

Série 2 (suite) Oclomath P78 NAM P61

1)  $x^3 \cdot x = x^4$   
 $(4a)^2 = 16a^2$   
 $-5a \cdot a = -5a^2$   
 $(-3ab)^2 = 9a^2b^2$   
 $(x^3)^4 = x^{12}$

2)  $(-2a)^5 = -32a^5$   
 $-7a^3 \cdot 2a = -14a^4$   
 $(3xy^3)^2 = 9x^2y^6$   
 $(-10a^4b)^3 = -1000a^{12}b^3$   
 $(-4ab)^3 = -64a^3b^3$

3)  $-4a^3 \cdot (-3a^4) = 12a^7$   
 $(-a^5b^2)^2 = a^{10}b^4$   
 $(-ab^3)^5 = -a^5b^{15}$   
 $4a^3 \cdot (-a^2) = -4a^5$   
 $2xy^3 \cdot 3x^2y = 6x^3y^4$

4)  $(-b^3)^2 = b^6$   
 $(a^3)^2 \cdot (b^2)^3 = a^6b^6$   
 $(-a^3)^5 = -a^{15}$   
 $(-4a^3)^2 = -16a^6$   
 $(-2a^3)^4 = -16a^{12}$

5)  $(-5a)^3 \cdot (a^3)^2 = -125a^5$   
 $(-5a^2b) \cdot (-2ab^3) = 10a^3b^4$   
 $(-x^3)^4 \cdot (x^2)^3 = +x^{18}$   
 $(-x^3)^2 \cdot (-x^5)^2 = -x^{16}$   
 $5xy^2 \cdot (5xy)^2 = 125x^3y^4$

6)  $(-a^3)^2 \cdot (-a^2)^3 = -a^{16}$   
 $(-5a^3)^2 \cdot 2a^3 = -50a^9$   
 $(-5a^2)^3 + (2a^3)^2 = -125a^6 + 4a^6 = -121a^6$   
 $-5a^3 + (5a)^3 = -5a^3 + 125a^3 = 120a^3$   
 $(-2a^3)^4 - (-a^4)^3 = 16a^{12} + a^{12} = 17a^{12}$

7)  $(-2a^3b)^3 \cdot (-3a^2b)^2 = -12a^{13}b^5$   
 $(5x^2y) \cdot (-2xy)^3 = -40x^5y^4$   
 $(-a^3b^4)^4 \cdot (2ab^2)^5 = 32a^{17}b^{26}$   
 $(3a^2b)^4 + (-2a^4b^2)^2 = 81a^8b^4 + 4a^8b^4 = 85a^8b^4$   
 $(-2a^2b^2)^3 - (ab)^6 = -8a^6b^6 - a^6b^6 = -9a^6b^6$

8)  $\left(\frac{a}{b}\right)^3 = \frac{a^3}{b^3}$   
 $\left(\frac{2a}{3b}\right)^4 = \frac{16a^4}{81b^4}$   
 $\left(\frac{-5a}{2b}\right)^3 = \frac{-125a^3}{8b^3}$   
 $\left(\frac{-a}{4b}\right)^2 = \frac{a^2}{16b^2}$   
 $\left(\frac{-x}{3y}\right)^3 = \frac{-x^3}{27y^3}$

9)  $\left(\frac{-2a^3}{b^4}\right)^5 = \frac{-32a^{15}}{b^{20}}$   
 $\left(\frac{-x^3}{y^2}\right)^5 = \frac{-x^{15}}{y^{10}}$   
 $\left(\frac{-10x^2}{14y^4}\right)^2 = \frac{100x^4}{196y^8} = \frac{25x^4}{49y^8}$   
 $\left(\frac{-3ab^5}{12}\right)^3 = \frac{-27a^3b^{15}}{1728} = \frac{-ab^{15}}{64}$   
 $\left(\frac{-40x^4}{50y^3}\right)^3 = \frac{-64000x^{12}}{125000y^9} = \frac{-64x^{12}}{125y^9}$

Ⓢ 85 a 8 b 4 : former calculables : on copie la partie difficile et on additionne les coefficients

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3) Écris les expressions ci-dessous en n'utilisant que des exposants positifs.

