Extension activities

Power of zero and negative powers

Evaluate the powers given to gain an intuitive understanding of what a power of zero means and what a negative power means.

2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}

3^4	3^3	3^2	3^1	3^0	3^{-1}	3^{-2}	3^{-3}

From this we can deduce some rules for exponents:

$$x^0 = 1$$
$$x^{-n} = \frac{1}{x^n}$$

we also have:

$$x^m \times x^n = x^{m+n}$$
$$(x^m)^n = x^{mn}$$

and can show:

$$\frac{x^m}{x^n} = \frac{x^m}{1} \times \frac{1}{x^n}$$
$$= x^m \times x^{-n} = x^{m-n}$$

Questions

1) Simplify

a) $(2x)^0$

b) $3x^0$

c) $(-5)^0$

d) $x \times 4x^0$

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2) Simplify and write with positive exponents:

a) x^{-2}

b) $3x^{-2}$

c) $x^3 \times x^{-2}$

d) $x^4 \times x^{-5}$

e) $y \times y^{-5}$

f) $3x^{-1} \times y$

g) $4y^{-2} \times 3y^{-1}$

h) $7x^{-1} \times y^{-3}$

i) $3x^2y \times 2xy^{-3}$

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3) Simplify and write with positive exponents:

a) $(3x)^{-2}$

b) $(3x)^{-2} \times x^4$

c) $(7x)^2 \times x^{-2}$

d) $(3x)^{-2} \times x^{-2}$

e) $(4xy)^2 \times (xy)^{-3}$

f) $9x^{-2} \times (3x)^{-1}$

g) $4^2x^{-3} \times 4^{-1}xy$

h) $3x^{-1} \times (y^{-2})^{-1}$

i) $(y^{-2})^{-3} \times x^{-3}$

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4) Evaluate these fractions:

a) $\dfrac{1}{\frac{1}{2}}$

b) $\dfrac{3}{\frac{1}{2}}$

c) $\dfrac{1}{\frac{2}{3}}$

d) $\dfrac{\frac{3}{2}}{\frac{2}{3}}$

e) $\dfrac{1}{2^{-1}}$

f) $\dfrac{1}{2^{-2}}$

g) $\left(\dfrac{1}{3}\right)^{-1}$

h) $\left(\dfrac{2}{3}\right)^{-2}$

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5) Simplify and write with positive exponents:

a) $\dfrac{1}{x^{-2}}$

b) $\left(\dfrac{1}{x}\right)^{-2}$

c) $\left(\dfrac{y}{x}\right)^{-2}$

d) $\left(\dfrac{yx^3}{x^2}\right)^{-2}$

e) $\left(\dfrac{3x^4}{y}\right)^{-3}$

f) $\left(\dfrac{6x^2}{3x^2y}\right)^{-1}$