



# Thème 13: PUISSANCES ( 2ème partie )

## ACTIVITE 1: a)

Ecriture condensée	Ecriture détaillée	Valeur
$2^5$	$2 \times 2 \times 2 \times 2 \times 2$	32
$3^4$	$3 \times 3 \times 3 \times 3$	81
$10^2$	$10 \times 10$	100
$10^6$	$10 \times 10 \times 10 \times 10 \times 10 \times 10$	1 000 000
$4^3$	$4 \times 4 \times 4$	64
$2^6$	$2 \times 2 \times 2 \times 2 \times 2 \times 2$	64
$1^7$	$1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1$	1
$0^3$	$0 \times 0 \times 0$	0
$(-2)^5$	$(-2) \times (-2) \times (-2) \times (-2) \times (-2)$	-32
$(-3)^4$	$(-3) \times (-3) \times (-3) \times (-3)$	81
$(-10)^2$	$(-10) \times (-10)$	100
$(-10)^3$	$(-10) \times (-10) \times (-10)$	-1000
$8^1$	8	8

## b)

a	3	2	1,414	-9	10	4	-1	1	0
n	8	7	2	5	6	4	23	17	15
$a^n$	6561	128	1,999396	-59049	1000000	256	-1	1	0

## ACTIVITE 2: a) Produit de deux puissances d'un même nombre:

$$2^4 \times 2^2 = (2 \times 2 \times 2 \times 2) \times (2 \times 2) = 2^6$$

$$3^3 \times 3^2 = (3 \times 3 \times 3) \times (3 \times 3) = 3^5$$

$$4^3 \times 4^4 = (4 \times 4 \times 4) \times (4 \times 4 \times 4 \times 4) = 4^7$$

$$10^2 \times 10^5 = (10 \times 10) \times (10 \times 10 \times 10 \times 10 \times 10) = 10^7$$

$$5,2^1 \times 5,2^3 = 5,2 \times (5,2 \times 5,2 \times 5,2) = 5,2^4$$

$$a^2 \times a^3 = (a \times a) \times (a \times a \times a) = a^5$$

$$a^m \times a^n = a^{m+n}$$

## b) Quotient de deux puissances d'un même nombre:

$$\frac{2^5}{2^2} = \frac{2 \times 2 \times 2 \times 2 \times 2}{2 \times 2} = 2^3$$

$$\frac{3^4}{3^1} = 3^{4-1} = 3^3 ; \quad \frac{1,5^5}{1,5^4} = 1,5^{5-4} = 1,5 ; \quad \frac{10^7}{10^3} = 10^{7-3} = 10^4 ; \quad \frac{a^6}{a^4} = a^{6-4} = a^2$$

$$\frac{a^m}{a^n} = a^{m-n}$$

**c) Puissance d'un produit**

$$(2 \times 4)^3 = (2 \times 4) \times (2 \times 4) \times (2 \times 4) = (2 \times 2 \times 2) \times (4 \times 4 \times 4) = 2^3 \times 4^3$$

$$(3,1 \times 5)^2 = (3,1 \times 5) \times (3,1 \times 5) = (3,1 \times 3,1) \times (5 \times 5) = 3,1^2 \times 5^2$$

$$(7 \times 10)^5 = (7 \times 10) \times (7 \times 10) \times (7 \times 10) \times (7 \times 10) \times (7 \times 10) = (7 \times 7 \times 7 \times 7 \times 7) \times (10 \times 10 \times 10 \times 10 \times 10) = 7^5 \times 10^5$$

$$(a \times b)^4 = (a \times b) \times (a \times b) \times (a \times b) \times (a \times b) = (a \times a \times a \times a) \times (b \times b \times b \times b) = a^4 \times b^4$$

$$a^n \times b^n = (a \times b)^n$$

**ACTIVITE 3: a) Exposants négatifs**

a	n	$a^n$	$\frac{1}{a^n}$	$a^{-n}$
4	2	16	0,0625	0,0625
5	3	125	≈0,0067	≈0,0067
10	4	10000	0,0001	,00001
2	5	32	0,03125	0,03125

$$a^{-n} = \frac{1}{a^n}$$

**Exercice n°1:**

a)

