ILLAWARRA TUTORING

This worksheet covers the concept of zero and negative indices. You will learn how to simplify and manipulate algebraic expressions by applying the rules: $a^0 = 1$ for any nonzero a and $a^{-n} = \dfrac{1}{a^n}$. Practice carefully simplifying expressions and solving equations using these ideas.

Easy Questions

1. Find the value of 5^0.
2. Evaluate $(-3)^0$.
3. Write an expression for a^0 and state its value for any nonzero a.
4. Evaluate 2^{-1}.
5. Find the value of 10^{-1}.

Intermediate Questions

6. Simplify $2^{-3} \times 2^5$.
7. Simplify $3^{-2} \times 3^4$.
8. Simplify $(5^0) \times (5^{-1})$.
9. Simplify $\dfrac{4^{-2}}{4^{-5}}$.
10. Express a^{-3} in fractional form.
11. Simplify $6^{-2} \times 6^0$.
12. Simplify $\dfrac{7^{-1} \times 7^{-2}}{7^{-3}}$.
13. Solve for x in the equation $x^{-1} = \dfrac{1}{4}$.
14. Simplify $\dfrac{2^{-4} \times 2^{-2}}{2^{-5}}$.
15. Express $b^{-4} \times b^2$ using positive exponents.
16. Simplify $\left(5^{-2}\right)^{-1}$.

17. Simplify $9^{-1} \times 9^{3}$.
18. Solve for y if $y^{-2} = 16$.
19. Simplify $x^{-2} \times x^{-3}$.
20. Evaluate $\left(3^{-1}\right)^{3}$.

Hard Questions

21. Prove that for any nonzero number a, $a^{0} = 1$ by starting with the definition $a^{-n} = \dfrac{1}{a^{n}}$.
22. Simplify $\dfrac{2^{-3} \times 3^{-2}}{6^{-5}}$.
23. Prove that $a^{-n} \times a^{n} = 1$ for any nonzero a and positive integer n.
24. Simplify $\dfrac{(2^{-2} \times 5^{-1})^{-1}}{10^{-1}}$.
25. Simplify $\dfrac{x^{-3} \times 1}{x^{-1} \times y^{-2}}$ and express your answer using only positive exponents.
26. Solve for k if $k^{-2} = 25$.
27. Prove that $\left(a^{-2}\right)^{3} = a^{-6}$ for any nonzero a.
28. Simplify $\dfrac{(m^{-3} \times n^{-2}) \times (m^{5} \times n)}{m^{-2} \times n^{-3}}$.
29. Simplify $\left(\dfrac{a^{-1} \times b^{-2}}{a^{-3} \times b}\right)^{-2}$.
30. Simplify $\left(\dfrac{c^{3} \times d^{-4}}{c^{-4} \times d}\right)^{3}$.