COSMOS
COACHING CENTRE

Worksheet 27
INDICES AND SURDS
- Zero power and power of power
- Negative indices

1. Simplify each of the following by combining various index laws.

a $4 \times (4^3)^2$ **b** $(3^4)^2 \times 3$ **c** $x \times (x^0)^5$

d $y^5 \times (y^2)^4$ **e** $b^5 \times (b^3)^3$ **f** $(a^2)^3 \times a^4$

g $(d^3)^4 \times (d^2)^6$ **h** $(y^2)^6 \times (y)^4$ **i** $z^4 \times (z^3)^2 \times (z^5)^3$

j $a^3 f \times (a^4)^2 \times (f^4)^3$ **k** $x^2 y \times (x^3)^4 \times (y^2)^2$ **l** $(s^2)^3 \times 5(r^0)^3 \times rs^2$

2. Simplify each of the following using various index laws.

a $\dfrac{3x^4 \times 6x^3}{9x^{12}}$ **b** $\dfrac{5x^5 \times 4x^2}{2x^{10}}$ **c** $\dfrac{24(x^4)^4}{8(x^4)^2}$

d $\dfrac{4(d^4)^3 \times (e^4)^2}{8(d^2)^5 \times e^7}$ **e** $\dfrac{6(m^3)^2(n^5)^3}{15(m^5)^0(n^2)^7}$ **f** $\dfrac{2(a^3)^4(b^2)^6}{16(a)^0(b^6)^2}$

3. Evaluate these without using a calculator.

a $(2^4)^8 \div 2^{30}$ **b** $(10^3)^7 \div 10^{18}$ **c** $(7^4)^9 \div 7^{36}$

d $((-1)^{11})^2 \times ((-1)^2)^{11}$ **e** $-2((-2)^3)^3 \div (-2)^8$ **f** $\dfrac{(5^2)^3}{(8^4)^7} \times \dfrac{(8^7)^4}{(5^3)^2}$

4. Simplify each of the following.

a $((x^2)^3)^4$ **b** $((2x^3)^2)^4$ **c** $(a^3b^2)^3 \times (a^4b)^2$

d $(a^2b)^3 \times (ab^2)^4$ **e** $\dfrac{(2m^3n)^3}{m^4}$ **f** $\dfrac{3(2^2c^4d^5)^3}{(2cd^2)^4}$

g $\left(\dfrac{-3x^2y^0}{5a^5b^3}\right)^3$ **h** $\dfrac{-3(2^4a^4b^3)^3}{(-2^3a^2b)^4}$ **i** $\dfrac{-5(3^5m^3n^2)^2}{(-3^3m^2n)^3}$

j $\left(\dfrac{a^3b}{c}\right)^3 \times \left(\dfrac{ac^4}{b}\right)^2$ **k** $\left(\dfrac{x^2z}{y}\right)^4 \times \left(\dfrac{xy^2}{z}\right)^3$ **l** $\left(\dfrac{r^3s}{t}\right)^2 \div \left(\dfrac{s}{rt^4}\right)^3$

5. Express each of the following with positive indices only.

a x^{-1} **b** a^{-4} **c** b^{-6} **d** 5^{-2}

e 4^{-3} **f** 9^{-1} **g** $5x^{-2}$ **h** $4y^{-3}$

i $3m^{-5}$ **j** p^7q^{-2} **k** mn^{-4} **l** x^4y^{-4}

m $2a^{-3}b^{-1}$ **n** $7r^{-2}s^{-3}$ **o** $5^{-1}u^{-8}v^2$ **p** $9^{-1}m^{-3}n^{-5}$

6. Express each of the following using positive indices only.

a $\dfrac{7}{x^{-4}y^3}$ **b** $\dfrac{1}{u^{-3}v^2}$ **c** $\dfrac{a^{-3}5^{-1}}{y^{-3}}$ **d** $\dfrac{2a^{-4}}{b^{-5}c^2}$

e $\dfrac{5a^2c^{-4}}{6b^{-2}d}$ **f** $\dfrac{5^{-1}h^3k^{-2}}{4^{-1}m^{-2}p}$ **g** $\dfrac{4t^{-1}u^{-2}}{3^{-1}v^2w^{-6}}$ **h** $\dfrac{4^{-1}x^2y^{-5}}{4m^{-1}n^{-4}}$