

Subject 1

Student 1: Ripmann George

Student 1: $q_1 = 4, q_2 = 16$

$$x = 132021_{(4)}$$

$$y = 21321_{(4)}$$

$$z = 4B1234_{(16)}$$

$$f = A_{(16)}$$

$$C: 011100$$

$$x: 132021_{(4)} +$$

$$y: 21321_{(4)}$$

$$= 220002_{(4)}$$

$$\text{iter 1: } 0_{(4)} + 1_{(4)} + 1_{(4)} = 2_{(4)}$$

$$2 \text{ div } 4 = 0$$

$$2 \bmod 4 = 2$$

$$\text{iter 2: } 0_{(4)} + 2_{(4)} + 2_{(4)} = 4$$

$$4 \text{ div } 4 = 1$$

$$4 \bmod 4 = 0$$

$$\text{iter 3: } 1_{(4)} + 0_{(4)} + 3_{(4)} = 4$$

$$4 \text{ div } 4 = 1$$

$$4 \bmod 4 = 0$$

$$\text{iter 4: } 1_{(4)} + 2_{(4)} + 1_{(4)} = 4$$

$$4 \text{ div } 4 = 1$$

$$4 \bmod 4 = 0$$

$$\text{itn 5: } 1_{(4)} + 3_{(4)} + 2_{(4)} = 6$$

$$6 \text{ div } 4 = 1$$

$$6 \bmod 4 = 2$$

$$\text{itn 6: } 1_{(4)} + 1_{(4)} + 0_{(4)} = 2$$

$$2 \text{ div } 4 = 0$$

$$2 \bmod 4 = 2$$

$$\Rightarrow n = 220002_{(4)}$$

$$\begin{array}{r} 6601220 \\ z = AB1234_{(16)} \end{array}$$

$$I = A$$

$$n = 6AEB6D8$$

$$\text{itn 1: } 0_{(16)} + 4_{(16)} \times A_{(16)} = 40$$

$$40 \text{ div } 16 = 2$$

$$40 \bmod 16 = 8$$

$$\text{itn 2: } 2_{(16)} + 3_{(16)} \times A_{(16)} = 32$$

$$32 \text{ div } 16 = 2$$

$$32 \bmod 16 = 0$$

$$\text{itn 3: } 2_{(16)} + 2 \times A_{(16)} = 22$$

$$22 \text{ div } 16 = 1$$

$$22 \bmod 16 = 6$$

$$\text{itn 4: } 1_{(16)} + 1_{(16)} \times A_{(16)} = 11$$

$$11 \text{ div } 16 = 0$$

$$11 \bmod 16 = 11 = B_{(16)}$$

$$\text{itn 5: } 0_{(16)} + B_{(16)} \times A_{(16)} = 110_{(16)}$$

$$110 \text{ div } 16 = 6$$

$$110 \bmod 16 = 14 = E$$

$$\text{it } 6: 6_{(16)} + A_{(16)} \times A_{(16)} = 106$$

$$106 \text{ div } 16 = 6 \text{ r}$$

$$106 \bmod 16 = 10 = A_{(16)}$$

$$\text{it } 4: 6_{(16)} + 0_{(16)} \times A_{(16)} = 6$$

$$6 \text{ div } 16 = 0$$

$$6 \bmod 16 = 6$$

$$\Rightarrow p = 6AEB608$$

Subject 1 - Student 2: Reiter Alex

$$b_1 = 4$$

$$A = 220002$$

$$Y = 21321$$

$$b_2 = 16$$

$$p = 6AEB608$$

$$f = A$$

$$A(b_1) - Y(b_1) = ?(b_1)$$

$$\begin{array}{r} \overset{-1}{2} \overset{-1}{2} \overset{-1}{0} \overset{-1}{0} 0 2_{(4)} \\ \underline{21321_{(4)}} \\ 132021_{(4)} \end{array}$$

$$p(b_2) : f(b_2) = ?(b_2)$$

$$\begin{array}{r} 06AEB608_{(16)} \mid A_{(16)} \\ \hline 6A \\ \hline 6E \\ \hline 0B \\ \hline 16 \\ \hline 20 \\ \hline 28 \\ \hline 0 \end{array}$$

