})^3$

24. $x^7 \cdot x^{-6} \cdot y^{-3}$

25. $(x^2)^{-1}$

26. $(x^4)^2 \cdot (x^{-1})^{-4}$

27. $(3^6)^0$

28. $(x^3y^4)^3 \cdot (xy^3)^{-2}$

Evaluate each expression for the given value(s) of the variable(s).

29. $\left(\frac{2}{3}v\right)^{-3}$ for $v = 9$

30. $(10 - d)^0$ for $d = 11$

31. $10m^{-1}n^{-5}$
for $m = 10$
and $n = -2$

32. $(3ab)^{-2}$
for $a = \frac{1}{2}$ and $b = 8$

33. $4w^v x^v$ for $w = 3$, $v = 0$, and $x = -5$

Simplify.

34. k^{-4}

35. $2z^{-8}$

36. $\frac{1}{2b^{-3}}$

37. $c^{-2}d$

38. $-5x^{-3}$

39. $4x^{-6}y^{-2}$

40. $\frac{r^{-5}}{s^{-1}}$

41. $\frac{2f^0}{7g^{-10}}$

42. $\frac{s^5}{t^{-12}}$

43. $\frac{3w^{-5}}{x^{-6}}$

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44. b^0c^0

45. $\frac{2}{3}m^{-1}n^5$

46. $\frac{q^{-2}r^0}{s^0}$

47. $\frac{a^{-7}b^2}{c^3d^{-4}}$

48. $\frac{h^3k^{-1}}{6m^2}$

4.1.3 Quotient Properties of Exponents

Simplify.

49. $\frac{x^8y^3}{x^3y^3}$

50. $\frac{x^8y^4}{x^9yz}$

51. $\left(\frac{a^4}{b^2}\right)^3$

52. $\left(\frac{xy^2}{x^2y}\right)^3$

53. $\left(\frac{1}{7}\right)^{-3}$

54. $\left(\frac{x^2}{y^5}\right)^{-5}$

55. $\left(\frac{8w^7}{16}\right)^{-1}$

56. $\left(\frac{1}{4}\right)^{-2}\left(\frac{6x}{7}\right)^{-2}$