CLUEY LEARNING

MATHEMATICS: INDICES

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Learning Objective: Multiplication, division and negative index laws.

Index Law for further powers:

$(a^m)^n = a^{m\times n}$	$(a\times b)^m = a^m \times b^m$	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

- Raise any coefficient to the power outside grouping symbols
- Keep the same base
- Multiply the indices

Example:

Simplify

$(a^4)^3 = a^{4\times 3}$ $= a^{12}$	$(5k)^2 = 5^2k^2$ $= 25k^2$	$\left(\frac{2x^3}{y^5}\right)^6 = \frac{2^{1\times 6}x^{3\times 6}}{y^{5\times 6}}$ $= \frac{64x^{18}}{y^{30}}$

Simplify the following questions.

$(m^9)^5$	$(5s)^4$	$\left(\frac{6b^2}{5d^3}\right)^3$	$\left(\frac{8g^6}{3h^9}\right)^2$

Simplify the following, giving answers without negative indices.

$\frac{(x^{-2}y^4)^2}{x^5y^{-7}}$	$\frac{a^{-3}b^6}{(a^2b^{-4})^2}$	$\frac{(w^{-4}v^5)^2}{w^7v^{-4}}$	$\frac{d^{-5}e^6}{(d^4e^{-3})^2}$

MATHEMATICS: ANSWER SHEET

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$(m^9)^5$	$(5s)^4$	$\left(\frac{6b^2}{5d^3}\right)^3$	$\left(\frac{8g^6}{3h^9}\right)^2$
$(m^9)^5 = m^{9\times5}$ $= m^{45}$	$(5s)^4 = 5^4 \times s^4$ $= 625d^4$	$\left(\frac{6b^2}{5d^3}\right)^3 = \frac{6^3b^{2\times3}}{5^3d^{3\times3}}$ $= \frac{216b^6}{125d^9}$	$\left(\frac{8g^6}{3h^9}\right)^2 = \frac{8^2g^{6\times2}}{3^2h^{9\times2}}$ $= \frac{64g^{12}}{9h^{18}}$

Simplify the following, giving answers without negative indices.

$\frac{(x^{-2}y^4)^2}{x^5y^{-7}}$	$\frac{a^{-3}b^6}{(a^2b^{-4})^2}$	$\frac{(w^{-4}v^5)^2}{w^7v^{-4}}$	$\frac{d^{-5}e^6}{(d^4e^{-3})^2}$
$\frac{(x^{-2}y^4)^2}{x^5y^{-7}} = \frac{x^{-4}y^8}{x^5y^{-7}}$ $= x^{-4\ -5}\ y^{8\ -\ (-7)}$ $= x^{-9}y^{15}$ $= \frac{y^{15}}{x^9}$	$\frac{a^{-3}b^6}{(a^2b^{-4})^2} = \frac{a^{-3}b^6}{a^4b^{-8}}$ $= a^{-3\ -4}\ b^{6\ -\ (-8)}$ $= a^{-7}b^{14}$ $= \frac{b^{17}}{a^7}$	$\frac{(w^{-4}v^5)^2}{w^7v^{-4}} = \frac{w^{-8}\ v^{10}}{w^7v^{-4}}$ $= w^{(-8)\ -7}\ v^{10\ -\ (-4)}$ $= w^{-15}\ v^{14}$ $= \frac{v^{14}}{w^{15}}$	$\frac{d^{-5}e^6}{(d^4e^{-3})^2} = \frac{d^{-5}e^6}{d^8e^{-6}}$ $= d^{-5\ -8}\ e^{6\ -\ (-6)}$ $= d^{-13}\ e^{12}$ $= \frac{e^{12}}{d^{13}}$