

Chapitre 1. Calcul numérique - Corrigé

Exercice 1

1. $60 + (7-6) - 4.5 = 60 + 1 - 20 = \underline{41}$.
2. $5 - (52 + 3(7-2)) = 5 - (52 + 3.5) = 5 - (52 + 15) = 5 - 67 = \underline{-62}$.
3. $12 - (-14-13) + (12-50) = 12 - (-27) + (-38) = 12 + 27 - 38 = \underline{8}$.
4. $(34-45)(145 : (-5)) = (-11) \cdot (-29) = \underline{319}$.
5. $((-3-3)-3)(-3-3-3) = (-6-3)(-9) = (-9)(-9) = \underline{81}$.
6. $6 + 5 \cdot (4 - 35 : 7) - 2,5 = 6 + 5 \cdot (4 - 5) - 2,5 = 6 + 5 \cdot (-1) - 2,5 = 6 - 5 - 2,5 = \underline{-1,5}$.
7. $32 - 3(25 - 24 : 6) = 32 - 3 \cdot (25 - 4) = 32 - 3 \cdot 21 = 32 - 63 = \underline{-31}$.
8. $1 + 19(7 - 8 : 4) = 1 + 19 \cdot (7 - 2) = 1 + 19 \cdot 5 = 1 + 95 = \underline{96}$.

Exercice 2

1. $5 \cdot (18 + 4) = 110$.
2. $(3 \cdot 2 + 5) \cdot 6 = 66$.
3. $(5 + 3) \cdot (1 + 1) = 16$.
4. $30 : (2 + 8) = 3$.
5. $80 + 40 : 2 = 100$.
6. $(5 - 2) \cdot 9 - 7 = 20$.
7. $(2 + 2) \cdot (2 + 2 \cdot 2) = 24$.
8. $(100 - 1) \cdot 100 - 1 = 9899$.
9. $(9 - 9) \cdot 9 + 9 = 9$.
10. $(3 \cdot 3 + 3) \cdot (3 + 3 - 3) = 36$.

Exercice 3

1. $(1 + 2 - 3) \cdot 4 = 0$.
2. $1 \cdot 2 - 3 + 4 = 3$.
3. $(4 : 4 + 4) \cdot 4 = 20$.
4. $(7 + 3) : (7 + 3) = 1$.
5. $7 \cdot 3 + 7 - 3 = 25$.
6. $(6 + 6) : (6 + 6) = 1$.
7. $3 \cdot 7 - 3 - 7 = 11$.

Exercice 4

- 1. $52 - 34 : 2 + 12 \cdot 3 = 52 - 17 + 36 = \underline{71}$.
- 2. $34 + 36 : 2 \cdot 3 - 8 + 62 = 34 + 18 \cdot 3 - 8 + 62 = 34 + 54 - 8 + 62 = \underline{142}$.
- 3. $24 : 3 \cdot 2 - 64 : 2 = 8 \cdot 2 - 32 = 16 - 32 = \underline{-16}$.
- 4. $7 \cdot 4 \cdot 5 : 2 + 5 - 96 : 4 : 4 = 28 \cdot 5 : 2 + 5 - 24 : 4 = 140 : 2 + 5 - 6 = 70 + 5 - 6 = \underline{69}$.

Exercice 5

Si $n \geq 0$, on a $|n| = n$: par exemple, $|5| = 5$.
 Si $n < 0$, on a $|n| = -n$: par exemple, $|-6| = -(-6) = 6$.

- 1. $|-3 - 2| = |-5| = -(-5) = \underline{5}$.
- 2. $|-5| - |2| = -(-5) - 2 = 5 - 2 = \underline{3}$.
- 3. $|7| + |-4| = 7 - (-4) = 7 + 4 = \underline{11}$.
- 4. $|-11 + 1| = |-10| = -(-10) = \underline{10}$.

Exercice 6

Il suffit d'effectuer la division du numérateur par le dénominateur.

- 1. $\frac{12}{5} = 12 : 5 = \underline{2,4}$.
- 2. $\frac{3}{4} = 3 : 4 = \underline{0,75}$.
- 3. $\frac{5}{3} = 5 : 3 = \underline{1,6}$.
- 4. $\frac{7}{11} = 7 : 11 = \underline{0,63}$.
- 5. $\frac{2}{3} = 2 : 3 = \underline{0,6}$.
- 6. $\frac{1}{2} = 1 : 2 = \underline{0,5}$.
- 7. $\frac{1}{4} = 1 : 4 = \underline{0,25}$.
- 8. $\frac{5}{6} = 5 : 6 = \underline{0,83}$.
- 9. $\frac{7}{5} = 7 : 5 = \underline{1,4}$.
- 10. $\frac{3}{7} = 3 : 7 = \underline{0,428571}$.
- 11. $\frac{15}{7} = 2,142857$.
- 12. $\frac{13}{10} = \underline{1,3}$.

Exercice 7

1. Comme $\frac{8}{14} = \frac{4}{7}$, on a $\frac{4}{7} = \frac{32}{56} = \frac{8}{14} = \frac{12}{21} = \frac{40}{70}$.