a)  $a^{-3} = \frac{1}{a^3}$     $a^{-3}b^5 = \frac{b^5}{a^3}$     $2a^{-3} = \frac{2}{a^3}$     $x^{-2}y^{-1} = \frac{1}{x^2y}$     $5xy^{-4} = \frac{5x}{y^4}$

b)  $4a^{-2}b^5 = \frac{4b^5}{a^2}$     $ab^{-1}c^3 = \frac{a^3c^3}{b}$     $-3a^3b^{-2} = -\frac{3a^3}{b^2}$     $-a^2b^{-3} = -\frac{a^2}{b^3}$     $-a^{-5}b^2 = -\frac{b^2}{a^5}$

c)  $\frac{a^3}{b^{-2}} = a^3b^2$     $\frac{x^{-2}}{y^3} = \frac{1}{x^2y^3}$     $\frac{2a^3}{5b^{-3}} = \frac{2a^3b^3}{5}$     $\frac{-a^2}{2b^{-2}} = -\frac{a^2b^2}{2}$     $\frac{3a^{-1}}{5b^{-2}} = \frac{3a^{-1}b^2}{5}$

4) Calcule.

a)  $4^{-2} = \frac{1}{16}$     $5^{-3} = \frac{1}{125}$     $(-2)^{-3} = -\frac{1}{8}$     $(-3)^{-2} = \frac{1}{9}$     $10^{-4} = \frac{1}{10000}$

b)  $4^3 = 64$     $(-4)^3 = -64$     $4^{-3} = \frac{1}{64}$     $(-4)^{-3} = -\frac{1}{64}$     $-4^{-3} = -\frac{1}{64}$

c)  $\frac{5}{3^{-2}} = \frac{5 \cdot 9}{1} = 45$     $\frac{2^{-3}}{5^{-2}} = \frac{2^{-3} \cdot 25}{1} = \frac{25}{8}$     $\frac{(-4)^2}{2^{-4}} = \frac{16 \cdot 16}{1} = 256$     $\frac{(-3)^{-2}}{5^{-3}} = \frac{125}{9}$     $\frac{8^{-1}}{(-4)^{-3}} = \frac{8^{-1} \cdot (-4)^3}{1} = -8$

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5) Réduis les expressions ci-dessous en appliquant les propriétés des puissances. Écris tes réponses en utilisant uniquement des exposants positifs.

a)  $a^{-3} \cdot a^5 = a^2$    b)  $2a^5 \cdot (-4a^{-2}) = -8a^3$    c)  $(x^{-2})^3 = \frac{1}{x^6}$   
 $x^{-5} \cdot x^{-3} = x^{-8} = \frac{1}{x^8}$     $-5x^{-3} \cdot x^2 = -\frac{5}{x}$     $(a^{-3})^{-4} = a^{12}$   
 $a^{-8} \cdot a^3 = a^{-5} = \frac{1}{a^5}$     $b^{-5} \cdot (-3b^3) = -3b^{-2} = -\frac{3}{b^2}$     $(b^3)^{-2} = \frac{1}{b^6}$   
 $a^5 \cdot a^{-6} = a^{-1} = \frac{1}{a}$     $3a^{-3} \cdot (-2a^2) = -6a^{-1} = -\frac{6}{a}$     $-(a^{-2})^6 = -\frac{1}{a^{12}}$   
 $x^4 \cdot x^4 = x^8$     $a^{-3} \cdot 2a^{-1} \cdot a^5 = 2a^1 = 2a$     $(y^{-5})^5 = \frac{1}{y^{25}}$

d)  $(a^3b^{-2})^{-3} = \frac{b^6}{a^9}$    e)  $(3a^{-2})^2 = \frac{9}{a^4}$    f)  $(-3a^2b^3)^{-3} = -\frac{1}{27a^6b^9}$   
 $(ab^{-4})^2 = \frac{a^2}{b^8}$     $(5x^{-1})^{-3} = \frac{x^3}{125}$     $(a^{-3}b^5)^{-2} = \frac{a^6}{b^{10}}$   
 $(2a)^{-3} = \frac{1}{8a^3}$     $(2a^{-3}b^2)^3 = \frac{8b^6}{a^9}$     $(-4a^{-4}b^5)^{-3} = -\frac{a^{12}}{64b^{15}}$   
 $(3b)^{-2} = \frac{1}{9b^2}$     $(4a^2b^{-4})^{-2} = \frac{b^8}{16a^4}$     $(-3a^2b^{-3})^3 = -27a^6/b^9$   
 $(c^{-3})^{-2} = \frac{1}{c^6}$     $(-3a^2)^{-2} = \frac{1}{9a^4}$     $(-2a^{-2})^{-3} = -\frac{a^6}{8}$