$$(-3)^4 \text{ positif} \quad -5^2 \text{ négatif} \quad (-5)^7 \text{ négatif} \quad (5-41)^5 \text{ négatif} \quad -68^{85} \text{ négatif}$$

$$10^7 \text{ positif} \quad -10^3 \text{ négatif} \quad (-2 \times 7)^8 \text{ positif} \quad (-9 \times (-15))^3 \text{ positif}$$

$$b) (-7,2)^5 = -19349,176 \quad ; \quad 52,43^6 \approx 2,08 \times 10^{11}$$

$$(-5,7)^{-3} \approx -5,4 \times 10^{-3} \quad ; \quad (-7,74)^2 \times (-3,14)^3 \approx -59,9076 \times 30,959144 \approx -1854,688$$

**Exercice n°2:**

a) L'inverse de  $8^3$  est  $\frac{1}{8^3} = 8^{-3}$  ; L'inverse de  $17^{-2}$  est  $\frac{1}{17^{-2}} = 17^2$

L'inverse de  $(-5,8)^{-1}$  est  $\frac{1}{(-5,8)^{-1}} = -5,8$  ; L'inverse de  $\left(\frac{2}{3}\right)^5$  est  $\left(\frac{2}{3}\right)^{-5}$

$$b) 10^3 \times 10^5 = 10^{3+5} = 10^8 \quad ; \quad 10^{-2} \times 10^{-4} = 10^{-2+(-4)} = 10^{-6} \quad ; \quad 10^{-3} \times 10^2 = 10^{-3+2} = 10^{-1}$$

$$10^{-9} \times 10 = 10^{-9+1} = 10^{-8} \quad ; \quad 10^{-3} \times 10^2 \times 10^4 = 10^{-3+2+4} = 10^3 \quad ; \quad 2^3 \times 2^{-6} = 2^{3+(-6)} = 2^{-3}$$

$$-5 \times (-5)^4 = (-5)^{1+4} = (-5)^5 \quad ; \quad 3^{-5} \times 3^{-2} = 3^{-5+(-2)} = 3^{-7} \quad ; \quad 2^7 \times 2 \times 2^{-5} = 2^{7+1+(-5)} = 2^3$$

$$7^{-2} \times 7^{-3} \times (-7)^2 = 7^{-2} \times 7^{-3} \times 7^2 = 7^{-2+(-3)+2} = 7^{-3}$$

$$\frac{10^8}{10^{-3}} = 10^{8-(-3)} = 10^{11} \quad ; \quad \frac{10^{-3}}{10^5} = 10^{-3-5} = 10^{-8} \quad ; \quad \frac{10^2}{10^5} = 10^{2-5} = 10^{-3}$$

$$\frac{10^4 \times 10^{-5}}{10^3 \times 10^5} = \frac{10^{4+(-5)}}{10^{3+5}} = \frac{10^{-1}}{10^8} = 10^{-1-8} = 10^{-9}$$

$$\frac{4 \times 10^{-5} \times 10^3}{12 \times 10^{-4}} = \frac{4}{12} \times \frac{10^{-5} \times 10^3}{10^{-4}} = \frac{1}{3} \times \frac{10^{-5+3}}{10^{-4}} = \frac{1}{3} \times \frac{10^{-2}}{10^{-4}} = \frac{1}{3} \times 10^{-2-(-4)} = \frac{1}{3} \times 10^2$$

$$\left(\frac{5}{2}\right)^2 \times \left(-\frac{5}{2}\right)^3 = -\left(\frac{5}{2}\right)^2 \times \left(\frac{5}{2}\right)^3 = -\left(\frac{5}{2}\right)^{2+3} = -\left(\frac{5}{2}\right)^5 ; \quad \frac{5^6 \times 5^3}{5^8} = \frac{5^{6+3}}{5^8} = \frac{5^9}{5^8} = 5^{9-8} = 5$$

$$\frac{(-3)^4 \times 3^7}{(-3)^{-5}} = -\frac{3^4 \times 3^7}{3^{-5}} = -\frac{3^{4+7}}{3^{-5}} = -\frac{3^{11}}{3^{-5}} = -3^{11-(-5)} = -3^{16}$$

$$\frac{7^{-2} \times (-7)^5}{7^3 \times 7^{-4}} = -\frac{7^{-2} \times 7^5}{7^3 \times 7^{-4}} = -\frac{7^{-2+5}}{7^{3+(-4)}} = -\frac{7^3}{7^{-1}} = -7^{3-(-1)} = -7^4$$

