

# Calcul littéral

## Exercices d'entraînement et d'approfondissement

« Qui veut aller loin, ménage sa monture ! »

« Chi va piano va sano ! »

### Exercice 1

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Factorise le plus possible :

$$A = 4y^2 - 12y$$

$$C = -60x + 84xy - 12x^2y^2$$

$$E = 289q^2 + 85qt^2 - 68t$$

$$B = 35t^2 - 7t$$

$$D = 12mn^2 - 5m^2n^2 - 49m^2n$$

$$F = 2a^2b^2c - 6ab + 38bc^2$$

### Exercice 2

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Factorise par  $\frac{15}{a^2b^2}$  :  $A = \frac{-75}{a^2b^2} + \frac{105}{ab^2} - \frac{45}{a^2b}$

Factorise par  $\frac{12}{xy}$  :  $B = \frac{84}{x} - 60 + 144y$

### Exercice 3

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Réduis les expressions suivantes :

$$A = -4x + 14x - 32x + 17x$$

$$C = \frac{2}{3}q^2 - 2q - q \times \frac{7}{5}q + \frac{3}{7}q$$

$$B = -\frac{2}{7}t^2 - \frac{1}{3}t^2 + \frac{3}{5}t^2$$

$$D = 2,5x^2 - 3,1 + 6,5x - 7,8x^2 - 10,2x + 8,3$$

**Exercice 4**

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Supprime les parenthèses et réduis :

$$\begin{aligned}A &= -(2x+7)+(-5x-10) \\ B &= 25a+(-a^2+5a-13)-(-17a+16-2a^2) \\ C &= 3(-6t^2+4-7t)-(-3t^2-8+3t)-8(2t^2-3t-7) \\ D &= -(2,3x^2+5,7x-7,6)-5(1,2x-3,4x^2+1,7)+(3,3-5,2x^2) \\ E &= \frac{2}{3}\left(\frac{1}{4}y^2-5y-\frac{2}{5}\right)-\frac{1}{4}\left(-2y+\frac{1}{2}y^2-7\right)\end{aligned}$$

**Exercice 5**

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Développe et réduis :

$$\begin{aligned}A &= (2m-5)(m+12) \\ B &= (-5m-3)(m-11) \\ C &= (-m+7)(-6m+5) \\ D &= \left(1-\frac{a}{2}\right)\left(5a-\frac{1}{5}\right) \\ E &= \left(\frac{11}{13}t-12\right)\left(\frac{11}{13}t+12\right) \\ F &= \left(-\frac{x}{2}+\frac{y}{3}\right)\left(\frac{-2y}{5}+\frac{3}{4}x\right) \\ G &= \left(\frac{2n}{3}-\frac{5}{4}\right)^2\end{aligned}$$

**Exercice 6**

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Donne l'expression développée la plus réduite possible :

$$\begin{aligned}A &= 3x^2+11x-13-(2x-5)(3x+2) \\ B &= -7(t^2-4t+3)-2(3t-5)(t-9) \\ C &= 5\left(a-\frac{3}{4}\right)^2-\frac{1}{3}\left(2a-\frac{3}{5}\right)\left(a+\frac{1}{2}\right)\end{aligned}$$

# Calcul littéral

## Exercices d'entraînement et d'approfondissement - Réponses

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### Exercice 1

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$$A = 4y^2 - 12y = \boxed{4y(y-3)}$$

$$B = 35t^2 - 7t = \boxed{7t(5t-1)}$$

$$C = -60x + 84xy - 12x^2y^2 = \boxed{12x(-5 + 7y - xy^2)} = \boxed{-12x(5 - 7y + xy^2)}$$

$$D = 12mn^2 - 5m^2n^2 - 49m^2n = \boxed{mn(12n - 5mn - 49m)}$$

$$E = 289q^2 + 85qt^2 - 68t = \boxed{17(17q^2 + 5qt^2 - 4t)}$$

$$F = 2a^2b^2c - 6ab + 38bc^2 = \boxed{2b(a^2bc - 3a + 19c^2)}$$

### Exercice 2

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$$A = \frac{-75}{a^2b^2} + \frac{105}{ab^2} - \frac{45}{a^2b} = \boxed{\frac{15}{a^2b^2}(-5 + 7a - 3b)}$$

$$B = \frac{84}{x} - 60 + 144y = \boxed{\frac{12}{xy}(7y - 5xy + 12xy^2)}$$

### Exercice 3

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$$A = -4x + 14x - 32x + 17x = \boxed{-5x}$$

$$B = -\frac{2}{7}t^2 - \frac{1}{3}t^2 + \frac{3}{5}t^2 = \left(-\frac{2}{7} - \frac{1}{3} + \frac{3}{5}\right)t^2 = \boxed{-\frac{2}{105}t^2}$$

