

**GCSE 7+ Session 1**  
**Independent Practice**  
**Fluency with indices and surds**



**KING'S  
MATHS  
SCHOOL**

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

- 1 Evaluate      a)  $100 \times 5^{-2}$       b)  $\sqrt{2^{10}}$   
                         c) the HCF and LCM of 200 and 160
- 2 Simplify fully      a)  $(3\sqrt{5})^2$       b)  $3(2 + \sqrt{5}) - 2(5 - 3\sqrt{5})$   
                         c)  $(7 - 3\sqrt{5})^2$       d)  $\sqrt{12}$   
                         e)  $\sqrt{18} + \sqrt{50}$       f)  $\frac{12}{\sqrt{3}}$
- 3 Two boxes are mathematically similar. The smaller box has a surface area of  $0.5\text{m}^2$ .  
The larger box has a surface area of  $1\text{m}^2$ .  
The smaller box is  $\sqrt{800}$  cm tall. How tall is the larger box?

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

- 4 Evaluate  
a)  $5 \times 100^{-\frac{1}{2}}$       b)  $1000^{\frac{2}{3}} \times 100^{-\frac{3}{2}}$   
c)  $\sqrt[3]{8^6}$       d)  $2^8 \times 8^2 \div 4^5$
- 5 Work out the HCF and LCM of  
a) 200 and 160 and 2500      b)  $2^7 \times 3^8 \times 5^3$  and  $6^4 \times 10^5$
- 6 Simplify fully  
a)  $(2\sqrt{5})^3$       b)  $8(1 + 2\sqrt{5}) - 2\sqrt{5}(3 - \sqrt{5})$   
c)  $(7 + 3\sqrt{5})(7 - 3\sqrt{5})$
- 7 Simplify fully  
a)  $\sqrt{48}$       b)  $\sqrt{75} - \sqrt{48}$       c)  $(\sqrt{75} - \sqrt{48})^2$   
d)  $\frac{\sqrt{8} + \sqrt{18}}{5}$       e)  $\frac{\sqrt{8} + \sqrt{18}}{\sqrt{2}}$       f)  $\frac{12}{\sqrt{45}} - \frac{7}{\sqrt{20}}$

- 8 Two statues are mathematically similar.  
One statue has a surface area of  $4.5\text{m}^2$ , and the other has a surface area of  $2\text{m}^2$ .  
One statue has a mass of  $21.6\text{kg}$ . What could be the mass of the other statue?

- 9 Use pairs of similar right-angled triangles to demonstrate that

a)  $3\sqrt{10} = \sqrt{90}$                       b)  $4\sqrt{3} = \sqrt{48}$   
c)  $\sqrt{5}\sqrt{2} = \sqrt{10}$

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

- 10 Evaluate

a)  $\left(6\frac{1}{4}\right)^{-\frac{1}{2}}$                       b)  $\sqrt{20} \times 5^{-2.5}$   
c)  $9^{18} \div 27^{12}$                       d)  $\sqrt{12^{10} \times 72^{-4}}$

- 11 Simplify fully

a)  $(2 - \sqrt{5})^2$                       b)  $(2 - \sqrt{5})^5$   
c)  $(\sqrt{243} - \sqrt{75} - \sqrt{48})^2$                       d)  $(1 - \sqrt{3})^3(3 + \sqrt{3})^3$   
e)  $\frac{40}{\sqrt{5}} - (\sqrt{5})^3 - \sqrt{45}$                       f)  $\frac{(15 - 3\sqrt{5})^2}{(5 + \sqrt{5})(3 - \sqrt{5})}$

- 12 Simplify fully

a)  $\frac{12}{3 - \sqrt{3}}$                       b)  $\frac{6 - \sqrt{8}}{\sqrt{2}}$                       c)  $\frac{\sqrt{500} - \sqrt{80}}{\sqrt{20}}$   
d)  $\frac{\sqrt{500} - \sqrt{80}}{\sqrt{5} + \sqrt{20}}$                       e)  $\frac{9}{\sqrt{6} - \sqrt{3}}$                       f)  $\frac{5 - 3\sqrt{3}}{2 + \sqrt{3}}$

- 13 A train ticket costs £19.80 and a coach ticket costs £18.48.

What are the smallest integers M and N (both greater than 0) that make this true?

- "The total cost of M train tickets is the same as the total cost of N coach tickets".

- 14 Put in order, from smallest to largest:

$3 \times 27^{13}$                        $2^{60}$                        $8 \times 128^{11}$                        $6^{20} \times 16^5$