g)  $\left(\frac{a^{-3}}{b^2}\right)^5 = \frac{1}{a^{15}b^{10}}$     $\left(\frac{5a^{-4}}{b^{-3}}\right)^{-2} = \frac{5^{-2}a^8}{b^6} = \frac{a^8}{25b^6}$     $\left(\frac{2a}{b}\right)^{-3} = \frac{b^3}{8a^3}$   
 $\left(\frac{a^3}{b^{-5}}\right)^2 = \frac{a^6b^{10}}{1}$     $\left(\frac{-2a^{-4}}{b}\right)^{-3} = \frac{-6^3a^{12}b^{-1}}{1} = -216a^{12}b^{-1}$   
 $= -216a^{11}b^{-1}$   
 $= -\frac{216a^{11}}{b}$

6) Complète.

a) $a^{-4} \cdot a^{-2} = a^{-6}$	b) $(a^{-3})^{-3} = a^9$	c) $(-a^2)^{-3} = -a^{-6}$
$a^2 \cdot a^{-5} = a^{-3}$	$(5a^2)^2 \cdot (3a^{-1}) = 75a^{-2}$	$(-a^3)^{-2} = a^{-6}$
$(a^{-1})^2 = a^{-2}$	$(3a)^2 = 9a^2$	$(-2a^{-1})^3 = -8a^{-3}$
$(a^{-3})^{-2} = a^6$	$3a \cdot (-4a^6) = -12a^7$	$(5a^{-4})^{-2} = 5^{-2}a^8 = \frac{1}{25}a^8$

7) Réduis les expressions ci-dessous en n'utilisant que des exposants positifs.

a) $x^3 \cdot x^{-8} = \frac{1}{x^5}$	b) $\left(\frac{4x^3}{y^2}\right)^3 = \frac{64x^9}{y^6}$	c) $(-a^3b^{-2})^{-2} = \frac{b^4}{a^6}$
$(a^{-3}b^4)^{-3} = \frac{a^9}{b^{12}}$	$\frac{3a^{-1}}{5a^7} = \frac{3}{5a^8}$	$(-3xy^{-4})^{-1} = \frac{-y^4}{3x}$
$\left(\frac{a^{-3}}{b^7}\right)^{-2} = a^6b^{14}$	$(2a^{-3}b^2)^{-4} = \frac{a^{12}}{16b^8}$	$2a^{-3} \cdot (-3a^2) = -\frac{6}{a}$
$(3a^{-2})^{-4} = \frac{a^8}{81}$	$\frac{-5a^{-5}}{4a^{-4}} = -\frac{5}{4a}$	$(-2a^{-3}b^{-4})^{-3} = -\frac{a^9b^{12}}{8}$
$-5a \cdot (-3a^{-4}) = \frac{15}{a^3}$	$-(-x^5)^{-2} = -\frac{1}{x^{10}}$	$\left(\frac{a^{-1}b}{3b^{-2}}\right)^{-2} = \frac{a^2b^{-2}}{9^{-1}b^{-4}} = 9a^2b^{-2-4} = 9a^2b^{-6} = \frac{9a^2}{b^6}$

8) Réduis les fractions en n'utilisant que des exposants positifs dans les réponses finales.