## Calcul littéral

### Exercices d'entraînement et d'approfondissement

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$$\begin{aligned}C &= \frac{2}{3}q^2 - 2q - q \times \frac{7}{5}q + \frac{3}{7}q = \frac{2}{3}q^2 - 2q - \frac{7}{5}q^2 + \frac{3}{7}q \\&= \frac{2}{3}q^2 - \frac{7}{5}q^2 + \frac{3}{7}q - 2q = \left(\frac{2}{3} - \frac{7}{5}\right)q^2 + \left(\frac{3}{7} - 2\right)q \\&= \boxed{-\frac{11}{15}q^2 - \frac{11}{7}q}\end{aligned}$$

$$\begin{aligned}D &= 2,5x^2 - 3,1 + 6,5x - 7,8x^2 - 10,2x + 8,3 \\&= (2,5 - 7,8)x^2 + (6,5 - 10,2)x + (-3,1 + 8,3) \\&= \boxed{-5,3x^2 - 3,7x + 5,2}\end{aligned}$$

#### Exercice 4

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$$A = -(2x + 7) + (-5x - 10) = -2x - 7 - 5x - 10 = \boxed{-7x - 17}$$

$$\begin{aligned}B &= 25a + (-a^2 + 5a - 13) - (-17a + 16 - 2a^2) \\&= 25a - a^2 + 5a - 13 + 17a - 16 + 2a^2 \\&= 2a^2 - a^2 + 25a + 5a + 17a - 13 - 16 \\&= \boxed{a^2 + 47a - 29}\end{aligned}$$

$$\begin{aligned}C &= 3(-6t^2 + 4 - 7t) - (-3t^2 - 8 + 3t) - 8(2t^2 - 3t - 7) \\&= -3 \times 6t^2 + 3 \times 4 - 3 \times 7t + 3t^2 + 8 - 3t - 8 \times 2t^2 - 8 \times (-3t) - 8 \times (-7) \\&= -18t^2 + 12 - 21t + 3t^2 + 8 - 3t - 16t^2 + 24t + 56 \\&= -18t^2 + 3t^2 - 16t^2 - 21t - 3t + 24t + 12 + 8 + 56 \\&= \boxed{-31t^2 + 76}\end{aligned}$$

$$\begin{aligned}D &= -(2,3x^2 + 5,7x - 7,6) - 5(1,2x - 3,4x^2 + 1,7) + (3,3 - 5,2x^2) \\&= -2,3x^2 - 5,7x + 7,6 - 5 \times 1,2x - 5 \times (-3,4x^2) - 5 \times 1,7 + 3,3 - 5,2x^2 \\&= -2,3x^2 - 5,7x + 7,6 - 6x + 17x^2 - 8,5 + 3,3 - 5,2x^2 \\&= 17x^2 - 2,3x^2 - 5,2x^2 - 5,7x - 6x + 7,6 - 8,5 + 3,3 \\&= \boxed{9,5x^2 - 11,7x + 2,4}\end{aligned}$$

