

Exercise walk-through

1.3

Indices, surds, standard form and bounds (N11–N16)

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).

19. Checklist before you call this topic done

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Four operations on fractions/mixed numbers and negatives without a calculator; BIDMAS traps. Prime decomposition $\rightarrow$ HCF/LCM; product rule for counting (H). Index laws including negative and fractional; simplify and rationalise surds (H). Standard form arithmetic; rounding and error intervals; upper/lower bounds through a formula (H). FDP conversions including recurring decimals (H); percentage multipliers and reverse percentages.

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 Simplify $7^5 \times 7^2$. [1]

2.2 Write 0.00052 in standard form. [2]

2.3 Estimate 412×29 by rounding each number to one significant figure. [2]

Exercises 2.1·2.3

2.1 Simplify $7^5 \times 7^2$. [1]

2.1 7^7 .

2.2 Write 0.00052 in standard form. [2]

2.2 5.2×10^{-4} .

2.3 Estimate 412×29 by rounding each number to one significant figure. [2]

2.3 $400 \times 30; = 12\,000$.

Exercises 3.1·3.3

3.1 Work out $(3 \times 10^4) \div (6 \times 10^{-3})$, giving your answer in standard form. [3]

3.2 (H) Simplify fully $\sqrt{48} + \sqrt{27}$. [3]

3.3 (H) The mass of a parcel is 3.6 kg to 1 d.p. and the mass of a box is 1.2 kg to 1 d.p. Work out the upper bound of the total mass. [3]

Exercises 3.1·3.3

3.1 Work out $(3 \times 10^4) \div (6 \times 10^{-3})$, giving your answer in standard form. [3]

3.1 $3 \div 6 = 0.5$; $10^4 \div 10^{-3} = 10^7$; $= 0.5 \times 10^7 = 5 \times 10^6$.

3.2 (H) Simplify fully $\sqrt{48} + \sqrt{27}$. [3]

3.2 $\sqrt{48} = 4\sqrt{3}$; $\sqrt{27} = 3\sqrt{3}$; sum $= 7\sqrt{3}$.

3.3 (H) The mass of a parcel is 3.6 kg to 1 d.p. and the mass of a box is 1.2 kg to 1 d.p. Work out the upper bound of the total mass. [3]

3.3 UBs: 3.65 and 1.25; total $= 3.65 + 1.25$; $= 4.9$ kg.