2. $\frac{7}{2} \cdot \frac{3}{8} = \frac{21}{16}$

3. $\frac{4}{3} \cdot \frac{10}{3} = \frac{40}{9}$

4. $\frac{25}{4} \cdot \frac{3}{-4} = \frac{75}{-16}$

Exercice 8

1. $\frac{5 \cdot 7 \cdot 2 \cdot 13^1}{13 \cdot 3 \cdot 5 \cdot 8} = \frac{5 \cdot 7 \cdot 2}{3 \cdot 4 \cdot 8} = \frac{7 \cdot 2^1}{3 \cdot 4} = \frac{7}{3 \cdot 4} = \frac{7}{12}$.

2. $\frac{5+7}{2 \cdot 5} = \frac{12}{10} = \frac{3}{\frac{5}{2}}$

3. $\frac{5 \cdot 7}{8+7} = \frac{35}{15} = \frac{7}{3}$

Exercice 9

1. $4 \cdot \frac{2}{3} \cdot \frac{5}{2} = \frac{4 \cdot 2 \cdot 5}{1 \cdot 3 \cdot 2} = \frac{4 \cdot 5}{3} = \frac{20}{3}$.

2. $\frac{18}{8} \cdot \frac{25}{2} \cdot \frac{4}{6} = \frac{6 \cdot 5 \cdot 4}{6 \cdot 1} = \frac{5 \cdot 4}{1} = 20$.

3. $\frac{65}{121} \cdot \frac{48}{150} \cdot \frac{50}{13} \cdot \frac{3}{2} = \frac{5 \cdot 27 \cdot 3^1}{121 \cdot 2} = \frac{5 \cdot 27}{121} = \frac{135}{121}$.

4. $\frac{64}{11} \cdot \frac{88}{35} \cdot \frac{120}{56} = \frac{64 \cdot 8 \cdot 10}{11 \cdot 3 \cdot 56} = \frac{64 \cdot 10}{11 \cdot 3 \cdot 7} = \frac{640}{231}$.

5. $\frac{144}{65} \cdot \frac{51}{24} \cdot \frac{125}{204} = \frac{4 \cdot 5^1}{5 \cdot 2 \cdot 4} = \frac{4^1}{5 \cdot 2} = \frac{1}{5}$.

6. $\frac{1024}{243} \cdot \frac{125}{32} \cdot \frac{8}{1004} = \frac{8 \cdot 31 \cdot 5}{3 \cdot 4} = \frac{8 \cdot 5}{3} = \frac{40}{3}$.

7. $0,75 \cdot \frac{4}{5} \cdot \frac{12}{7} = \frac{3}{4} \cdot \frac{4}{5} \cdot \frac{12}{7} = \frac{3 \cdot 12}{5 \cdot 7} = \frac{36}{35}$.

8. $\frac{1}{0,75} \cdot 0,52 \cdot \frac{12}{5} = \frac{1}{3/4} \cdot \frac{52}{100} \cdot \frac{12}{5} = \frac{4}{3} \cdot \frac{13}{25} \cdot \frac{12}{5} = \frac{4 \cdot 13 \cdot 4}{25 \cdot 5} = \frac{208}{125}$.

Exercice 10

1. $\frac{4}{7} : \frac{16}{24} = \frac{4}{7} \cdot \frac{24}{16} = \frac{3}{7}$

2. $\frac{2}{5} : \frac{8}{25} = \frac{2}{5} \cdot \frac{25}{8} = \frac{5}{4}$

3. $\frac{11}{6} : \frac{77}{26} = \frac{11}{6} \cdot \frac{26}{77} = \frac{6}{7}$

4. $\frac{20}{3} : (\frac{7}{4} : \frac{14}{3}) = \frac{20}{3} : (\frac{7}{4} \cdot \frac{3}{14}) = \frac{20}{3} : \frac{3}{4 \cdot 2} = \frac{20}{3} : \frac{3}{8} = \frac{20}{3} \cdot \frac{8}{3} = \frac{160}{9}$

5. $\frac{2}{3} \cdot (\frac{4}{7} : \frac{16}{3}) = \frac{2}{3} \cdot (\frac{4}{7} \cdot \frac{3}{16}) = \frac{2}{3} \cdot \frac{4}{7} \cdot \frac{3}{16} = \frac{2}{7} = \frac{1}{3.5} = \frac{1}{14}$

6. $\frac{4}{3} \cdot \frac{5}{9} : (\frac{2}{11} \cdot \frac{39}{6}) = \frac{4 \cdot 5}{3 \cdot 9} : (\frac{2 \cdot 3}{6}) = \frac{20}{27} : \frac{6}{6} = \frac{20}{27} : 1 = \frac{20}{27}$

Exercice 11

1. $\frac{5}{3} + \frac{8}{6} = \frac{5}{3} + \frac{4}{3} = \frac{9}{3} = 3$ ($\frac{8}{6} = \frac{4}{3}$)

2. $\frac{1}{2} + \frac{1}{3} - \frac{1}{4} = \frac{6}{12} + \frac{4}{12} - \frac{3}{12} = \frac{6+4-3}{12} = \frac{7}{12}$

