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

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

Simplify the following questions.

$(r^8)^8$	$(7l)^3$	$\left(\frac{3b^4}{7d^2}\right)^2$	$\left(\frac{6g^7}{5h^{11}}\right)^2$

Simplify the following, giving answers without negative indices.

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

MATHEMATICS: ANSWER SHEET

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Simplify the following questions.

$(r^8)^8$	$(7l)^3$	$\left(\frac{3b^4}{7d^2}\right)^2$	$\left(\frac{6g^7}{5h^{11}}\right)^2$
$(r^8)^8 = r^{8\times8}$ $= r^{64}$	$(7l)^3 = 7^3 \times l^3$ $= 343l^3$	$\left(\frac{3b^4}{7d^2}\right)^2 = \frac{3^2b^{4\times2}}{7^2d^{2\times2}}$ $= \frac{9b^8}{49d^4}$	$\left(\frac{6g^7}{5h^{11}}\right)^2 = \frac{6^2g^{7\times2}}{5^2h^{11\times2}}$ $= \frac{36g^{14}}{25h^{22}}$

Simplify the following, giving answers without negative indices.

$\frac{(x^{-3}y^5)^2}{x^3y^{-6}}$	$\frac{a^{-2}b^5}{(a^3b^{-2})^3}$	$\frac{(w^{-2}v^3)^2}{w^6v^{-2}}$	$\frac{d^{-3}e^7}{(d^5e^{-2})^3}$
$\frac{(x^{-3}y^5)^2}{x^3y^{-6}} = \frac{x^{-6}y^{10}}{x^3y^{-6}}$ $= x^{-6\ -3}\ y^{10\ -\ (-6)}$ $= x^{-9}y^{16}$ $= \frac{y^{16}}{x^9}$	$\frac{a^{-2}b^5}{(a^3b^{-2})^3} = \frac{a^{-2}b^5}{a^9b^{-6}}$ $= a^{-2\ -9}\ b^{5\ -\ (-6)}$ $= a^{-11}b^{11}$ $= \frac{b^{11}}{a^{11}}$ $= \left(\frac{b}{a}\right)^{11}$	$\frac{(w^{-2}v^3)^2}{w^6v^{-2}} = \frac{w^{-4}\ v^6}{w^6v^{-2}}$ $= w^{(-4)\ -6}\ v^{6\ -\ (-2)}$ $= w^{-10}\ v^8$ $= \frac{v^8}{w^{10}}$	$\frac{d^{-3}e^7}{(d^5e^{-2})^3} = \frac{d^{-3}e^7}{d^{15}e^{-6}}$ $= d^{-3\ -15}\ e^{7\ -\ (-6)}$ $= d^{-18}\ e^{13}$ $= \frac{e^{13}}{d^{18}}$