### Exercice n°3 :

$$A = 2^4 + 3^2 = 16 + 9 = 25 ; \quad B = 2 \times 5^4 = 2 \times 625 = 1250 ; \quad C = (-3)^2 \times 5^3 = 9 \times 125 = 1125$$

$$D = (-0,1)^4 = 0,0001 ; \quad E = (-10)^5 \times 4^2 = -100000 \times 16 = -1\,600\,000 ;$$

$$F = (-5)^3 \times (-2)^3 = (5 \times 2)^3 = 10^3 = 1\,000 ; \quad G = \frac{2^3}{2^4} = 2^{3-4} = 2^{-1} = \frac{1}{2} = 0,5$$

$$H = \frac{(-3)^3}{3^4} = -\frac{3^3}{3^4} = -3^{3-4} = -3^{-1} = -\frac{1}{3} ; \quad I = 10^2 \times 10^{-2} = 10^{2+(-2)} = 10^0 = 1 ;$$

$$J = 10^3 \times 10^{-5} = 10^{3+(-5)} = 10^{-2} = 0,01 ; \quad K = (-10)^{-2} \times 10^5 = 10^{-2} \times 10^5 = 10^{-2+5} = 10^3 = 1\,000$$

$$L = 10^2 \times 10^{-4} \times 10^{-5} = 10^{2+(-4)+(-5)} = 10^{-7} = 0,000\,000\,1 ;$$

$$M = (-10)^3 \times (-10)^5 = 10^3 \times 10^5 = 10^{3+5} = 10^8 = 100\,000\,000$$

### Exercice n°4 :

$$A = -2^2 - 3 \times (-5)^2 + (-1)^4 \times 6^2 = -4 - 3 \times 25 + 1 \times 36 = -4 - 75 + 36 = -43$$

$$B = \frac{3^3 \times 7^4 \times (3^2)^3}{3^8 \times (7^2)^2} = \frac{3^3 \times 3^6 \times 7^4}{3^8 \times 7^4} = \frac{3^9 \times 7^4}{3^8 \times 7^4} = 3^{9-8} = 3$$

$$C = \left(-\frac{5}{3}\right)^8 \times \left(-\frac{25}{9}\right)^{-4} = \left(\frac{5}{3}\right)^8 \times \left(-\left(\frac{5}{3}\right)^2\right)^{-4} = \left(-\frac{5}{3}\right)^8 \times \left(-\frac{5}{3}\right)^{-8} = \left(-\frac{5}{3}\right)^0 = 1$$

### Exercice n°5 : $A = 0,0000458 = 4,58 \times 10^{-5} ; \quad B = -128,00047 = -1,2800047 \times 10^2$

$$C = 35 \times 10^{-8} \times 2 \times 10^{-7} \times 10^{12} = 70 \times 10^{-8+(-7)+12} = 70 \times 10^{-3} = 7 \times 10^{-2}$$

$$D = \frac{48 \times 10^{-3} \times 3 \times 10^{-5}}{36 \times 10^{-4}} = \frac{48 \times 3}{36} \times \frac{10^{-3} \times 10^{-5}}{10^{-4}} = 4 \times \frac{10^{-8}}{10^{-4}} = 4 \times 10^{-4}$$

### Exercice n°6 : 1°) $C = \frac{2,3 \times 10^2 - 0,17 \times 10^3}{0,5 \times 10^{-1}} = \frac{2,3 \times 100 - 0,17 \times 1000}{0,5 \times 0,1} = \frac{230 - 170}{0,05} = \frac{60}{0,05} = 1\,200$

$$2°) c = (-2,5 \times 10^{175})(-3,7 \times 10^{-177}) = 2,5 \times 3,7 \times 10^{175-177} = 9,25 \times 10^{-2} = 0,0925$$

$$3°) B = \frac{18 \times (5 \times 10^{-1})^2}{25 \times (6 \times 10^{-1})^3} = \frac{18 \times 25 \times 10^{-2}}{25 \times 216 \times 10^{-3}} = \frac{18}{18 \times 12} \times 10^{-2-(-3)} = \frac{1}{12} \times 10 = \frac{10}{12} = \frac{5}{6}$$