**EXPOSANTS**

REMINDER: An exponent is a shortened way to represent repeated multiplication.

Examples: $3 ^{5}= 3×3×3×3×3$

  $x^{2} = x×x$

  In Grade 9, you manipulated natural exponents.

EXPLORATION: While analysing repeated multiplications, we could define other exponents to keep the regurity…

  

Note : Notice that 30=1, this is true for any base that is not zero…

Definition : For all whole positive numbers *n,* we have$: 3^{-n}=\frac{1}{3^{n}}$

This rule is true for any other base (not zero).

Examples : a) $2^{-3}=\frac{1}{2^{3}}=\frac{1}{8}$ b) $5^{-2}=\frac{1}{5^{2}}=\frac{1}{25}$ c) $2x^{-5}=2×\frac{1}{x^{5}}=\frac{2}{x^{5}}$

This rule has many interesting consequences:

* $\left(\frac{2}{3}\right)^{-5}=\left(\frac{3}{2}\right)^{5}$

(to change the sign of an exponent, take the reciprocal of the number!)
* 

(if you want to switch the numerator and denominator, you need to change the sign of the exponent)

Examples: Simplify only using positive exponents and evaluate only if possible.

  a) $\left(\frac{3}{4}\right)^{-2}$ b) $\frac{3}{5^{-4}}$

  c) $\frac{2x^{-3}}{5}$ d) $\frac{3^{3}x^{-3}}{2^{-3}y^{2}z^{-4}}$

  e) $\frac{2^{5}x^{3}}{2^{8}x^{-2}}$

Hwk : p 233 # 3 – 8 , 10, 16

LAW OF EXPONENTS (Reminders):

*What simplifies well...*

* Multiplying powers that have the same base: $ 3^{5}×3^{2}$

indeed: $3^{5}×3^{2}$
* Dividing powers that have the same base:  $\frac{3^{5}}{3^{2}}$

indeed: $\frac{3^{5}}{3^{2}}$
* If a power has another exponent: $\left(3^{4}\right)^{2}$

indeed: $\left(3^{4}\right)^{2}$
* If a product has an exponent: $\left(2x\right)^{3}$

indeed: $\left(2x\right)^{3}$

All of these rules continue to work the same with negative or positive exponents...

***What does not simplify****… too bad...*

Adding and subtracting powers that have the same base:

$$2^{3}+2^{5}= $$

Multiplying powers that don’t have the same base :

$$2^{3}×3^{2}=$$

If a sum has an exponent:

$$(x+3)^{2}=$$

Examples:

a) $3^{-5}×3^{2}=$

 b) $3^{-5}×9^{2}=$

 c) $\left(\left(-5\right)^{2}\right)^{-3}=$

d) $\frac{x^{-5}}{x^{-2}}=$

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

f) $\left(2x^{3}y^{-2}×\frac{1}{3}x^{5}y^{-3}\right)^{-1}=$

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

h) $\left(2xy^{-3}\right)^{-2}\left(3x^{2}y^{-3}\right)^{2}$

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

Hwk : p 241 # 3 – 11, 14 – 17 , 19, 21, 22

Review : worksheet + p 247 # - 24, 28 – 30 , 32 + p 249 # 6, 7 + p 253 # 25, 26