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

KING'S MATHS SCHOOL

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

1)

a) $\sqrt{x^{12}} = (x^{12})^{\frac{1}{2}} = x^{\frac{12}{2}} = x^6$

b) $\sqrt[3]{x^{12}} = (x^{12})^{\frac{1}{3}} = x^{\frac{12}{3}} = x^4$

c) $(2x^3y^2)^4 = 2^4(x^3)^4(y^2)^4 = 16x^{12}y^8$

d) $\frac{25x^8}{40x^5} = \frac{5\times5x^8}{5\times8x^5} = \frac{5}{8}\frac{x^8}{x^5} = \frac{5}{8}(x^{8-5}) = \frac{5x^3}{8}$.

e) **Factorise** the numerator and denominator: $\frac{25x+5x^2}{40+8x} = \frac{5x(5+x)}{8(5+x)} = \frac{5x}{8}\left(\frac{5+x}{5+x}\right) = \frac{5x}{8}$

2) To write a sum or a difference as a single fraction, you need a **common denominator**.

a) $\frac{x}{3} + \frac{x}{5} = \frac{5x}{3\times5} + \frac{3x}{5\times3} = \frac{5x+3x}{15} = \frac{8x}{15}$

b) $\frac{3}{x} + \frac{5}{x} = \frac{3+5}{x} = \frac{8}{x}$

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

3)

a) $x^3 = -\frac{8}{27} = \frac{-8}{27}$ therefore $x = \left(\frac{-8}{27}\right)^{\frac{1}{3}} = \frac{(-8)^{\frac{1}{3}}}{27^{\frac{1}{3}}} = \frac{\sqrt[3]{-8}}{\sqrt[3]{27}} = \frac{-2}{3}$

b) $x^{-2} = 64$ therefore $\frac{1}{x^2} = 64$ therefore $x^2 = \frac{1}{64}$

Therefore $x = \pm\left(\frac{1}{64}\right)^{\frac{1}{2}}$

Remember there is a positive **and** a negative solution $x = \pm\frac{1}{\sqrt{64}} = \pm\frac{1}{8}$.

c) $2^x = 8^{12}$. Rewrite both sides as powers of 2, using the fact that $8 = 2^3$.

$2^x = (2^3)^{12} = 2^{(3\times12)} = 2^{36}$ therefore $x = 36$

4)

a)	b)
$\sqrt{2}x + 12 = 8$ So $\sqrt{2}x = -4$ $x = \frac{-4}{\sqrt{2}} = \frac{-4\sqrt{2}}{2}$ ← Multiply both numerator and denominator by $\sqrt{2}$. $x = -2\sqrt{2}$	$\sqrt{2}x + 12 = \sqrt{8}x = \sqrt{4}\sqrt{2}x = 2\sqrt{2}x$ So $\sqrt{2}x + 12 = 2\sqrt{2}x$ So $12 = \sqrt{2}x$ $x = \frac{12}{\sqrt{2}} = \frac{12\sqrt{2}}{2}$ $x = 6\sqrt{2}$

5) Make x the subject.

a) $p - qx = r$ $p - r = qx$	Group all the terms in x on the same side.	b) $p - qx = rx$ $p = rx + qx$ **Factorise by x.** $p = x(r + q)$
$x = \frac{p - r}{q}$	Divide both sides by the coefficient of x.	$x = \frac{p}{r + q}$