3. $\frac{12}{42} + \frac{15}{6} = \frac{2}{7} + \frac{5}{2} = \frac{4}{14} + \frac{35}{14} = \frac{39}{14}$ ($\frac{12}{42} = \frac{2}{7}$ et $\frac{15}{6} = \frac{5}{2}$)

4. $\frac{2}{5} + \frac{1}{16} + \frac{1}{20} = \frac{32}{80} + \frac{5}{80} + \frac{4}{80} = \frac{32+5+4}{80} = \frac{41}{80}$

5. $\frac{5}{7} - \frac{2}{3} = \frac{15}{21} - \frac{14}{21} = \frac{15-14}{21} = \frac{1}{21}$

6. $\frac{5}{6} + (-\frac{4}{5}) - (-\frac{2}{15}) = \frac{5}{6} - \frac{4}{5} + \frac{2}{15} = \frac{25}{30} - \frac{24}{30} + \frac{4}{30} = \frac{25-24+4}{30} = \frac{5}{30} = \frac{1}{6}$

7. $\frac{3}{7} + \frac{3}{4} = \frac{12}{28} + \frac{21}{28} = \frac{12+21}{28} = \frac{33}{28}$

8. $\frac{7}{9} + \frac{45}{6} - 2 - 3,5 = \frac{7}{9} + \frac{45}{6} - \frac{2}{1} - \frac{7}{2} = \frac{14}{18} + \frac{135}{18} - \frac{36}{18} - \frac{63}{18} = \frac{14+135-36-63}{18} = \frac{50}{18} = \frac{25}{9}$

Exercice 12

$$1. \frac{22}{13} \cdot \frac{34}{24} : \frac{17}{26} = \frac{2 \cdot 22}{13} \cdot \frac{26^2}{24} = \frac{2 \cdot 2 \cdot 2}{1} = 8.$$

$$2. \frac{1000}{6^2} \cdot \frac{45 \cdot 5}{2000^2} = \frac{5}{2 \cdot 2} = \frac{5}{4}.$$

$$3. \left(\frac{14}{5} : \frac{5}{8}\right) \cdot \frac{3}{7} = \frac{24}{5} \cdot \frac{8}{5} \cdot \frac{3}{7} = \frac{2 \cdot 8 \cdot 3}{5 \cdot 5} = \frac{48}{25}.$$

$$4. - \left[\left(3 + \frac{1}{2}\right) : \frac{2}{5} \right] = - \left[\left(\frac{3}{1} + \frac{1}{2}\right) \cdot \frac{5}{2} \right] = - \left[\left(\frac{6}{2} + \frac{1}{2}\right) \cdot \frac{5}{2} \right] = - \left[\frac{7}{2} \cdot \frac{5}{2} \right] = - \frac{35}{4}.$$

$$5. \left(\frac{11}{5} - \frac{3}{20}\right) - \left(\frac{9}{10} - \frac{11}{15}\right) = \left(\frac{44}{20} - \frac{3}{20}\right) - \left(\frac{27}{30} - \frac{22}{30}\right) = \frac{41}{20} - \frac{5}{30} = \frac{41}{20} - \frac{1}{6} =$$

$$= \frac{123}{60} - \frac{10}{60} = \frac{113}{60}.$$

$$6. \left(\frac{12}{13} : 5\right) \left(\frac{2}{3} - 4\right) = \left(\frac{12}{13} : \frac{5}{1}\right) \left(\frac{2}{3} - \frac{4}{1}\right) = \left(\frac{12}{13} \cdot \frac{1}{5}\right) \left(\frac{2}{3} - \frac{12}{3}\right) = \frac{12}{13} \cdot \frac{1}{5} \cdot \left(-\frac{10}{3}\right) =$$

$$= - \frac{12}{13} \cdot \frac{1}{5} \cdot \frac{10}{3} = - \frac{4 \cdot 2}{13} = - \frac{8}{13}.$$

$$7. \frac{\frac{6}{2} + \frac{4}{3}}{3 - \frac{8}{3}} = \left(\frac{6}{2} + \frac{4}{3}\right) : \left(3 - \frac{8}{3}\right) = \left(\frac{18}{6} + \frac{8}{6}\right) : \left(\frac{9}{3} - \frac{8}{3}\right) = \frac{26}{6} : \frac{1}{3} = \frac{13}{3} \cdot \frac{3}{1} = 13.$$

$$8. 12 - 2 \cdot \left(-\frac{3}{8} + \frac{4}{5}\right) \cdot 4 = 12 - 2 \cdot \left(\frac{-15}{40} + \frac{32}{40}\right) \cdot 4 = 12 - 2 \cdot \frac{17}{40} \cdot 4 =$$

$$= 12 - \frac{17}{10} \cdot \frac{4}{1} = 12 - \frac{17}{5} = \frac{60}{5} - \frac{17}{5} = \frac{43}{5}.$$