$$N_1: 06_{(16)} = 0 \times 16 + 6 = 6$$

$$6 \text{ div } 10 = 0 \quad 6 \text{ mod } 10 = 6$$

$$N_2: 6A_{(16)} = 6 \times 16 + 10 = 106$$

$$106 \text{ div } 10 = 10 = A_{(16)} \quad 106 \text{ mod } 10 = 6$$

$$N_3: 6E_{(16)} = 6 \times 16 + 14 = 110$$

$$110 \text{ div } 10 = 11 \quad 110 \text{ mod } 10 = 0$$

$$N_4: 0B_{(16)} = 0 \times 16 + 11 = 11$$

$$11 \text{ div } 10 = 1 \quad 11 \text{ mod } 10 = 1$$

$$N_5: 16_{(16)} = 1 \times 16 + 0 = 16$$

$$16 \text{ div } 10 = 1 \quad 16 \text{ mod } 10 = 6$$

$$N_6: 20_{(16)} = 2 \times 16 + 0 = 32$$

$$32 \text{ div } 10 = 3 \quad 32 \text{ mod } 10 = 2$$

$$N_7: 28_{(16)} = 2 \times 16 + 8 = 40$$

$$40 \text{ div } 10 = 4 \quad 40 \text{ mod } 10 = 0$$

Übung 2: Student 2: Reithler Alex

$$b=4 \quad k=8$$

$$x_{(b)} = 32123, 123_{(4)}$$

$$8 = 20_{(4)}$$

$$\begin{array}{r}
 32123_{(4)} \\
 \begin{array}{r}
 20 \\
 \hline
 121 \\
 120 \\
 \hline
 12 \\
 0 \\
 \hline
 123 \\
 120 \\
 \hline
 3_{(4)} = 3_{(8)}
 \end{array}
 \end{array}
 \quad
 \begin{array}{r}
 20_{(4)} \\
 \hline
 1303_{(4)} \\
 \begin{array}{r}
 120 \\
 \hline
 103 \\
 100 \\
 \hline
 3_{(4)} = 3_{(8)}
 \end{array}
 \end{array}
 \quad
 \begin{array}{r}
 20_{(4)} \\
 \hline
 32_{(4)} \\
 20 \\
 \hline
 12_{(4)} = 6_{(8)} \\
 \begin{array}{r}
 1_{(4)} \\
 0 \\
 \hline
 1_{(4)} = 1_{(8)}
 \end{array}
 \end{array}
 \quad
 \begin{array}{r}
 20_{(4)} \\
 \hline
 1_{(4)} \\
 0 \\
 \hline
 0
 \end{array}$$

$$\Rightarrow 1633_{(8)}$$

$$0, 123_{(4)} * 20_{(4)} = 3, 120_{(4)}$$

$$0, 12_{(4)} * 20_{(4)} = 3, 00_{(4)}$$

$$\Rightarrow 0, 33_{(8)}$$

$$\begin{array}{r}
 1 \\
 12_{(4)} \\
 \hline
 20_{(4)} \\
 00 \\
 \hline
 30 \\
 \hline
 300_{(4)}
 \end{array}$$

$$\begin{array}{r}
 11 \\
 123_{(4)} \\
 \hline
 20_{(4)} \\
 000 \\
 \hline
 312 \\
 \hline
 3120_{(4)}
 \end{array}$$

$$\Rightarrow 32123, 123_{(4)} = 1633, 33_{(8)}$$

Student 1: Rippenberg

Subjed 2: Student 1: $h=8, k=4$

$$y(n) = 1633, 33181$$

Integer part: $1633(8)$

$$\begin{array}{r|l} 1633 & 4(8) \\ \hline 0 & 0346 \\ \hline 16 & \\ 14 & \\ \hline 23 & \\ 20 & \\ \hline 33 & \\ 30 & \\ \hline 3 & \end{array}$$

$$\Rightarrow \begin{cases} 1633 \text{ div } 4 = 346 \\ 1633 \text{ mod } 4 = 3 \\ (8) \end{cases}$$

$$\begin{array}{r|l} 346 & 4(8) \\ \hline 0 & 071 \\ \hline 34 & \\ 34 & \\ \hline 6 & \\ 4 & \\ \hline 2 & \end{array}$$

$$\Rightarrow \begin{cases} 346 \text{ div } 4 = 71 \\ 346 \text{ mod } 4 = 2 \end{cases}$$

$$\begin{array}{r|l} 71 & 4(8) \\ \hline 4 & 16(8) \\ \hline 31 & \\ 30 & \\ \hline 1 & \end{array}$$

$$\Rightarrow \begin{cases} 71 \text{ div } 4 = 16 \\ 71 \text{ mod } 4 = 1 \\ (8) \end{cases}$$

$$\begin{array}{r|l} 16 & 4 \\ \hline 0 & 03 \\ \hline 16 & \\ 14 & \\ \hline 2 & \end{array}$$

$$\Rightarrow \begin{cases} 16 \text{ div } 4 = 3 \\ 16 \text{ mod } 4 = 0 \end{cases}$$

