Subject 1 - operations

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Student 1

$b_1 = 8$

$b_2 = 16$

$x = 753416_{(8)}$ $\quad y = 32641_{(8)}$

$$\begin{array}{r} {\scriptstyle 1\ \ 1} \\ 753416_{(8)} \\ 32641_{(8)} \\ \hline 1006257_{(8)} \end{array}$$

$6 + 6 = 10 : 8 = 1 \ R\ 2$

$5 + 3 = 8 : 8 = 1 \ R\ 0$

$x_{(8)} + y_{(8)} = 753416_{(8)} + 32641_{(8)} = 1006257_{(8)}$

$\Rightarrow z_{(8)} = 1006257_{(8)}$

$Z = 23F56C_{(16)}$

$4_{(16)}$

3 1 1 3

$23F56C_{(16)} \cdot 4_{(16)}$

$8FD5B0_{(16)}$

$4 \cdot C = 4 \cdot 12 = 48 : 16 = 3$ R (0)

$4 \cdot 6 = 24 + 3 = 27 : 16 = 1$ R (11 = B)

$4 \cdot 5 = 20 + 1 = 21 : 16 = 1$ R 5

$4 \cdot F = 4 \cdot 15 = 60 + 1 = 61 : 16 = 3$ R (13 = D)

$4 \cdot 3 = 12 + 3 = 15 : 16 = 0$ R (15 = F)

$4 \cdot 2 = 8 + 0 = 8 : 16 = 0$ R 8

$23F56C_{(16)} \cdot 4_{(16)} = 8FD5B0_{(16)}$

$R = 8FD5B0_{(16)}$

Subject 1 - operations

Cherasim Delia
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$x(6_1) = 100625_{7(8)}$

$y(6_1) = 3264_{1(8)}$

$$\begin{array}{r} 100625_{7(8)} \\ -\ 3264_{1(8)} \\ \hline 75346 \end{array}$$

$8+2=10-6=4$

$8-3=5$

$\Rightarrow x(6_1) = 75346_{(8)}$

$p(6_2) = 8FD5B0_{(16)}$

$f(6_2) = 4_{(16)}$

$8FD5B0_{(16)} : 4_{(16)} = 23F56C_{(16)}$

$$\begin{array}{r} 8 \\ \hline 1F \\ C \\ \hline 3D \\ 15 \\ 13 \\ 30 \end{array}$$

$F_{(16)} : 4_{(16)} = 15_{(10)} : 4_{(10)} = 3,\ R3$

$3D_{(16)} = 3 \cdot 16^1 + 13 \cdot 16^0 = 48 + 13 = 61_{(10)}$

$61_{(10)} : 4_{(10)} = 15_{(10)} = F_{(16)},\ R1$

$15_{(16)} = 1 \cdot 16^1 + 5 \cdot 16^0 = 16 + 5 = 21_{(10)}$

$21_{(10)} : 4_{(10)} = 5,\ R1$

$13_{(16)} = 1 \cdot 16^1 + 11 \cdot 16^0 = 16 + 11 = 27_{(10)}$

$27_{(10)} : 4_{(10)} = 6,\ R3$

$30_{(16)} = 3 \cdot 16^1 + 0 \cdot 16^0 = 48_{(10)}$

$48_{(10)} : 4_{(10)} = 12_{(10)} = C_{(16)}$

$\Rightarrow z(6_2) = 23F56C_{(16)}$

Subject 2 - conversions

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Source base $b = 5$

Destination base $h = 8$

$x_{(8)} = 20132,123_{(5)}$

$20132,123_{(5)} = 2_{(8)} \cdot 5_{(8)}^{4} + 0_{(8)} \cdot 5_{(8)}^{3} + 1_{(8)} \cdot 5_{(8)}^{2} + 3_{(8)} \cdot 5_{(8)}^{1} + 2_{(8)} \cdot 5_{(8)}^{0}$
$+ 1_{(8)} \cdot 5_{(8)}^{-1} + 2_{(8)} \cdot 5_{(8)}^{-2} + 3_{(8)} \cdot 5_{(8)}^{-3}$

$5_{(8)} \times 5_{(8)} = 20_{(8)}$

$5 \cdot 5 = 16 \quad 16 \,|\, 8 = 2 \quad 16 \,\%\, 8 = 0$

$\Rightarrow 5_{(8)}^{2} = 20_{(8)}$

$20_{(8)} \times 5_{(8)} = 100_{(8)}$

$0 \cdot 5 = 0$

$2 \cdot 5 = 8 \quad 8 \,|\, 8 = 1 \quad 8 \,\%\, 8 = 0$

$\Rightarrow 5_{(8)}^{3} = 100_{(8)}$

$100_{(8)} \times 5_{(8)} = 500_{(8)}$

$0 \cdot 5 = 0$

$5 \cdot 1 = 5$

$\Rightarrow 5_{(8)}^{4} = 500_{(8)}$

$500_{(8)} \times 2_{(8)} = 1000_{(8)}$

$0 \cdot 5 = 0$

$5 \cdot 2 = 8 \quad 8 \,|\, 8 = 1 \quad 8 \,\%\, 8 = 0$

$1_{(8)} \times 5_{(8)}^{-1} = 1_{(8)} : 5_{(8)} = 0,25_{(8)}$

$0 : 10_{(8)} = 0$

$8 : 20 = 2$

$2_{(8)} \times 5_{(8)}^{-2} = 2_{(8)} : 20_{(8)} = 0,1_{(8)}$

$3_{(8)} \times 5_{(8)}^{-3} = 3_{(8)} : 100_{(8)} = 0,03_{(8)}$

$20132,123_{(5)} = 1000_{(8)} + 20_{(8)} + 15_{(8)} + 2_{(8)} + 0,25_{(8)} + 0,1_{(8)} + 0,03_{(8)}$

$= 1036,33_{(8)}$

$\Rightarrow y_{(h)} = 1036,33_{(8)}$

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Subject 2 - Conversions Student!