Exercice 13

$$1. \text{ Avec } x=3, y=6 \text{ et } z=-1, \frac{2x-y(z-y)}{x^2+yz} = \frac{2 \cdot 3 - 6(-1-6)}{3^2 + 6 \cdot (-1)} = \frac{6 - 6 \cdot (-7)}{9 - 6} =$$

$$= \frac{6 + 42}{3} = \frac{48}{3} = 16$$

$$2. \text{ Avec } x=-6, y=4 \text{ et } z=-9, \frac{2x-y(z-y)}{x^2+yz} = \frac{2 \cdot (-6) - 4(-9-4)}{(-6)^2 + 4 \cdot (-9)} = \frac{-12 - 4 \cdot (-13)}{36 - 36} =$$

$$= \frac{-12 + 52}{0} = \frac{40}{0} \text{ ce qui est impossible, car il est interdit de diviser par zéro.}$$

$$3. \text{ Avec } x=2, y=3 \text{ et } z=-2, \frac{2x-y(z-y)}{x^2+yz} = \frac{2 \cdot 2 - 3(-2-3)}{2^2 + 3 \cdot (-2)} = \frac{4 - 3 \cdot (-5)}{4 - 6} =$$

$$= \frac{4 + 15}{-2} = \frac{19}{-2} = -\frac{19}{2}.$$

$$4. \text{ Avec } x=4, y=-2 \text{ et } z=8, \frac{2x-y(z-y)}{x^2+yz} = \frac{2 \cdot 4 - (-2)(8-(-2))}{4^2 + (-2) \cdot 8} = \frac{8 + 2 \cdot 10}{16 - 16} =$$

$$= \frac{28}{0}, \text{ ce qui est impossible, car il est interdit de diviser par zéro.}$$

Exercice 14

On a $x=36$, $y=12$, $z=-4$ et $t=-2$.

$$1. (x-y) : (z-t) = \frac{x-y}{z-t} = \frac{36-12}{-4-(-2)} = \frac{24}{-4+2} = \frac{24}{-2} = \underline{-12.}$$

$$2. (x-y) : z-t = \frac{x-y}{z} - t = \frac{36-12}{-4} - (-2) = \frac{24}{-4} + 2 = -6+2 = \underline{-4.}$$

$$3. x-y : (z-t) = x - \frac{y}{z-t} = 36 - \frac{12}{-4-(-2)} = 36 - \frac{12}{-4+2} = 36 - \frac{12}{-2} = 36+6 = \underline{42.}$$

$$4. x-y : z-t = x - \frac{y}{z} - t = 36 - \frac{12}{-4} - (-2) = 36+3+2 = \underline{41.}$$

Exercice 15

$$1. \left[\frac{1}{21} - \frac{5}{7} \right] : \frac{3}{14} = \left[\frac{1}{21} - \frac{15}{21} \right] \cdot \frac{14}{3} = \frac{-14}{21} \cdot \frac{14}{3} = \frac{-2}{3} \cdot \frac{14}{3} = \underline{-\frac{28}{9}.}$$

$$2. \frac{4}{5} : \frac{5}{6} + 1 + \frac{2}{3} : \frac{1}{5} = \frac{4}{5} \cdot \frac{6}{5} + 1 + \frac{2}{3} \cdot \frac{5}{1} = \frac{24}{25} + 1 + \frac{10}{3} = \frac{72}{75} + \frac{75}{75} + \frac{250}{75} = \underline{\frac{397}{75}.}$$

$$3. \frac{\frac{1}{5}+3}{3-\frac{2}{3}-\frac{1}{5}} = \left(\frac{1}{5}+3 \right) : \left(3-\frac{2}{3}+\frac{1}{5} \right) = \left(\frac{1}{5}+\frac{15}{5} \right) : \left(\frac{45}{15}-\frac{10}{15}+\frac{3}{15} \right) = \frac{16}{5} : \frac{38}{15} = \frac{16}{5} \cdot \frac{15}{38} = \frac{16 \cdot 3}{38} = \frac{48}{19} = \underline{\frac{24}{19}.}$$

Exercice 16

$$1. X = 7 \cdot 2 \cdot 5 \cdot 5 \cdot 2 \cdot 2 \cdot 7 = 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5 \cdot 7 \cdot 7 = \underline{2^3 \cdot 5^2 \cdot 7^2.}$$

$$2. Y = 5 \cdot 3 \cdot 7 \cdot 7 \cdot 7 \cdot 2 \cdot 5 \cdot 3 = 3 \cdot 3 \cdot 3 \cdot 5 \cdot 5 \cdot 7 \cdot 7 \cdot 7 = \underline{3^3 \cdot 5^2 \cdot 7^3.}$$

$$3. Z = a \cdot b \cdot a \cdot c \cdot a \cdot a \cdot b = a \cdot a \cdot a \cdot a \cdot b \cdot b \cdot c = \underline{a^4 \cdot b^2 \cdot c.}$$

$$4. U = \frac{1}{4} \cdot \frac{1}{5} \cdot \frac{1}{4} \cdot \frac{1}{4} \cdot \frac{1}{3} \cdot \frac{1}{4} = \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{4} \cdot \frac{1}{4} \cdot \frac{1}{4} \cdot \frac{1}{4} = \underline{\left(\frac{1}{3} \right)^2 \cdot \left(\frac{1}{4} \right)^4.}$$

$$5. V = \frac{2}{3} \cdot \frac{2}{5} \cdot \frac{2}{3} \cdot \frac{1}{3} \cdot \frac{2}{5} = \frac{1}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{5} \cdot \frac{2}{5} = \underline{\frac{1}{3} \cdot \left(\frac{2}{3} \right)^2 \cdot \left(\frac{2}{5} \right)^2.}$$

$$6. W = \left(\frac{5}{3} \right) \cdot \left(-\frac{5}{3} \right) \cdot \left(\frac{5}{3} \right)^3 = -\frac{5}{3} \cdot \frac{5}{3} \cdot \left(\frac{5}{3} \right)^3 = \underline{-\left(\frac{5}{3} \right)^5.}$$

Exercice 17

Règle: $a^m \cdot a^n = a^{m+n}$.

