



15 – Powers of Powers

What happens when we have a power to a power such as $(5^2)^4$? Explore this by filling out the following table:

#	Expression	Expanded Form	Laws of Exponents	Simplified Exponent Form
1.	$(2^3)^2$	$2^3 \cdot 2^3$	2^{3+3}	2^6
2.	$((-6)^4)^3$	$(-6)^4 \cdot (-6)^4 \cdot (-6)^4$	$(-6)^{4+4+4}$	$(-6)^{12}$
3.	$(5^2)^4$			
4.	$(8^3)^3$			
5.	$(7^5)^4$			
6.	$-(1^2)^5$			
7.	$((-3)^3)^3$			
8.	$(9 \cdot 4^2)^2$			
9.	$(12^0 \cdot 3^3 \cdot 2^4)^3$			
10.	$\left(\frac{8^7}{5^3}\right)^4$			

11. How would you simplify $(3^{12})^{20}$ without using expanded form?

12. Using the pattern from the table, come up with a rule that would help you simplify powers of powers without having to write out the expanded form:

13. How would you write $(4^4)^{-3}$ in simplified exponent form?

14. How would you write $(2^{-3})^{-5}$ in simplified exponent form?

Write each expression in simplified exponent form.

EX. $(8^3)^6 = 8^{18}$

15. $(8^7)^2$ _____

16. $((-3)^6)^5$ _____

17. $(13^4)^4$ _____

18. $-(1^2)^5$ _____

19. $(9^{-3})^{-3}$ _____

20. $(6^7 \cdot 2^3)^4$ _____

21. $(5^9 \cdot 2)^7$ _____

22. $\left(\frac{2^2}{2^7}\right)^6$ _____

23. $\left(\frac{7^8}{4}\right)^6$ _____

Evaluate each expression.

EX: $(3^2 \cdot 2^2)^2 = 3^4 \cdot 2^4 = 81 \cdot 16 = 1296$ or $(3^2 \cdot 2^2)^2 = (9 \cdot 4)^2 = (36)^2 = 1296$

24. $(4^3)^0$ _____

25. $(3^3)^3$ _____

26. $(4^0 \cdot 2^2)^4$ _____

27. $-(5^2)^{-1}$ _____

28. $((-10)^2)^2$ _____

29. $\left(\frac{2^2}{3^4}\right)^2$ _____