$$\Rightarrow 1633_{(8)} = 32123_{(4)}$$

Fractional part: $0,33_{(8)}$

$$C: 110$$

$$0,33_{(8)} \times 4_{(8)} \Rightarrow 0,33 \times 4_{(8)} = 1,54_{(8)} \neq$$

$$\begin{array}{r} 1,54_{(8)} \\ \hline \end{array}$$

$$C: 220$$

$$0,54_{(8)} \times 4_{(8)} = 2,16_{(8)}$$

$$\begin{array}{r} 2,16_{(8)} \\ \hline \end{array}$$

$$2,60_{(8)}$$

$$C: 300$$

$$0,60_{(8)} \times 4_{(8)} = 3,00$$

$$\begin{array}{r} 3,00 \\ \hline \end{array}$$

$$\Rightarrow 0,33_{(8)} = 0,123_{(4)}$$

$$\Rightarrow 1633,33_{(8)} = 32123,123_{(4)}$$

Student 1: Rameen George
Subject 3, option 5: Floating point representation, mantissa < 1

Student 1: $x = 12345, 25$

Conversion of the integer part

$$\begin{array}{r|l} 12345 & 2 \\ \hline 12 & 6142 \\ \hline \text{---} & \\ 2 & \\ \hline 24 & \\ \hline 16 & \\ \hline \text{---} & \\ 5 & \\ \hline 4 & \\ \hline 1 & \end{array}$$

$$\Rightarrow \begin{cases} 12345 \text{ div } 2 = 6142 \\ 12345 \text{ mod } 2 = 1 \end{cases}$$

$$\begin{array}{r|l} 6142 & 2 \\ \hline 6 & 3086 \\ \hline \text{---} & \\ 0 & \\ \hline 14 & \\ \hline 16 & \\ \hline \text{---} & \\ 12 & \\ \hline 12 & \\ \hline \text{---} & \\ 0 & \end{array}$$

$$\Rightarrow \begin{cases} 6142 \text{ div } 2 = 3086 \\ 6142 \text{ mod } 2 = 0 \end{cases}$$

$$\begin{array}{r|l} 3086 & 2 \\ \hline 2 & 1543 \\ \hline 10 & \\ \hline 10 & \\ \hline \text{---} & \\ 0 & \\ \hline 8 & \\ \hline 6 & \\ \hline 6 & \\ \hline \text{---} & \\ 0 & \end{array}$$

$$\Rightarrow \begin{cases} 3086 \text{ div } 2 = 1543 \\ 3086 \text{ mod } 2 = 0 \end{cases}$$

$$\begin{array}{r|l}
 1543 & 2 \\
 \hline
 14 & 771 \\
 \hline
 =14 & \\
 14 & \\
 \hline
 =0 & \\
 2 & \\
 \hline
 1 &
 \end{array}$$

$$\Rightarrow \begin{cases} 1543 \text{ div } 2 = 771 \\ 1543 \bmod 2 = 1 \end{cases}$$

$$\begin{array}{r|l}
 771 & 2 \\
 \hline
 6 & 385 \\
 \hline
 14 & \\
 \hline
 16 & \\
 \hline
 =14 & \\
 10 & \\
 \hline
 =1 &
 \end{array}$$

$$\Rightarrow \begin{cases} 771 \text{ div } 2 = 385 \\ 771 \bmod 2 = 1 \end{cases}$$

$$\begin{array}{r|l}
 385 & 2 \\
 \hline
 2 & 192 \\
 \hline
 18 & \\
 \hline
 18 & \\
 \hline
 =0 & \\
 4 & \\
 \hline
 1 &
 \end{array}$$

$$\Rightarrow \begin{cases} 385 \text{ div } 2 = 192 \\ 385 \bmod 2 = 1 \end{cases}$$

$$\begin{array}{r|l}
 192 & 2 \\
 \hline
 18 & 96 \\
 \hline
 =18 & \\
 12 & \\
 \hline
 =0 &
 \end{array}$$

$$\Rightarrow \begin{cases} 192 \text{ div } 2 = 96 \\ 192 \bmod 2 = 0 \end{cases}$$

$$\begin{array}{r|l}
 96 & 2 \\
 \hline
 8 & 48 \\
 \hline
 16 & \\
 \hline
 16 & \\
 \hline
 =0 &
 \end{array}$$

$$\Rightarrow \begin{cases} 96 \text{ div } 2 = 48 \\ 96 \bmod 2 = 0 \end{cases}$$

$$\begin{array}{r|l}
 48 & 2 \\
 \hline
 4 & 24 \\
 \hline
 =8 & \\
 2 & \\
 \hline
 = &
 \end{array}$$

$$\Rightarrow \begin{cases} 48 \text{ div } 2 = 24 \\ 48 \bmod 2 = 0 \end{cases}$$