1. $2^3 \cdot 2^5 = 2^{3+5} = \underline{2^8}$.

2. $2^7 \cdot 2^{11} = 2^{7+11} = \underline{2^{18}}$.

3. $3^2 \cdot 3^5 = 3^{2+5} = \underline{3^7}$.

4. $3^2 \cdot 2^3 = \underline{3^2 \cdot 2^3}$ (on ne peut pas faire car les bases des puissances sont différentes)

5. $a^2 \cdot a^5 = a^{2+5} = \underline{a^7}$.

Exercice 18

Règle: $(a^m)^n = a^{m \cdot n}$.

1. $(2^3)^2 = 2^{3 \cdot 2} = \underline{2^6}$.

2. $(3^2)^3 = 3^{2 \cdot 3} = \underline{3^6}$.

3. $(5^3)^4 = 5^{3 \cdot 4} = \underline{5^{12}}$.

Exercice 19

Règle: $\frac{a^m}{a^n} = a^{m-n}$.

1. $\frac{2^7}{2^3} = 2^{7-3} = \underline{2^4}$.

2. $\frac{3^5}{3^4} = 3^{5-4} = 3^1 = \underline{3}$.

3. $\frac{2^3}{2^1} = 2^{3-1} = \underline{2^2}$.

4. $\frac{3^3}{3^2} = 3^{3-2} = 3^1 = \underline{3}$.

Exercice 20

Règles: $(a \cdot b)^n = a^n \cdot b^n$ et $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$.

1. $(2 \cdot 3)^2 = \underline{2^2 \cdot 3^2}$ ou 6^2 .

2. $(2 \cdot 3)^3 = \underline{2^3 \cdot 3^3}$ ou 6^3 .

3. $(2 \cdot 5)^4 = \underline{2^4 \cdot 5^4}$ ou 10^4 .

Exercice 21

1. $-2,5 \cdot (-2,5) \cdot (-2,5) \cdot (-2,5) = \underline{(-2,5)^4}$.

2. $(-3)^7 \cdot (-3)^8 = (-3)^{7+8} = \underline{(-3)^{15}}$.

3. $0,2^5 \cdot 0,2^5 = 0,2^{5+5} = \underline{0,2^{10}}$.

4. $2^3 \cdot 2^6 \cdot (-2)^4 \cdot (-2)^5 = 2^3 \cdot 2^6 \cdot (-1 \cdot 2)^4 \cdot (-1 \cdot 2)^5 =$
 $= 2^3 \cdot 2^6 \cdot (-1)^4 \cdot 2^4 \cdot (-1)^5 \cdot 2^5 = -2^3 \cdot 2^6 \cdot 2^4 \cdot 2^5 = \underline{-2^{18}}$.

5. $(2^4)^2 \cdot 2^3 = 2^{4 \cdot 2} \cdot 2^3 = 2^8 \cdot 2^3 = 2^{8+3} = \underline{2^{11}}$.

6. $5^3 \cdot (5^2)^3 = 5^3 \cdot 5^{2 \cdot 3} = 5^3 \cdot 5^6 = 5^{3+6} = \underline{5^9}$.

7. $3^3 \cdot 4^2 \cdot (3 \cdot 5)^3 \cdot 2^4 \cdot 5^5 = 3^3 \cdot 4^2 \cdot 3^3 \cdot 5^3 \cdot 2^4 \cdot 5^5 = \underline{2^4 \cdot 3^7 \cdot 4^2 \cdot 5^8}$.

8. $6^9 : (6^2 \cdot 6^3) = 6^9 : 6^{2+3} = 6^9 : 6^5 = \frac{6^9}{6^5} = 6^{9-5} = \underline{6^4}$.

9. $(2 \cdot 3^2)^5 = 2^5 \cdot (3^2)^5 = 2^5 \cdot 3^{2 \cdot 5} = \underline{2^5 \cdot 3^{10}}$.

Exercice 22

1. $(2^3 \cdot 3)^2 = (8 \cdot 3)^2 = 24^2 = \underline{576}$.

2. $10^3 - 6^3 = 1000 - 216 = \underline{784}$.

3. $((-3)^2)^4 = 9^4 = \underline{6561}$.

4. $\frac{5^4}{5^2} = 5^{4-2} = 5^2 = \underline{25}$.

5. $(4+5)^2 = 9^2 = \underline{81}$.

6. $(3^2)^3 - 9^3 = 9^3 - 9^3 = \underline{0}$.