a) $\frac{(a^{-3}b^4)^{-2}}{(a^4b^5)^2} = \frac{a^6b^{-8}}{a^8b^{10}} = \frac{1}{a^2b^{18}}$	b) $\left(\frac{-3x^3y^{-2}}{2y^4z^5}\right)^2 \cdot \left(\frac{-2^{-1}z^{-4}}{3x^2y^5}\right)^{-3} = \frac{9x^6y^{-4}}{4y^8z^{10}} \cdot \frac{4 \cdot 2^3 z^{12} \cdot 27}{x^6 y^{-15}} = \frac{-243 x^{12} z^8 y^3}{-486 x^{12} y^3 z^2} = \frac{z^6}{y^2}$
$\frac{(-3a^2b^5)^{-1}}{(2a^{-4}b^3)^{-2}} = \frac{-4b^6}{3a^4b^5a^8} = \frac{-4b}{3a^{12}}$	$\left(\frac{a^{-3}b^5}{-2a^4b^{-7}}\right)^{-3} = \left(\frac{-b^{12}}{2a^7}\right)^{-3} = \frac{-8a^{21}}{b^{36}}$
$\left(\frac{-x^2y^{-3}}{-2^{-2}x^{-3}y^4}\right)^3 = \frac{8x^6y^{-9} \cdot x^9}{y^{12}} = \frac{64x^{15}}{y^{12}}$	$\frac{(-3a^{-4}b^2c)^{-5}}{(-2a^2b^{-3})^{-2}} = \frac{-3^{-5}a^{20}b^{-10}c^{-5}}{2^{-2}a^{-4}b^6} = \frac{-4a^{24}}{243b^{16}c^5}$
$\left(\frac{-2a^4}{5b^3c^{-1}}\right)^{-4} = \frac{5^4b^{12}c^{-4}}{2^4a^{16}} = \frac{625b^{12}}{16a^{16}c^4}$	$\left(\frac{-3}{2}x^{-4}\right)^2 \cdot \left(\frac{1}{3x^3}\right)^{-3} = \left(\frac{-3}{2x^4}\right)^2 \cdot (3x^3)^3 = \frac{4}{3^2x^8} \cdot 3^3x^9 = \frac{12}{3^2x^8} \cdot 3^3x^9 = \frac{12}{4 \cdot 3} \cdot x^{17} = 12x^{17}$
$\left(\frac{-a^5b^3c^{-1}}{b^{-4}a^3c^3}\right)^{-2} = \left(\frac{b^{-4}a^3c^3}{a^5b^3c^{-1}}\right)^2$	$\left(\frac{-3}{2}a^{-4}b^{-3}\right) \cdot (2a^{-1}b^3)^{-2}$
$= \frac{b^{-8}a^6c^6}{a^{10}b^6c^{-2}}$	$= \frac{-3}{2a^4b^3} \cdot \frac{a^2}{4b^6}$
$= \frac{c^8}{a^4b^{14}}$	$= \frac{-3}{8a^2b^9}$

Attention : 3 "fautes" par face

$$c) \left( \frac{+a^2b^{-3}c^5}{+1^{-5}b^2c^{-4}} \right)^2 = \frac{a^4b^{-6}c^{10}}{1 \cdot b^4 \cdot c^{-8}} = \frac{a^4c^{18}}{b^{10}}$$

$$\left( \frac{+x^{-2}y^{-1}z^5}{+2^{-3}x^2y^{-4}} \right)^3 = \frac{x^{-6}y^{-3}z^{15}}{2^{-9}x^6y^{-12}} = \frac{y^9z^{15}}{512x^{12}} = 512 \frac{y^9z^{15}}{x^{12}}$$

$$\left( \frac{+2^{-2}a^3b^3}{+3^{-1}b^{-2}c^3} \right)^{-2} = \frac{2^4a^{-6}b^{-6}}{3^2b^4c^{-6}} = \frac{16c^6}{9b^{10}a^6} = \frac{16c^6}{9a^6b^{10}}$$

$$\left( \frac{-x^3y^4}{3^{-2}y^{-3}x^2} \right)^{-2} = \frac{x^6y^{-8}}{3^4y^6x^{-4}} = \frac{x^{6+4}}{81y^{6+8}} = \frac{x^{10}}{81y^{14}}$$

$$\left( \frac{a^{-5}b}{c^4} \right)^{-3} \odot \left( \frac{3c^{-5}b^{-3}}{a^4} \right)^{-2} = \frac{a^{15}b^{-3}c^{20}}{c^{-12}a^{-8}b^6} = \frac{a^{23}b^3c^{22}}{9}$$

ok

$$d) \frac{[(-3)^{-2}a^{-5}b^3] \cdot (-2^{-4}a^7b^{-3})^{-2}}{(-3a^5b^{-2})^{-3}} = \frac{3^{-2}a^{-5}b^3 \cdot 2^8a^{-14}b^6}{-3^{-3}a^{-15}b^6} = -3a^{15}b^3 = \frac{3b^3}{a^4} \cdot 2^8 = -768 \frac{b^3}{a^4}$$

$$\left( \frac{-2^{-2}x^4}{3} \right)^{-3} \cdot \left( \frac{1}{3^{-2}x^3} \right)^{-3} = \frac{-2^6x^{-12}}{3^{-3}} \cdot \frac{1}{3^6x^{-9}} = \frac{-64}{27x^3}$$

$$\frac{(-3^{-1}xy^3)^{-2} \cdot (2^{-3}x^2y^{-1})^3}{(2^3x^{-3}y)^{-2} \cdot (x^{-1}y^3)^3} = \frac{3^2x^{-2}y^{-6} \cdot 2^{-9}x^6y^{-3}}{2^6x^6y^{-2} \cdot x^{-3}y^9} = \frac{9x^4y^{-9}}{8x^3y^7} = \frac{9x}{8y^{16}}$$

