Introduction to informatics

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Labor 03

Exercise

$$\begin{array}{r} 1345234652_7 \\ +\ 2541023466_7 \\ \hline \end{array} \qquad \begin{array}{r} 131251253234_6 \\ -\ 215340515315_6 \\ \hline \end{array}$$

$$\begin{array}{r} 64AB233C56D_{16} \\ +\ 23FE5689A9B_{16} \\ \hline \end{array} \qquad \begin{array}{r} 64AB233C56D_{16} \\ -\ 23FE5689A9B_{16} \\ \hline \end{array}$$

Solution

Addition and subtraction

- $1345234652_7+2541023466_7=4216261451_7$
- $64AB233C56D_{16}+23FE5689A9B_{16}=88A979C6008_{16}$
- $131251253234_6-215340515315_6= -44045222041_6$
- $64AB233C56D_{16}-23FE5689A9B_{16} = 40ACCCB2AD2_{16}$

Converting repeating decimal

Exercise:

- $20122.'1100'1100'1100'\ldots_{(3}$

Solution:

- convert the integer part
- convert the fraction part
  - Solution 1
  - Solution 2

Solution

- Conversion of the integer part of the number:

$$20122_{(3}$$

$$20122_{(3} = 2\cdot 3^4 + 0\cdot 3^3 + 1\cdot 3^2 + 2\cdot 3^1 + 2\cdot 3^0$$
$$= 162 + 9 + 6 + 2 = 179_{(10}$$

Fraction part – Solution1: $0.'1100'1100'1100'_{(3}$

$$S_1 = 3^{-1} + 3^{-5} + 3^{-9} + \ldots = \sum_{i=0}^{\infty} 3^{-1-4i} \qquad S_1 = \frac{a_1}{1-q} \qquad S_2 = \frac{b_1}{1-r}$$

$$S_2 = 3^{-2} + 3^{-6} + 3^{-10} + \ldots = \sum_{i=0}^{\infty} 3^{-2-4i} \qquad a_1 = 3^{-1} = \frac{1}{3}, \quad q = 3^{-4} = \frac{1}{3^4}$$

$$S = S_1 + S_2 = \sum_{i=0}^{\infty} 3^{-1-4i} + \sum_{i=0}^{\infty} 3^{-2-4i} \qquad b_1 = 3^{-2} = \frac{1}{3^2}, \quad r = 3^{-4} = \frac{1}{3^4}$$

$$S = \frac{\frac{1}{3}}{1-\frac{1}{3^4}} + \frac{\frac{1}{3^2}}{1-\frac{1}{3^4}} = \frac{1}{3} \cdot \frac{3^4}{3^4-1} + \frac{1}{3^2} \cdot \frac{3^4}{3^4-1} = \frac{3^3}{3^4-1} + \frac{3^2}{3^4-1} =$$

$$= \frac{3^3+3^2}{80} = \frac{36}{80} = \frac{9}{20} = 0.45$$

Fraction part –Solution2: 0.’1100’1100’1100’(3

$$\frac{x}{y} = 0.'1100\ '1100\ '\ldots_{(3}$$

$$\frac{x}{y} = \frac{1100}{2222}$$

$$\frac{x}{y} = \frac{36}{80}$$

$$\frac{x}{y} = 0.45$$

Exercise

- Convert the following numbers to decimal system. Solve each of them with both learnt methods.
  1. $0,2'32'32'\ldots_{(4} =$
  2. $0,20'131'131'\ldots_{(4} =$
  3. $0,4'231'231'\ \ldots_{(5} =$
  4. $0,51'153'153\ '\ldots_{(6}\ =$
  5. $0,3'415'415'\ \ldots_{(7} =$
  6. $0,25'175'175'\ldots_{(8} =$
  7. $0,57'83'83'\ \ldots_{(9} =$
  8. $7B,73'5'5'\ldots_{(16} =$