7. $(12-4)^2 + (7+5)^2 = 8^2 + 12^2 = 64 + 144 = \underline{208}$.

8. $1,2^2 + 0,5^2 = 1,44 + 0,25 = \underline{1,69}$.

9. $2 \cdot (17-21)^2 = 2 \cdot (-4)^2 = 2 \cdot 16 = \underline{32}$.

10. $2^3 - 3^3 = 8 - 27 = \underline{-19}$.

11. $4^2 + 3^4 = 16 + 81 = \underline{97}$.

12. $((-10)^2)^4 = 100^4 = \underline{100'000'000}$.

Exercice 23

1. $5 + 3^2 : 2 + 2 \cdot 3^2 = 5 + 9 : 2 + 2 \cdot 9 = 5 + \frac{9}{2} + 18 = \frac{10}{2} + \frac{9}{2} + \frac{36}{2} = \underline{\frac{55}{2}}$.

2. $4 + 4^2 : 2 - 2 \cdot 2^2 = 4 + 16 : 2 - 2 \cdot 4 = 4 + 8 - 8 = \underline{4}$.

3. $100 - (100 + 50) : 5 = 100 - 150 : 5 = 100 - 30 = \underline{70}$.

Exercise 24

- 1. $2^3 = 8$
 - 2. $2^2 = 4$
 - 3. $2^1 = 2$
 - 4. $2^0 = 1$
 - 5. $2^{-1} = \frac{1}{2}$
 - 6. $2^{-2} = \frac{1}{4}$
- } : 2
 } : 2
 } : 2
 } : 2
 } : 2

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

Exercise 25

- 1. $2^{-2} = \frac{1}{2^2} = \frac{1}{4}$
- 2. $2^{-5} \cdot (2^3 \cdot 2^5)^2 \cdot (2^{-2})^3 = 2^{-5} \cdot (2^8)^2 \cdot 2^{-6} = 2^{-5} \cdot 2^{16} \cdot 2^{-6} = 2^{-5+16-6} = 2^5 = 32$
- 3. $\frac{2^3 \cdot 3^{-4} \cdot (5^2)^{-2}}{2^{-1} \cdot 3^0 \cdot 5^{-7}} = \frac{2^3 \cdot 3^{-4} \cdot 5^{-4}}{2^{-1} \cdot 3^0 \cdot 5^{-7}} = \frac{2^3}{2^{-1}} \cdot \frac{3^{-4}}{3^0} \cdot \frac{5^{-4}}{5^{-7}} = 2^{3-(-1)} \cdot 3^{-4-0} \cdot 5^{-4-(-7)} = 2^4 \cdot 3^{-4} \cdot 5^3 = 2^4 \cdot \frac{1}{3^4} \cdot 5^3 = \frac{2^4 \cdot 5^3}{3^4} = \frac{16 \cdot 125}{81} = \frac{2000}{81}$

Exercise 26

Regel: $\sqrt{a \cdot b} = \sqrt{a} \cdot \sqrt{b}$

- 1. $\sqrt{4 \cdot 9} = \sqrt{4} \cdot \sqrt{9} = 2 \cdot 3 = 6$
- 2. $\sqrt{4 \cdot 25} = \sqrt{4} \cdot \sqrt{25} = 2 \cdot 5 = 10$
- 3. $\sqrt{25 \cdot 36} = \sqrt{25} \cdot \sqrt{36} = 5 \cdot 6 = 30$
- 4. $\sqrt{4 \cdot 100} = \sqrt{4} \cdot \sqrt{100} = 2 \cdot 10 = 20$
- 5. $\sqrt{9 \cdot 25} = \sqrt{9} \cdot \sqrt{25} = 3 \cdot 5 = 15$
- 6. $\sqrt{16 \cdot 9} = \sqrt{16} \cdot \sqrt{9} = 4 \cdot 3 = 12$

