| GCSE - **Numeracy and Mathematics**

Topic: Fractional, negative index numbers | Tier: Higher | Grade: A/A* | |

Starter

Write each of the following in index notation:

a) 4 x 4 x 4 x 4 x 4 =

b) 7 x 7 x 7 x 7 =

c) 3 x 3 x 3 =

Skills:

1. Simplify each of the following, giving your answer in index form:

a) $2^7 \times 2^4$

b) $3^4 \times 3^5$

c) $5^7 \div 5^4$

d) $5^4 \div 5^1$

e) $(5^2)^6$

f) $(2^4)^5$

g) 4^{-2}

h) 5^{-4}

i) $125^{\frac{2}{3}}$

j) $16^{\frac{3}{4}}$

k) $3^2 \times 3^0 \times 3^4$

l) $\dfrac{7^4 \times 7^5}{7^4 \times 7^3}$

Top Tips!

Multiplying Indices: $a^b \times a^c = a^{b+c}$ e.e. $2^4 \times 2^2 = 2^6$

Dividing Indices: $a^b \div a^c = a^{b-c}$ e.e. $4^5 \div 4^3 = 4^2$

Raising a power to a power: $\left(a^b\right)^c = a^{b \times c}$ e.e. $(3^4)^3 = 3^{12}$

Power of zero: $a^0 = 1$ e.e. $13^0 = 1$

Negative Indices: $a^{-b} = \dfrac{1}{a^b}$ e.e. $3^{-2} = \dfrac{1}{3^2}$

Fractional Indices: $a^{\frac{b}{c}} = \left(\sqrt[c]{a}\right)^b$ e.e. $64^{\frac{2}{3}} = \left(\sqrt[3]{64}\right)^2 = 4^2 = 16$

Examination Question: 2013 Summer Link Applications U1 Q10

Raul has been asked to look at some data.

He is asked to write the data in the form 2^n, where *n* is a whole number or a decimal.

Write the following numbers in the form 2^n.

(a) $\dfrac{1}{2^3}$ [1]

(b) $(2^{0\cdot3})^{0\cdot4}$

[1]

(c) $\left(\sqrt[4]{8}\right)^{12}$

[2]

Assessment for Learning

Video / QR code

GCSE - **Numeracy and Mathematics** **Topic: Fractional, negative index numbers**	**Tier: Higher**	**Grade: A/A***	GwE

Starter

Write each of the following in index notation:

a) 4 x 4 x 4 x 4 x 4 = 4^5

b) 7 x 7 x 7 x 7 = 7^4

c) 3 x 3 x 3 = 3^3

Skills:

1. Simplify each of the following, giving your answer in index form:

a) $2^7 \times 2^4$ = 2^{11}

b) $3^4 \times 3^5$ = 3^9

c) $5^7 \div 5^4$ = 5^3

d) $5^4 \div 5^1$ = 5^3

e) $(5^2)^6$ = 5^{12}

f) $(2^4)^5$ = 2^{20}

g) 4^{-2} = $\frac{1}{16}$

h) 5^{-4} = $\frac{1}{625}$

i) $125^{\frac{2}{3}}$ = 25

j) $16^{\frac{3}{4}}$ = 8

k) $3^2 \times 3^0 \times 3^4$ = 3^6

l) $\frac{7^4 \times 7^5}{7^4 \times 7^3}$ = 7^2

Top Tips!

Multiplying Indices: $a^b \times a^c = a^{b+c}$ e.e. $2^4 \times 2^2 = 2^6$

Dividing Indices: $a^b \div a^c = a^{b-c}$ e.e. $4^5 \div 4^3 = 4^2$

Raising a power to a power: $(a^b)^c = a^{b \times c}$ e.e. $(3^4)^3 = 3^{12}$

Power of zero: $a^0 = 1$ e.e. $13^0 = 1$

Negative Indices: $a^{-b} = \frac{1}{a^b}$ e.e. $3^{-2} = \frac{1}{3^2}$

Fractional Indices: $a^{\frac{b}{c}} = (\sqrt[c]{a})^b$ e.e. $64^{\frac{2}{3}} = (\sqrt[3]{64})^2 = 4^2 = 16$

Examination Question: 2013 Summer Link Applications U1 Q10

Raul has been asked to look at some data.

He is asked to write the data in the form 2^n, where *n* is a whole number or a decimal.

Write the following numbers in the form 2^n.

(a) $\frac{1}{2^3}$ 2^{-3} [1]

(b) $(2^{0 \cdot 3})^{0 \cdot 4}$

$2^{0.12}$ [1]

(c) $(\sqrt[4]{8})^{12}$

2^9 [2]

Assessment for Learning

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