Practice
Expressions: Exponents

Answer these problems, then check your answers using the key on the next page. If you missed something, look at the solutions after the answer key, and if you still don't understand, watch the review video again.

For all problems:
Simplify without using a calculator. If answers contain exponents, make sure they are positive.

#1) $\dfrac{12x^{-9}}{-4x^{3}}$

#2) $\dfrac{-18x^{-10}y^{-2}}{6x^{-3}y^{-5}}$

#3) $\left(\dfrac{6x^{3}y}{3x^{2}y^{3}}\right)^{2}$

#4) $\dfrac{-9x^{-8}}{-3x^{-5}}$

#5) $\left(2x^{3}y^{5}\right)^{3}$

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

#7) 3^{-2}

#8) $\left(-\frac{2}{3}\right)^{0}$

#9) $20 \cdot 15^{-1}$

#10) $2^{3} \cdot 4^{-2}$

#11) $\frac{-10x^{0}}{30y^{-2}}$

#12) $\frac{8a^{2}b^{-3}c^{-4}}{12a^{-3}b^{0}c^{-2}}$

#13) $\frac{\left(x^{3}\right)\left(x^{4}\right)}{\left(x^{2}\right)^{5}}$

#14) $\frac{\left(4xy^{3}\right)^{2}}{24x^{6}y^{8}}$

Answers:

#1) $\frac{-3}{x^{12}}$

#2) $\frac{-3y^3}{x^7}$

#3) $\frac{4x^2}{y^4}$

#4) $\frac{3}{x^3}$

#5) $8x^9y^{15}$

#6) $\frac{y^6}{x^9}$

#7) $\frac{1}{9}$

#8) 1

#9) $\frac{4}{3}$

#10) $\frac{1}{2}$

#11) $\frac{-y^2}{3}$

#12) $\frac{2a^5}{3b^3c^2}$

#13) $\frac{1}{x^3}$

#14) $\frac{2}{3x^4y^2}$

Solutions:

Simplify without using a calculator. If answers contain exponents, make sure they are positive.

#1) $\frac{12x^{-9}}{-4x^{3}}$

using properties

$\frac{12x^{-9}}{-4x^{3}}$

$\frac{12}{-4} \cdot x^{(-9-3)}$

$-3x^{-12}$

$\boxed{\frac{-3}{x^{12}}}$

factor and 'cancel'

$\frac{12x^{-9}}{-4x^{3}}$

$\frac{4 \cdot 3}{4(-1)x^{9}x^{3}}$

$\frac{-3}{x^{9}x^{3}}$

$\boxed{\frac{-3}{x^{12}}}$

#2) $\frac{-18x^{-10}y^{-2}}{6x^{-3}y^{-5}}$

properties

$\frac{-18}{6} \cdot \frac{x^{-10}}{x^{-3}} \frac{y^{-2}}{y^{-5}}$

$-3x^{-10-(-3)}y^{(-2)-(-5)}$

$-3x^{-7}y^{3}$

$\boxed{\frac{-3y^{3}}{x^{7}}}$

factor/cancel

$\frac{-18x^{-10}y^{-2}}{6x^{-3}y^{-5}}$

$\frac{6(-3)x^{3}y^{5}}{6(1)x^{10}y^{2}}$

$\frac{-3x^{3}y^{2}y^{3}}{x^{7}x^{3}y^{2}}$

$\boxed{\frac{-3y^{3}}{x^{7}}}$

#3) $\left(\frac{6x^{3}y}{3x^{2}y^{3}}\right)^{2}$

$\left(\frac{3(2)xx^{2}y}{3x^{2}y^{3}}\right)^{2}$

$\left(\frac{2x}{y^{2}}\right)^{2}$

$\frac{(2x)^{2}}{(y^{2})^{2}}$

$\frac{2^{2}x^{2}}{y^{4}}$

$\boxed{\frac{4x^{2}}{y^{4}}}$

#4) $\frac{-9x^{-8}}{-3x^{-5}}$

$\frac{-3(3)x^{5}}{-3x^{8}}$

$\frac{3x^{5}}{x^{3} \cdot x^{5}}$

$\boxed{\frac{3}{x^{3}}}$

— or —

$\frac{-9(3)x^{-8}}{-3x^{-5}}$

$3x^{-8-(-5)}$

$3x^{-3}$

$\boxed{\frac{3}{x^{3}}}$

#5) $(2x^{1}y^{5})^{3}$

$(2x^{3}y^{5})(2x^{3}y^{5})(2x^{3}y^{5})$

$2^{3}(x^{3})^{3}(y^{5})^{3}$

$\boxed{8x^{9}y^{15}}$

#6) $\left(\frac{x^{3}}{y^{2}}\right)^{-3}$

$\left(\frac{y^{2}}{x^{3}}\right)^{3}$

$\frac{(y^{2})^{3}}{(x^{3})^{3}}$

$\boxed{\frac{y^{6}}{x^{9}}}$

#7) 3^{-2}

$\frac{1}{3^2}$

$\boxed{\frac{1}{9}}$

#8) $\left(-\frac{2}{3}\right)^0$

$\boxed{1}$

#9) $20 \cdot 15^{-1}$

$20 \cdot \frac{1}{15}$

$\frac{20}{15}$

$\frac{\cancel{5} \cdot 4}{\cancel{5} \cdot 3}$

$\boxed{\frac{4}{3}}$

#10) $2^3 \cdot 4^{-2}$

$\frac{8}{1} \cdot \frac{1}{4^2}$

$\frac{8}{16}$

$\frac{\cancel{8} \cdot 1}{\cancel{8} \cdot 2}$

$\boxed{\frac{1}{2}}$

#11) $\frac{-10x^0}{30y^{-2}}$

$\frac{-10(1)}{30y^{-2}}$

$\frac{\cancel{10}(-1)y^2}{\cancel{10}(3)}$

$\boxed{\frac{-y^2}{3}}$

#12) $\frac{8a^2b^{-3}c^{-1}}{12a^{-3}b^0c^{-2}}$

$\frac{\cancel{4}\cdot 2}{\cancel{4}\cdot 3} a^{2-(-3)} b^{-3-0} c^{-1-(-2)}$

$\frac{2}{3} a^5 b^{-3} c^{-2}$

$\boxed{\frac{2a^5}{3b^3c^2}}$

#13) $\frac{(x^3)(x^4)}{(x^2)^5}$

$\frac{x^{(3+4)}}{x^{(2\cdot 5)}}$

$\frac{x^7}{x^{10}}$

x^{7-10}

x^{-3}

$\boxed{\frac{1}{x^3}}$

#14) $\frac{(4xy^3)^2}{24x^6y^8}$

$\frac{y^2x^2(y^3)^2}{24x^6y^8}$

$\frac{16x^2y^6}{24x^6y^8}$

$\frac{8(2)x^2 \quad y^6}{8(3)x^4x^4 \quad y^6 \cdot y^2}$

$\boxed{\frac{2}{3x^4y^2}}$

or →

$\frac{8(2)}{8(3)} x^{2-6} y^{6-8}$

$\frac{2}{3} x^{-4} y^{-2}$

$\boxed{\frac{2}{3x^4y^2}}$