

Higher Check In – 3.01 Powers and roots

Do not use a calculator.

1. Estimate $\sqrt{177}$ to the nearest whole number.
2. Evaluate $-\frac{1}{3^{-2}}$.
3. If $x^a = \frac{1}{\sqrt{x^5}}$, find a .
4. Evaluate $64^{\frac{2}{3}} \div 16^{-\frac{1}{4}}$.
5. Find the value of x which will satisfy the equation $2^{4x-6} = \frac{1}{4}$.
6. Max is trying to complete his maths homework, but can't remember the rule to simplify $(2^3)^4$. Lin says the rule is multiply the powers so the answer is 2^{12} ; Kush says the rule is add the powers so the answer is 2^7 . Produce a step-by-step explanation to convince the three friends of the correct answer.
7. Using the laws of indices, show that any non-zero number raised to the power of zero equals one.
8. Marley says that $9^{\frac{1}{3}} = 9 \times \frac{1}{3} = 3$. You tell her that $9^{\frac{1}{3}} = \sqrt[3]{9}$ but she doesn't believe you. By letting $9^a \times 9^a \times 9^a = 9$, prove that you are correct.
9. If $x^{-\frac{3}{2}} = \frac{8}{27}$, find x .
10. A cube has volume V . The area of one of the faces is A . Find a formula for A in terms of V , giving your answer in the form $A = V^x$.

Extension

If $\sqrt[3]{4096} = 16$, evaluate $4096^{\frac{5}{12}}$ without a calculator, demonstrating your working clearly.



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AO1	2	Use a negative integer index to represent a reciprocal			
AO1	3	Use a fractional index to represent a combination of powers and roots			
AO1	4	Calculate fractional powers			
AO1	5	Calculate with integer powers			
AO2	6	Know and apply $(a^m)^n = a^{m \times n}$			
AO2	7	Know and apply $a^m \div a^n = a^{m-n}$			
AO2	8	Know and apply $a^m \times a^n = a^{m+n}$			
AO3	9	Solve a problem involving a fractional index			
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