Exercice 27

Règle: $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

1. $\sqrt{\frac{4}{9}} = \frac{\sqrt{4}}{\sqrt{9}} = \frac{2}{3}$

2. $\sqrt{\frac{4}{25}} = \frac{\sqrt{4}}{\sqrt{25}} = \frac{2}{5}$

3. $\sqrt{\frac{25}{36}} = \frac{\sqrt{25}}{\sqrt{36}} = \frac{5}{6}$

4. $\sqrt{\frac{100}{4}} = \frac{\sqrt{100}}{\sqrt{4}} = \frac{10}{2}$

5. $\sqrt{\frac{25}{9}} = \frac{\sqrt{25}}{\sqrt{9}} = \frac{5}{3}$

6. $\sqrt{\frac{16}{9}} = \frac{\sqrt{16}}{\sqrt{9}} = \frac{4}{3}$

Exercice 28

Règle: $\sqrt[n]{a^m} = a^{\frac{m}{n}} = (\sqrt[n]{a})^m$

1. $\sqrt[2]{9^3} = (\sqrt[2]{9})^3 = 3^3 = \underline{27}$

2. $\sqrt[3]{2^6} = 2^{\frac{6}{3}} = 2^2 = \underline{4}$

3. $\sqrt{3^6} = \sqrt[2]{3^6} = 3^{\frac{6}{2}} = 3^3 = \underline{27}$

Exercice 19

1. $\sqrt{-4}$ impossible: la racine carrée d'un nombre négatif n'existe pas.
2. $\sqrt{0,0016} = \sqrt{\frac{16}{10'000}} = \frac{\sqrt{16}}{\sqrt{10'000}} = \frac{4}{100} = \underline{0,04}$.
3. $\sqrt{1600} = \sqrt{16 \cdot 100} = \sqrt{16} \cdot \sqrt{100} = 4 \cdot 10 = \underline{40}$.
4. $\sqrt{10^6} = \sqrt[2]{10^6} = 10^{\frac{6}{2}} = 10^3 = \underline{1000}$.
5. $\sqrt{9} \cdot \sqrt{0,09} = 3 \cdot 0,3 = \underline{0,9}$.
6. $\sqrt{\frac{16}{900}} = \frac{\sqrt{16}}{\sqrt{900}} = \frac{\sqrt{16}}{\sqrt{9 \cdot 100}} = \frac{\sqrt{16}}{\sqrt{9} \cdot \sqrt{100}} = \frac{4}{3 \cdot 10} = \frac{4}{30} = \underline{\frac{2}{15}}$.
7. $\sqrt{1} = \underline{1}$.
8. $\sqrt{1,44} = \sqrt{\frac{144}{100}} = \frac{\sqrt{144}}{\sqrt{100}} = \frac{12}{10} = \underline{1,2}$.
9. $\sqrt[4]{16} = \underline{2}$ (car $2^4 = 16$).
10. $\sqrt[3]{-27} = \underline{-3}$ (car $(-3)^3 = -27$).
11. $\sqrt[3]{10^9} = 10^{\frac{9}{3}} = 10^3 = \underline{1000}$.
12. $\sqrt{10^8} = \sqrt[2]{10^8} = 10^{\frac{8}{2}} = 10^4 = \underline{10'000}$.
13. $\sqrt{9} \cdot \sqrt{4} = 3 \cdot 2 = \underline{6}$.
14. $\sqrt{9 \cdot 4} = \sqrt{9} \cdot \sqrt{4} = 3 \cdot 2 = \underline{6}$.
15. $\sqrt{16} + \sqrt{9} = 4 + 3 = \underline{7}$.
16. $\sqrt{16+9} = \sqrt{25} = \underline{5}$.
17. $\sqrt{32} \cdot \sqrt{2} = \sqrt{32 \cdot 2} = \sqrt{64} = \underline{8}$.
18. $\sqrt[3]{9} \cdot \sqrt[3]{3} = \sqrt[3]{9 \cdot 3} = \sqrt[3]{27} = \underline{3}$ (car $3^3 = 27$).
19. $\sqrt{8} \cdot \sqrt{18} = \sqrt{8 \cdot 18} = \sqrt{144} = \underline{12}$.
20. $\frac{\sqrt{2}}{\sqrt{8}} = \sqrt{\frac{2}{8}} = \sqrt{\frac{1}{4}} = \frac{\sqrt{1}}{\sqrt{4}} = \underline{\frac{1}{2}}$.
21. $\frac{\sqrt{32}}{\sqrt{18}} = \sqrt{\frac{32}{18}} = \sqrt{\frac{16}{9}} = \frac{\sqrt{16}}{\sqrt{9}} = \underline{\frac{4}{3}}$.
22. $(\sqrt{2})^6 = (\sqrt[2]{2})^6 = 2^{\frac{6}{2}} = 2^3 = \underline{8}$.

23. $\sqrt{2^6} = \sqrt[2]{2^6} = 2^{\frac{6}{2}} = 2^3 = \underline{8}$.

24. $(\sqrt{2} \cdot \sqrt{3})^4 = (\sqrt{2 \cdot 3})^4 = (\sqrt{6})^4 = (\sqrt[2]{6})^4 = 6^{\frac{4}{2}} = 6^2 = \underline{36}$.

25. $\frac{\sqrt{300}}{\sqrt{3}} = \sqrt{\frac{300}{3}} = \sqrt{100} = \underline{10}$.

26. $\sqrt{0,0004} = \sqrt{\frac{4}{10'000}} = \frac{\sqrt{4}}{\sqrt{10'000}} = \frac{2}{100} = \underline{0,02}$.

27. $\sqrt{36 \cdot 25} = \sqrt{36} \cdot \sqrt{25} = 6 \cdot 5 = \underline{30}$.

Exercice 30

Le nombre de feuilles offertes est $3 \cdot \underbrace{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}_{\text{on recommence 5 fois}} = 3^6 = 729$, ce qui est inférieur à 1000 ("mille" feuilles).

Donc, non!

Exercice 31

1. $(2-2^2)^2 - (5-3^2)^3 = (2-4)^2 - (5-9)^3 = (-2)^2 - (-4)^3 = 4 - (-64) = 4 + 64 = \underline{68}$.

2. $1 - (9^{\frac{1}{2}} - 3^0)^2 - (6^0 - 4^{\frac{1}{2}})^3 = 1 - (3-1)^2 - (1-2)^3 = 1 - 2^2 - (-1)^3 = 1 - 4 - (-1) = 1 - 4 + 1 = \underline{-2}$.
($9^{\frac{1}{2}} = \sqrt{9} = 3$ et $4^{\frac{1}{2}} = \sqrt{4} = 2$).