Theory:

We are using the successive divisions and multiplications method

- the integer part is divided by h (destination base) obtaining a quotient and a remainder
- the quotient is divided by h obtaining a new quotient and a new remainder
- the process of successive divisions ends when 0 is obtained as a quotient
- the remainders, in the reverse order of obtaining them, are the digits of the new representation in base h

- the fractional part is multiplied by b obtaining a number with an intiger part and a fractional one
- we continue with the multiplication of this new fractional part
- the process of the succesive multiplications continues until one of the following conditions is satisfied:
  a) the fractional part becomes 0
  b) an established number of digits of the fractional part were calculated
  c) periodicity is obtained
- the integer parts, in the order of obtaining them, are the digits of the fractional part in the destination representation

$y_{(h)} = 1036,33_{(8)}$

$h = 8 \longleftrightarrow$ source base

$b = 4 \longleftarrow$ destination base

$0 \cdot 4 = 0_{(8)}$

$1 \cdot 4 = 4_{(8)}$

$2 \cdot 4 = 8_{(10)} = 10_{(8)}$

$3 \cdot 4 = 12_{(10)} = 14_{(8)}$

$4 \cdot 4 = 16_{(10)} = 20_{(8)}$

$5 \cdot 4 = 20_{(10)} = 24_{(8)}$

$6 \cdot 4 = 24_{(10)} = 30_{(8)}$

$7 \cdot 4 = 28_{(10)} = 34_{(8)}$

$1036_{(8)}$ | $4_{(8)}$

10 | 207 | $4_{(8)}$

3 | 20 | 41 | $4_{(8)}$

0 | 7 | 4 | 10 | $4_{(8)}$

36 | 4 | 1 | 10 | 2 | $4_{(8)}$

34 | 3 | 0 | 0 | 0 | 0

2 | 1 | 2

$$0,33 * 4_{(8)} = 1,54$$
$$0,54 * 4_{(8)} = 2,60$$
$$0,60 * 4_{(8)} = 3,00$$

$$\Rightarrow 1036,33_{(8)} = 20132,123_{(4)}$$

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Subject 3 Option 5 Student 1

Floating point representation

$X = 34215,25_{(10)}$

$34215 : 8 = 4276$ r 7

$4276 : 8 = 534$ r 4

$534 : 8 = 66$ r 6

$66 : 8 = 8$ r 2

$8 : 8 = 1$ r 0

$1 : 8 = 0$ r 1

$34215_{(10)} = 102647_{(8)}$

$102647_{(8)} = 1\,000\,010\,110\,100\,111_{(2)}$

$34215_{(10)} = 0,1000010110100111_{(2)} \cdot 2^{16}$

$0,25 \cdot 2 = 0,5 \rightarrow 0$

$0,5 \cdot 2 = 1,0 \rightarrow 1$

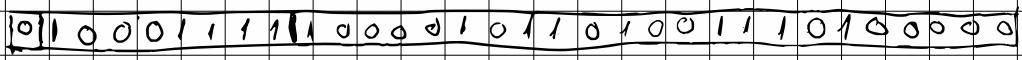
$0,25_{(10)} = 0,01_{(2)}$

$$34215,25 = 0,1000010110100111101_{(2)} \cdot 2^{16}$$

$$\Rightarrow q = 16 \qquad c = 127 + 16 = 143 = 10001111_{(2)}$$

143	2		1
71	2		1
35	2		1
17	2		1
8	2		0
4	2		0
2	2		0
1	2		1
0			

S C M



4 | 7 | C | 2 | 0 | 3 | A | 0

$$M_{(16)} = 47C203A0$$

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Subject 3 - option 5

Floating-point representation

$M_{(16)} = 47C23A0$

using rapid conversions $\Rightarrow M_{(10)} =$

0100 0111 1100 0010 1101 0011 1010 0000

4 7 C 2 D 3 A 0

Single Precision: n = 32 bits

c represented on 8 bits

$q = 127$

m represented on 23 bits

S	C	m
0	10001111	10000101101001111010000

$C = 10001111_{(2)} = 1 \cdot 2^0 + 1 \cdot 2^1 + 1 \cdot 2^2 + 1 \cdot 2^3 + 1 \cdot 2^7 = 1 + 2 + 4 + 8 + 128$

$\Rightarrow C = 143$

$e = C - q \Rightarrow e = 143 - 127 \Rightarrow e = 16$

$X = 0,1000\,0101\,1010\,0111\,0100\,0000 * 2^e =$

$= 0,10000101101001111010000 * 2^{16}$

$= 10000101101001111,010_{(2)}$

$= 2^{15} + 2^{10} + 2^8 + 2^7 + 2^5 + 2^2 + 2^1 + 2^0 + 2^{-2} =$

$= 32768 + 1024 + 256 + 128 + 32 + 4 + 2 + 1 + 0,25$

~~$= 34227,25$~~ $= 34215,25$

$\Rightarrow X = 34215,25$