## Calcul littéral

### Exercices d'entraînement et d'approfondissement

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$$\begin{aligned} E &= \frac{2}{3} \left( \frac{1}{4} y^2 - 5y - \frac{2}{5} \right) - \frac{1}{4} \left( -2y + \frac{1}{2} y^2 - 7 \right) \\ &= \frac{2}{3} \times \frac{1}{4} y^2 - \frac{2}{3} \times 5y - \frac{2}{3} \times \frac{2}{5} - \frac{1}{4} \times (-2y) - \frac{1}{4} \times \frac{1}{2} y^2 - \frac{1}{4} \times (-7) \\ &= \frac{\cancel{2}}{3 \times 2 \times \cancel{2}} y^2 - \frac{2 \times 5}{3} \times y - \frac{2 \times 2}{3 \times 5} - \frac{-1 \times \cancel{2}}{2 \times \cancel{2}} \times y - \frac{1}{4 \times 2} y^2 - \frac{-7}{4} \\ &= \frac{1}{6} y^2 - \frac{10}{3} y - \frac{4}{15} + \frac{1}{2} y - \frac{1}{8} y^2 + \frac{7}{4} \\ &= \frac{1}{6} y^2 - \frac{1}{8} y^2 - \frac{10}{3} y + \frac{1}{2} y - \frac{4}{15} + \frac{7}{4} \\ &= \left( \frac{1}{6} - \frac{1}{8} \right) y^2 + \left( -\frac{10}{3} + \frac{1}{2} \right) y + \frac{7}{4} + \frac{-4}{15} \\ &= \left( \frac{1 \times 4}{6 \times 4} - \frac{1 \times 3}{8 \times 3} \right) y^2 + \left( \frac{-10 \times 2}{3 \times 2} + \frac{1 \times 3}{2 \times 3} \right) y + \frac{7 \times 15}{4 \times 15} + \frac{-4 \times 4}{15 \times 4} \\ &= \left( \frac{4}{24} - \frac{3}{24} \right) y^2 + \left( \frac{-20}{6} + \frac{3}{6} \right) y + \frac{105}{60} + \frac{-16}{60} \\ &= \frac{1}{24} y^2 + \frac{-17}{6} y + \frac{89}{60} \\ &= \boxed{\frac{1}{24} y^2 - \frac{17}{6} y + \frac{89}{60}} \end{aligned}$$

### Exercice 5

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$$\begin{aligned} A &= (2m-5)(m+12) \\ &= 2m \times m + 2m \times 12 - 5 \times m - 5 \times 12 \\ &= 2m^2 + 24m - 5m - 60 \\ &= \boxed{2m^2 + 19m - 60} \end{aligned}$$

$$\begin{aligned} B &= (-5m-3)(m-11) \\ &= -5m \times m - 5m \times (-11) - 3 \times m - 3 \times (-11) \\ &= -5m^2 + 55m - 3m + 33 \\ &= \boxed{-5m^2 + 52m + 33} \end{aligned}$$

$$\begin{aligned} C &= (-m+7)(-6m+5) \\ &= -m \times (-6m) - m \times 5 + 7 \times (-6m) + 7 \times 5 \\ &= 6m^2 - 5m - 42m + 35 \\ &= \boxed{6m^2 - 47m + 35} \end{aligned}$$

## Calcul littéral

### Exercices d'entraînement et d'approfondissement

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$$\begin{aligned}D &= \left(1 - \frac{a}{2}\right) \left(5a - \frac{1}{5}\right) \\&= 1 \times 5a + 1 \times \left(-\frac{1}{5}\right) - \frac{a}{2} \times 5a - \frac{a}{2} \times \left(-\frac{1}{5}\right) \\&= 5a - \frac{1}{5} - \frac{a \times 5a}{2} + \frac{a}{10} \\&= -\frac{5a^2}{2} + 5a + \frac{a}{10} - \frac{1}{5} \\&= -\frac{5}{2}a^2 + \frac{50}{10}a + \frac{1}{10}a - \frac{1}{5} \\&= \boxed{-\frac{5}{2}a^2 + \frac{51}{10}a - \frac{1}{5}}\end{aligned}$$

$$\begin{aligned}E &= \left(\frac{11}{13}t - 12\right) \left(\frac{11}{13}t + 12\right) \\&= \frac{11}{13}t \times \frac{11}{13}t + \frac{11}{13}t \times 12 - 12 \times \frac{11}{13}t - 12 \times 12 \\&= \frac{11}{13} \times \frac{11}{13} \times t^2 + \frac{11 \times 12}{13}t - \frac{12 \times 11}{13}t - 12^2 \\&= \frac{11^2}{13^2} \times t^2 - 144 \\&= \boxed{\frac{121}{169}t^2 - 144}\end{aligned}$$

