GCSE 7+ Session 2
Independent Practice
Algebra with indices and surds

KING'S MATHS SCHOOL

Revise, refresh, recall *the core knowledge and skills:*

1 Simplify fully a) $\sqrt{x^{12}}$ b) $\sqrt[3]{x^{12}}$ c) $(2x^3y^2)^4$

d) $\frac{25x^8}{40x^5}$ e) $\frac{25x+5x^2}{40+8x}$

2 Write as a single fraction

a) $\frac{x}{3}+\frac{x}{5}$ b) $\frac{3}{x}+\frac{5}{x}$ c) $\frac{3}{x}+\frac{5}{x^2}$

3 Solve a) $x^3=-\frac{8}{27}$ b) $x^{-2}=64$ c) $2^x=8^{12}$

4 Solve a) $\sqrt{2}x+12=8$ b) $\sqrt{2}x+12=\sqrt{8}x$

5 Make x the subject of a) $p-qx=r$ b) $p-qx=rx$

Practice makes permanent: *these questions will help you embed and make secure your factual knowledge, procedural fluency and conceptual understanding:*

6 Simplify fully

a) $\sqrt{100x^{100}}$ b) $\sqrt[3]{8x^{18}}$ c) $(8x^{12}y^{-6})^{\frac{2}{3}}$

d) $\frac{12x^2+4x^3}{8x^3}$ e) $\frac{12x^2+4x^3}{3x+9}$

7 Write as a single fraction

a) $x^{-1}-x^{-2}$ b) $4x^{-2}-(3x)^{-1}$ c) $(4x)^{-2}-3x^{-1}$

8 Solve a) $x^3=15\frac{5}{8}$ b) $x^{-2}=16\frac{1}{3}$ c) $8^x=32^{12}$

9 Make x the subject of

a) $\frac{b}{x-b}=a$ b) $\frac{x+b}{x-b}=a$ c) $\frac{\sqrt{x}}{b-\sqrt{x}}=a$

d) $\frac{b}{x} = a$ e) $\frac{b}{x} + b = a$ f) $\frac{b}{x} + b = \frac{a}{x}$

10 Solve a) $\sqrt{2}x + 12 = x$ b) $\sqrt{2}x + 12 = \sqrt{5}x$

11 Solve a) $\begin{matrix} 3x - 2y = 12\sqrt{6} \\ 2x + 3y = -\sqrt{150} \end{matrix}$ b) $\begin{matrix} \sqrt{3}x + 2y = 10 \\ x - \sqrt{3}y = \sqrt{75} \end{matrix}$

Productive struggle: *these harder questions require deeper thinking.*

12 Simplify fully

a) $\sqrt{100x^{44}} \div \sqrt[3]{1000x^{66}}$ b) $(2x^4y^{-2})^3 \times \sqrt{36x^{-8}y^{14}}$

c) $\sqrt[3]{64x^{27}} - 3x^3 - \sqrt{16x^{18}} - x^3$ d) $\sqrt[3]{64x^{27}} \div 3x^3 \times \sqrt{16x^{18}} \div x^3$

13 Write as a single fraction

a) $3x^{-1} - 4x^{-3}$ b) $(3x)^{-2} \times 4x^{-3}$ c) $(4x)^{-2} \div 3x^{-3}$

d) $5(2x)^{-3} - 4(5x)^{-1}$ e) $3x - 3x^{-2} - (3x)^{-1}$

f) $4x^{\frac{1}{2}} - 9x^{-\frac{1}{2}}$ g) $(4x)^{\frac{1}{2}} - (9x)^{-\frac{1}{2}}$

14 Solve

a) $x^{-1.25} = 3^{-15}$ b) $x^{2.5} = 3^{10}$ c) $4^{2x-1} = 8^{x+3}$

15 Simplify fully

a) $\left(\frac{9x^6}{y^4}\right)^{-\frac{3}{2}}$ b) $\frac{25x^{-8}}{40x^{-5}}$ c) $\frac{25x^{-3}\sqrt{y}}{40x^{-2}\sqrt{y^3}}$

d) $\frac{3x^2 - 6x^3}{10x^4 - 5x^3}$ e) $\frac{3x^{-2} - 6x^{-3}}{5x^{-3} - 10x^{-4}}$

16 Give a fully simplified expression for the **width** of a rectangle which has

- Area = $18a^3b^2 + 12a^2b^3$
- Length = $27a^2 + 18ab$