3. $2^{-2} + 5^0 - (1 - 2^{-2})^{-1} = \frac{1}{2^2} + 1 - (1 - \frac{1}{2^2})^{-1} = \frac{1}{4} + 1 - (1 - \frac{1}{4})^{-1} = \frac{1}{4} + 1 - (\frac{3}{4})^{-1} = \frac{1}{4} + 1 - (\frac{4}{3}) = \frac{1}{4} + \frac{4}{4} - \frac{4}{3} = \frac{5}{4} - \frac{4}{3} = \frac{15}{12} - \frac{16}{12} = \underline{-\frac{1}{12}}$. ($(\frac{3}{4})^{-1} = \frac{4}{3}$).

4. $4 \cdot 25^0 + 1 \cdot 2^0 + 4 \cdot 5^0 = 4 + 1 + 4 = \underline{9}$.

5. $135^{45} : 135^{44} = 135^{45-44} = 135^1 = \underline{135}$.

6. $4 \cdot 10^3 + 5 \cdot 10 + 3 \cdot 10^0 = 4 \cdot 1000 + 50 + 3 \cdot 1 = 4000 + 50 + 3 = \underline{4053}$.

7. $(9^{\frac{1}{2}} - 4^{\frac{1}{2}})^2 + (\frac{1}{16})^2 = (3-2)^2 + \frac{1}{256} = 1^2 + \frac{1}{256} = 1 + \frac{1}{256} = \underline{\frac{257}{256}}$.

8. $(1-5^{-2})^{-1} = (1 - \frac{1}{5^2})^{-1} = (1 - \frac{1}{25})^{-1} = (\frac{24}{25})^{-1} = \underline{\frac{25}{24}}$.

9. $(14 - 25^{\frac{1}{2}})^{\frac{1}{2}} = (14 - 5)^{\frac{1}{2}} = 9^{\frac{1}{2}} = \underline{3}$.

10. $(2 \cdot 3^2 + 20 \cdot 4^{\frac{1}{2}})^{\frac{1}{2}} = (18 + 20 \cdot 2)^{\frac{1}{2}} = 38^{\frac{1}{2}} = \underline{6}$.

11. $(\frac{1}{9})^{-2} + (\frac{1}{9})^{-\frac{1}{2}} = 9^2 + 9^{\frac{1}{2}} = 81 + 3 = \underline{84}$ ($(\frac{1}{a})^{-n} = a^n$).

12. $(\frac{3}{7})^{\frac{1}{2}} \cdot (\frac{7}{3})^{\frac{1}{2}} = (\frac{3}{7} \cdot \frac{7}{3})^{\frac{1}{2}} = (\frac{21}{21})^{\frac{1}{2}} = (\frac{1}{1})^{\frac{1}{2}} = \underline{1}$.

Exercice 32

$$1. 0,00005 \cdot 200 = \frac{5}{100'000} \cdot 3 \cdot 100 = \frac{5}{10^5} \cdot 3 \cdot 10^2 = \frac{5 \cdot 3 \cdot 10^2}{10^5} = \frac{15 \cdot 10^2}{10^5} = 15 \cdot 10^{2-5} = \underline{15 \cdot 10^{-3}} \quad (\text{ou } 1,5 \cdot 10^{-2}).$$

$$2. 0,006^2 = \left(\frac{6}{1000}\right)^2 = \frac{6^2}{(10^3)^2} = \frac{36}{10^6} = \underline{36 \cdot 10^{-6}} \quad (\text{ou } 3,6 \cdot 10^{-5}).$$

$$3. 32'000 : 0,008 = 32 \cdot 1000 : \frac{8}{1000} = 32 \cdot 10^3 : \frac{8}{10^3} = \frac{32 \cdot 10^3}{8} = \frac{4 \cdot 10^3}{1} = \underline{4 \cdot 10^6}.$$

$$4. 10^5 : 10^{-4} \cdot 1000 = 10^5 : 10^{-1} \cdot 10^3 = 10^{5-(-1)} \cdot 10^3 = 10^7 \cdot 10^3 = \underline{10^{10}}.$$

$$5. 4000 \cdot 0,00125 = 4 \cdot 1000 \cdot \frac{125}{100'000} = 4 \cdot 10^3 \cdot \frac{125}{10^5} = 4 \cdot 125 \cdot 10^{3-5} = 500 \cdot 10^{-2} = \frac{500}{100} = \underline{5}.$$

$$6. 0,0016 : 400 = \frac{16}{10'000} : (4 \cdot 100) = \frac{16}{10^4} : (4 \cdot 10^2) = \frac{16}{10^4} \cdot \frac{1}{4 \cdot 10^2} = \frac{4}{10^6} = \underline{4 \cdot 10^{-6}}.$$

$$7. 7 \cdot 10^3 \cdot 4 \cdot 10^2 = 7 \cdot 4 \cdot 10^3 \cdot 10^2 = \underline{28 \cdot 10^5} \quad (\text{ou } 2,8 \cdot 10^6).$$