## Calcul littéral

### Exercices d'entraînement et d'approfondissement

$$\begin{aligned}
 F &= \left(-\frac{x}{2} + \frac{y}{3}\right) \left(\frac{-2y}{5} + \frac{3}{4}x\right) \\
 &= -\frac{x}{2} \times \frac{-2y}{5} - \frac{x}{2} \times \frac{3}{4}x + \frac{y}{3} \times \frac{-2y}{5} + \frac{y}{3} \times \frac{3}{4}x \\
 &= \frac{-x \times (-2y)}{2 \times 5} - \frac{x \times 3 \times x}{2 \times 4} + \frac{y \times (-2y)}{3 \times 5} + \frac{y \times \cancel{3} \times x}{\cancel{3} \times 4} \\
 &= \frac{\cancel{2} \times x \times y}{\cancel{2} \times 5} - \frac{3x^2}{8} + \frac{-2y^2}{15} + \frac{xy}{4} \\
 &= -\frac{3}{8}x^2 - \frac{2}{15}y^2 + \frac{xy}{5} + \frac{xy}{4} \\
 &= -\frac{3}{8}x^2 - \frac{2}{15}y^2 + \frac{4xy}{20} + \frac{5xy}{20} \\
 &= -\frac{3}{8}x^2 - \frac{2}{15}y^2 + \frac{9xy}{20} \\
 &= \boxed{-\frac{3}{8}x^2 - \frac{2}{15}y^2 + \frac{9}{20}xy}
 \end{aligned}$$

$$\begin{aligned}
 G &= \left(\frac{2n}{3} - \frac{5}{4}\right)^2 \\
 &= \left(\frac{2n}{3} - \frac{5}{4}\right) \times \left(\frac{2n}{3} - \frac{5}{4}\right) \\
 &= \frac{2n}{3} \times \frac{2n}{3} + \frac{2n}{3} \times \left(-\frac{5}{4}\right) - \frac{5}{4} \times \frac{2n}{3} - \frac{5}{4} \times \frac{5}{4} \\
 &= \frac{2n \times 2n}{3 \times 3} - \frac{2n \times 5}{3 \times 4} - \frac{5 \times 2n}{4 \times 3} - \frac{5 \times 5}{4 \times 4} \\
 &= \frac{4n^2}{9} - \frac{5n}{6} - \frac{5n}{6} - \frac{25}{16} \\
 &= \frac{4n^2}{9} + \frac{-5n}{6} + \frac{-5n}{6} - \frac{25}{16} \\
 &= \frac{4n^2}{9} + \frac{-5n - 5n}{6} - \frac{25}{16} \\
 &= \frac{4n^2}{9} + \frac{-10n}{6} - \frac{25}{16} \\
 &= \frac{4n^2}{9} + \frac{-5n}{3} - \frac{25}{16} \\
 &= \boxed{\frac{4n^2}{9} - \frac{5n}{3} - \frac{25}{16}}
 \end{aligned}$$

**Exercice 6**

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$$\begin{aligned}A &= 3x^2 + 11x - 13 - (2x - 5)(3x + 2) \\ &= 3x^2 + 11x - 13 - (2x \times 3x + 2x \times 2 - 5 \times 3x - 5 \times 2) \\ &= 3x^2 + 11x - 13 - (6x^2 + 4x - 15x - 10) \\ &= 3x^2 + 11x - 13 - (6x^2 - 11x - 10) \\ &= 3x^2 + 11x - 13 - 6x^2 + 11x + 10 \\ &= 3x^2 - 6x^2 + 11x + 11x - 13 + 10 \\ &= \boxed{-3x^2 + 22x - 3}\end{aligned}$$

$$\begin{aligned}B &= -7(t^2 - 4t + 3) - 2(3t - 5)(t - 9) \\ &= -7 \times t^2 - 7 \times (-4t) - 7 \times 3 - 2(3t \times t + 3t \times (-9) - 5 \times t - 5 \times (-9)) \\ &= -7t^2 + 28t - 21 - 2(3t^2 - 27t - 5t + 45) \\ &= -7t^2 + 28t - 21 - 2(3t^2 - 32t + 45) \\ &= -7t^2 + 28t - 21 - 2 \times 3t^2 - 2 \times (-32t) - 2 \times 45 \\ &= -7t^2 + 28t - 21 - 6t^2 + 64t - 90 \\ &= -7t^2 - 6t^2 + 28t + 64t - 21 - 90 \\ &= \boxed{-13t^2 + 92t - 111}\end{aligned}$$

