

Math 9 Lesson 4: Exponents

- Exponents and Exponent laws with whole-number exponents
- Includes variable bases
- $2^7 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$; $n^4 = n \times n \times n \times n$
- Exponent laws ex. $6^0 = 1$; $m^1 = m$; $n^5 \times n^3 = n^8$; $\frac{y^7}{y^3} = y^4$;
 $(5n)^3 = 5^3 \times n^3$; $\left(\frac{m}{n}\right)^5 = \frac{m^5}{n^5}$; and $(3^2)^4 = 3^8$
- Limited to whole-number exponents and whole-number exponent outcomes when simplified
- $(-3)^2$ does not equal -3^2

1. 2^6

2. Simplify $a \times a \times a \times a \times a$

3. $(-3)^4$

4. $n \times n^7 \times n^4$

5. $(x^5)(x) \cdot x^3$

6. $(3x^3)^3$

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

8. Simplify $\frac{x^5}{x^3}$

9. $x^a \cdot x^b$

10. $\left(\frac{2}{3}\right)^3$

11. $\left(\frac{a}{b}\right)^c$

12. Evaluate $(-5)^2$

13. Evaluate -5^2

14. $\frac{x^5}{x^3} \div \frac{x}{x^2}$

15. $\frac{5ab^3c}{15a^3b^5}$

16. $a^b \cdot a^d \cdot a$

17. $\left(\frac{2x^2y^3}{z^5}\right)^3$

18. $\frac{(-3)^4}{(-3)^2} \times -3^2$

19. $-2(-2)^2 - (-3)^2$

20. $\left((2x^2)^3\right)^2$

21. $\left(2(3a^2)^3\right)^2$

22. $(-1)^{2024}$

23. $\frac{(-2)^{100}}{-2^{98}}$

24. $1^0 + 0^1$

25. 0^0

$$26. \left(\frac{4p^4 p^6 q^4}{2p^8 q^3} \right)^3$$

$$27. \left(\frac{(-3)^2}{(-2)^4} \right)^2$$

$$28. -2 \left(-\frac{3}{4} \right)^2 + (-1)^3 - \left(\frac{-2^4}{(-2)^3} \right)^2$$

$$29. \frac{2}{x} \left(\frac{3x}{2x^2} \right)^3 \div \frac{1}{x^3}$$

$$30. \text{Solve } 27 = 9^{3x}$$

$$31. \text{Solve } \frac{3^{10}}{3^x} = 3^{x+1}$$

$$32. \text{Solve } 8^{1-2x} = \frac{2^9}{2^x}$$

33. Challenge:

a. $\left[\frac{(-3)^3}{3^2}\right]^2 - \left[\frac{(-3)^4}{3^3}\right]^1 + \left[\frac{(-3)^1}{3}\right]^0$

b. Solve $\left(\frac{8^{1-2x}}{2^{x+3}}\right)^4 = 2$

c. Solve $32 \times 2 + 2^{x+1} = 3 \times 2^x$