$$\begin{array}{r|l} 24 & 2 \\ \hline & 12 \\ \hline \end{array}$$

$$\Rightarrow \begin{cases} 24 \text{ div } 2 = 12 \\ 24 \bmod 2 = 0 \end{cases}$$

$$\begin{array}{r|l} 12 & 2 \\ \hline & 6 \\ \hline \end{array}$$

$$\Rightarrow \begin{cases} 12 \text{ div } 2 = 6 \\ 12 \bmod 2 = 0 \end{cases}$$

$$\begin{array}{r|l} 6 & 2 \\ \hline & 3 \\ \hline \end{array}$$

$$\Rightarrow \begin{cases} 6 \text{ div } 2 = 3 \\ 6 \bmod 2 = 0 \end{cases}$$

$$\begin{array}{r|l} 3 & 2 \\ \hline & 1 \\ \hline \end{array}$$

$$\Rightarrow \begin{cases} 3 \text{ div } 2 = 1 \\ 3 \bmod 2 = 1 \end{cases}$$

$$\begin{array}{r|l} 1 & 2 \\ \hline & 0 \\ \hline \end{array}$$

$$\Rightarrow \begin{cases} 1 \text{ div } 2 = 0 \\ 1 \bmod 2 = 1 \end{cases}$$

$$\Rightarrow \text{Integer part} = 11000000111001_{(2)} = 0,11000000111001 \times 2^{14}$$

$$\Rightarrow Q = 14 \Rightarrow C = 127 + 14 = 141 = 128 + 8 + 4 + 1 = 2^7 + 2^3 + 2^2 + 1 = 10001101_{(2)}$$

Conversion of the fractional part:

* There are 14 digits in the integer part

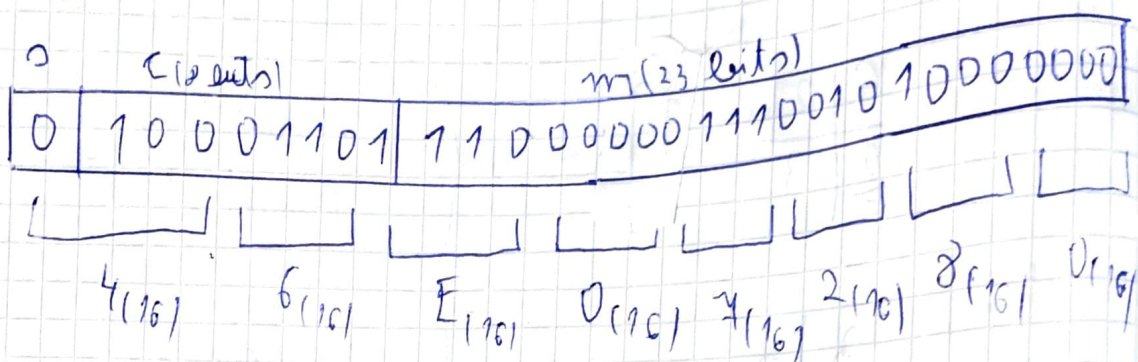
\Rightarrow we need 9 more digits in the fractional part

$$0,25 = 2^{-2} = 0,01_{(2)} = 0,01000000$$

$$\Rightarrow x = 12345,25 = 0,11000000111001010000000 \times 2^{14}$$

$$12345,25 > 0 \Rightarrow \text{sign bit} = 0$$

Representation on 32 bits:



\Rightarrow Memory representation: 46E07280₍₁₆₎

$$\Rightarrow M_{(16)} = 46E07280_{(16)}$$

Subject 3 - Option 5 - Student 2: Reiter Alex

$$M_{(16)} = 46E07280_{(16)}$$

$$46E07280_{(16)} = \underline{01000110111000000111001010000000}$$

$S=0 \Rightarrow$ positive number

$$C = 10001101_{(2)} = 2_{(10)}^0 + 2_{(10)}^2 + 2_{(10)}^3 + 2_{(10)}^7 = 1 + 4 + 8 + 128 = 141$$

$$Q = 141 - 127 = 14$$

$$\begin{aligned} \text{Integer part: } 11000000111001_{(2)} &= 2_{(10)}^0 + 2_{(10)}^3 + 2_{(10)}^4 + 2_{(10)}^5 + 2_{(10)}^{12} + 2_{(10)}^{13} \\ &= 1 + 8 + 16 + 32 + 4096 + 8192 = 12345 \end{aligned}$$

$$\text{fractional part: } 0,01_{(2)} = 2_{(10)}^{-2} = \frac{1}{4} = 0,25$$

$$\Rightarrow 12345,25$$