On pouvait aussi procéder de la façon suivante :

$$\begin{aligned}B &= -7(t^2 - 4t + 3) - 2(3t - 5)(t - 9) \\ &= -(7 \times t^2 + 7 \times (-4t) + 7 \times 3) - 2(3t \times t + 3t \times (-9) - 5 \times t - 5 \times (-9)) \\ &= -(7t^2 - 28t + 21) - 2(3t^2 - 27t - 5t + 45) \\ &= -7t^2 + 28t - 21 - 2(3t^2 - 32t + 45) \\ &= -7t^2 + 28t - 21 - (2 \times 3t^2 + 2 \times (-32t) + 2 \times 45) \\ &= -7t^2 + 28t - 21 - (6t^2 - 64t + 90) \\ &= -7t^2 + 28t - 21 - 6t^2 + 64t - 90 \\ &= -7t^2 - 6t^2 + 28t + 64t - 21 - 90 \\ &= \boxed{-13t^2 + 92t - 111}\end{aligned}$$



## Calcul littéral

### Exercices d'entraînement et d'approfondissement

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$$\begin{aligned}C &= 5\left(a - \frac{3}{4}\right)^2 - \frac{1}{3}\left(2a - \frac{3}{5}\right)\left(a + \frac{1}{2}\right) \\&= 5\left(a - \frac{3}{4}\right)\left(a - \frac{3}{4}\right) - \frac{1}{3}\left(2a \times a + 2a \times \frac{1}{2} - \frac{3}{5} \times a - \frac{3}{5} \times \frac{1}{2}\right) \\&= 5\left(a \times a + a \times \left(-\frac{3}{4}\right) - \frac{3}{4} \times a - \frac{3}{4} \times \left(-\frac{3}{4}\right)\right) - \frac{1}{3}\left(2a^2 + \frac{2a}{2} - \frac{3}{5}a - \frac{3}{10}\right) \\&= 5\left(a^2 - \frac{3}{4}a - \frac{3}{4}a + \frac{9}{16}\right) - \frac{1}{3}\left(2a^2 + a - \frac{3}{5}a - \frac{3}{10}\right) \\&= 5\left(a^2 - \frac{6}{4}a + \frac{9}{16}\right) - \frac{1}{3}\left(2a^2 + \frac{5}{5}a + \frac{-3}{5}a - \frac{3}{10}\right) \\&= 5\left(a^2 - \frac{3}{2}a + \frac{9}{16}\right) - \frac{1}{3}\left(2a^2 + \frac{2}{5}a - \frac{3}{10}\right) \\&= 5a^2 - \frac{5 \times 3}{2}a + \frac{5 \times 9}{16} - \frac{1}{3} \times 2a^2 - \frac{1}{3} \times \frac{2}{5}a - \frac{1}{3} \times \left(-\frac{3}{10}\right) \\&= 5a^2 - \frac{15}{2}a + \frac{45}{16} - \frac{2}{3}a^2 - \frac{2}{15}a + \frac{1}{10} \\&= 5a^2 + \frac{-2}{3}a^2 + \frac{-15}{2}a + \frac{-2}{15}a + \frac{45}{16} + \frac{1}{10} \\&= \left(5 + \frac{-2}{3}\right)a^2 + \left(\frac{-15}{2} + \frac{-2}{15}\right)a + \frac{5 \times 45}{5 \times 16} + \frac{8 \times 1}{8 \times 10} \\&= \left(\frac{5 \times 3}{3} + \frac{-2}{3}\right)a^2 + \left(\frac{-15 \times 15}{2 \times 15} + \frac{-2 \times 2}{15 \times 2}\right)a + \frac{225 + 8}{80} \\&= \frac{13}{3}a^2 + \frac{-225 - 4}{30}a + \frac{233}{80} \\&= \boxed{\frac{13}{3}a^2 + \frac{-229}{30}a + \frac{233}{80}}\end{aligned}$$