

Exercise walk-through

1.3.1

Indices

AQA · GCSE · Mathematics

14. Indices, surds, standard form and bounds (N7–N9, N14–N16)

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Bounds (N16, H): upper bound of a length 9 m to the nearest metre is 9.5; in calculations, for positive inputs, an upper product bound uses upper input bounds and an upper quotient bound uses upper numerator divided by lower denominator. Check signs first; these shortcuts need not hold for negative inputs. Track strict endpoints; give the answer to an appropriate degree of accuracy (often the bound width decides).

35. Integer indices and standard form · Foundation

Integer indices and standard form · Foundation

$0.000072 = 7.2 \times 10^{-5}$. Also $2^3 \times 2^4 = 2^7 = 128$. The square root of 81 is 9. Check a standard-form answer by writing it out as a decimal. Useful powers include $3^3 = 27$, $4^3 = 64$, $5^3 = 125$, $15^2 = 225$ and $10^6 = 1,000,000$. Integer laws give $2^0 = 1$, $2^{-3} = 1/8$ and $(2^3)^2 = 2^6 = 64$. For standard-form multiplication, $(3 \times 10^5)(4 \times 10^{-3}) = 12 \times 10^2 = 1.2 \times 10^3$. Division gives $(6 \times 10^5)/(2 \times 10^2) = 3 \times 10^3$. For addition, first align exponents: $3 \times 10^4 + 2 \times 10^3 = 3.2 \times 10^4$.

40. Indices, surds and standard form · Higher

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$0.000072 = 7.2 \times 10^{-5}$. Also $16^{(3/4)} = (16^{(1/4)})^3 = 2^3 = 8$. Simplify $\sqrt{72} = 6\sqrt{2}$, then rationalise $1/\sqrt{2} = \sqrt{2}/2$. Useful powers include $3^3 = 27$, $4^3 = 64$, $5^3 = 125$, $15^2 = 225$ and $10^6 = 1,000,000$. Integer laws give $2^0 = 1$, $2^{-3} = 1/8$ and $(2^3)^2 = 2^6 = 64$. For standard-form multiplication, $(3 \times 10^5)(4 \times 10^{-3}) = 12 \times 10^2 = 1.2 \times 10^3$. Division gives $(6 \times 10^5)/(2 \times 10^2) = 3 \times 10^3$. For addition, first align exponents: $3 \times 10^4 + 2 \times 10^3 = 3.2 \times 10^4$. For a positive base, $a^{(m/n)} = (\text{the } n\text{th root of } a)^m$. Thus $27^{(2/3)} = 3^2 = 9$ and $16^{(-1/2)} = 1/4$.

Exercises 2.1·2.3

2.1 (Foundation) Evaluate $2^3 \times 2^4$.

2.2 (Foundation) Evaluate 2^3 .

2.3 (Foundation) Write 7.2×10^{-5} as a decimal.

Exercises 2.1·2.3

2.1 (Foundation) Evaluate $2^3 \times 2^4$.

2.1 Same base: add indices. $2^3 \times 2^4 = 2^7 = 128$.

2.2 (Foundation) Evaluate 2^3 .

2.2 $2^3 = 2 \times 2 \times 2 = 8$.

2.3 (Foundation) Write 7.2×10^{-5} as a decimal.

2.3 Move the decimal point five places left: $7.2 \times 10^{-5} = 0.000072$.

Exercises 2.4·3.1

2.4 (Higher) Evaluate $16^{(3/4)}$.

2.5 (Higher) Evaluate $2^{(-3)}$.

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: For every positive a , $a^2 + a^3$ equals a^5 .

Exercises 2.4·3.1

2.4 (Higher) Evaluate $16^{(3/4)}$.

2.4 $16=2^4$, so $16^{(3/4)}=2^3=8$.

2.5 (Higher) Evaluate $2^{(-3)}$.

2.5 A negative index gives a reciprocal: $2^{(-3)}=1/8=0.125$.

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: For every positive a , a^2+a^3 equals a^5 .

3.1 False. At $a=2$, $a^2+a^3=4+8=12$, while $a^5=32$. Adding exponents applies to multiplication of powers with the same base.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.