$$\left( \frac{-2^{-3}x^{-2}y^3}{3y^4z^2} \right)^{-2} \cdot \left( \frac{-3^{-1}z^4}{2^{-3}x^3y^{-3}} \right)^{-3} = \frac{2^6x^4y^{-6}}{3^{-2}y^{-8}z^{-4}} \cdot \frac{3^9z^{12}}{2^9x^{-9}y^9} = \frac{2^7x^4y^2z^8}{8y^7} = \frac{2^7x^4y^2z^8}{8y^7}$$

$$\frac{(5x^{-3}y^2)^{-1} \cdot (3^{-2}x^{-2}y^{-2})^{-3}}{(3^{-1}x^{-3}y^{-1})^{-3} \cdot (x^{-1}y^{-2})^3} = \frac{5^{-1}x^3y^{-2} \cdot 3^6x^6y^6}{3^3x^9y^3 \cdot x^{-3}y^{-6}} = \frac{27x^3}{5y^7} = \frac{27}{5}x^3y^7$$

Choisis la bonne réponse.

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$4^{-2} =$	16	-16	$\left(\frac{1}{16}\right)$	$a^{-5} =$	$-a^5$	$\left(\frac{1}{a^5}\right)$	$\frac{-1}{a^5}$
$(-4)^2 =$	$(16)$	-16	$\frac{1}{16}$	$(2b)^{-3} =$	$-8b^{-3}$	$\frac{2}{b^3}$	$\left(\frac{1}{8b^3}\right)$
$(-5)^{-2} =$	$5^2$	$(5^{-2})$	$(-5)^2$	$a^{-3} \cdot a^3 =$	a	$(1)$	$a^{-9}$
$2 \cdot 10^{-3} =$	$(0,002)$	-2000	-0,002	$(a^3)^{-2} =$	$a^9$	$a^6$	$(a^{-6})$
$\frac{1}{32} =$	$(-2)^5$	$(2^{-5})$	$(-2)^{-5}$	$(a^{-4})^2 =$	$\left(\frac{1}{a^8}\right)$	$a^8$	$\frac{1}{a^2}$
$\frac{-1}{64} =$	$(-4)^3$	$4^{-3}$	$(-4)^{-3}$	$(-a)^{-3} =$	$-a^3$	$\left(\frac{-1}{a^3}\right)$	$a^3$
$\frac{2^{-6}}{2^2} =$	$(2^{-8})$	$2^{-3}$	$2^{-4}$	$2ab^{-1} =$	$\left(\frac{2a}{b}\right)$	$\frac{1}{2ab}$	$-2ab$
$\left(\frac{-2}{3}\right)^{-1} =$	$\left(\frac{-3}{2}\right)$	$\frac{2}{3}$	$\frac{3}{2}$	$3a^{-2} =$	$\frac{1}{9a^2}$	$\frac{9}{a^2}$	$\left(\frac{3}{a^2}\right)$
$4^5 \cdot 4^{-5} =$	$4^{-25}$	4	$(1)$	$(3a)^{-2} =$	$\left(\frac{1}{9a^2}\right)$	$\frac{9}{a^2}$	$\frac{3}{a^2}$
$-3^{-4} =$	-81	$\left(\frac{-1}{81}\right)$	$\frac{1}{81}$	$(-5a)^{-3} =$	$-125a^{-3}$	$\left(\frac{-1}{125a^3}\right)$	$\frac{125}{a^3}$

0) Écris les nombres suivants sous forme d'une puissance à exposant entier et dont la base est un nombre entier.

a)  $512 = 2^9$

$100\,000 = 10^5$

$-0,125 = (-2)^3$

$0,0025 = 20^{-2} = (20)^{-2}$

$\frac{1}{16} = 2^{-4} = (-2)^{-4} = 4^{-2} = (-4)^{-2}$

b)  $-125 = -5^3 = (-5)^3$

$243 = 3^5$

$-32 = -2^5 = (-2)^5$

$0,008 = 0,2^3 = 5^{-3}$

$\frac{1}{32} = 2^{-5}$

c)  $0,000\,001 = 10^{-6}$

$= (-10)^{-6} = 10^{-6}$

$0,25 = \frac{1}{4} = 2^{-2}$

$0,5 = \frac{1}{2} = 2^{-1}$

$-8 = -2^3 = (-2)^3$

$\frac{1}{8} = 2^{-3}$

Attention : 3 "fautes" par face