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1)  
a)  $(2076)_8 = 2 \cdot 8^3 + 0 + 7 \cdot 8^1 + 6 \cdot 8^0$   
 $= 2 \cdot 512 + 0 + 56 + 6$   
 $= 1024 + 62$   
 $= 1086$

$$\begin{array}{r} 3^4 = 81 \\ 3^3 = 27 \\ 3^2 = 9 \\ 3^1 = 3 \\ 3^0 = 1 \end{array}$$

b)  $(430)_5 = 4 \cdot 5^2 + 3 \cdot 5^1 + 0$   
 $= 4 \cdot 25 + 15$   
 $= 100 + 15$   
 $= 115$

c)  $(1010111)_2 = 1 \cdot 2^6 + 0 + 1 \cdot 2^4 + 0 + 1 \cdot 2^3 + 1 \cdot 2^2 + 1 \cdot 2^1 + 1 \cdot 2^0$   
 $= 64 + 0 + 16 + 0 + 8 + 4 + 2 + 1$   
 $= 95$

d)  $(2AB)_{16} = 2 \cdot 16^2 + A \cdot 16^1 + B \cdot 16^0$   
 $= 2 \cdot 256 + 10 \cdot 16 + 11$   
 $= 512 + 160 + 11$   
 $= 683$

$$\begin{array}{r} 16 \\ 16 \\ 16 \\ 16 \\ 16 \end{array}$$

e)  $(2170)_{10} = (?)_2$

$$\begin{array}{r} 2170 : 2 = 1085 \\ 1085 : 2 = 542 \text{ remainder } 1 \\ 542 : 2 = 271 \\ 271 : 2 = 135 \text{ remainder } 1 \\ 135 : 2 = 67 \text{ remainder } 1 \\ 67 : 2 = 33 \text{ remainder } 1 \\ 33 : 2 = 16 \text{ remainder } 1 \\ 16 : 2 = 8 \\ 8 : 2 = 4 \\ 4 : 2 = 2 \\ 2 : 2 = 1 \end{array}$$

$(2170)_{10} = (81111010)_2$

f)  $(520)_6 = 5 \cdot 6^2 + 2 \cdot 6^1 + 0$   
 $= 180 + 12$   
 $= 192$

$$\begin{array}{r} 192 : 7 = 27 \text{ remainder } 3 \\ 27 : 7 = 3 \text{ remainder } 6 \\ 3 : 7 = 0 \text{ remainder } 3 \end{array}$$

$(520)_6 = (363)_7$

$$\begin{array}{r} 36 \\ 5 \\ \hline 180 \end{array}$$

$$\begin{aligned}
 9) \quad (1443)_8 &= 1 \cdot 8^3 + 4 \cdot 8^2 + 4 \cdot 8^1 + 3 \cdot 8^0 \\
 &= 512 + 256 + 32 + 3 \\
 &= 803
 \end{aligned}$$

$(1443)_8 = (803)_{10} = (415)_{14}$

Conversion of 803 to base 14:  
 $803 \div 14 = 57 \text{ remainder } 5$   
 $57 \div 14 = 4 \text{ remainder } 1$   
 So,  $(803)_{10} = (415)_{14}$

$$\begin{aligned}
 2) \quad a) \quad (332, 123)_4 &= 3 \cdot 4^2 + 3 \cdot 4^1 + 2 \cdot 4^0 + 1 \cdot \frac{1}{4} + 2 \cdot \frac{1}{16} + 3 \cdot \frac{1}{64} \\
 &= 48 + 12 + 2 + \frac{1}{4} + \frac{1}{8} + \frac{3}{64} \\
 &= 62 + \frac{27}{64} \\
 &= \frac{3995}{64} \\
 &= (62,421875)_{10}
 \end{aligned}$$

$$\begin{aligned}
 b) \quad (423, 12)_5 &= 4 \cdot 5^2 + 2 \cdot 5^1 + 3 \cdot 5^0 + \frac{1}{5} + \frac{2}{25} \\
 &= 113 + \frac{7}{25} \\
 &= \frac{2832}{25} \\
 &= (113,28)_{10}
 \end{aligned}$$

$$\begin{aligned}
 c) \quad (13, 25)_{10} &= (?)_2
 \end{aligned}$$

Conversion of 13 to base 2:  
 $13 \div 2 = 6 \text{ remainder } 1$   
 $6 \div 2 = 3 \text{ remainder } 0$   
 $3 \div 2 = 1 \text{ remainder } 1$   
 $1 \div 2 = 0 \text{ remainder } 1$   
 So,  $13_{10} = 1101_2$

Conversion of 25 to base 2:  
 $25 \div 2 = 12 \text{ remainder } 1$   
 $12 \div 2 = 6 \text{ remainder } 0$   
 $6 \div 2 = 3 \text{ remainder } 0$   
 $3 \div 2 = 1 \text{ remainder } 1$   
 $1 \div 2 = 0 \text{ remainder } 1$   
 So,  $25_{10} = 11001_2$

Therefore,  $(13, 25)_{10} = (1101, 11001)_2$

$$\begin{aligned}
 d) \quad (419, 12109375)_{10} &= (?)_{16}
 \end{aligned}$$

Conversion of 419 to base 16:  
 $419 \div 16 = 26 \text{ remainder } 3$   
 $26 \div 16 = 1 \text{ remainder } 10$   
 $1 \div 16 = 0 \text{ remainder } 1$   
 So,  $419_{10} = 1A3_{16}$

Conversion of 12109375 to base 16:  
 $12109375 \div 16 = 756835 \text{ remainder } 15$   
 $756835 \div 16 = 47302 \text{ remainder } 3$   
 $47302 \div 16 = 2956 \text{ remainder } 6$   
 $2956 \div 16 = 184 \text{ remainder } 12$   
 $184 \div 16 = 11 \text{ remainder } 8$   
 $11 \div 16 = 0 \text{ remainder } 11$   
 So,  $12109375_{10} = B8C63F_{16}$

Therefore,  $(419, 12109375)_{10} = (1A3, B8C63F)_{16}$



e)  $(451,203125)_{10} = (?)_8$

$$\begin{array}{r} 451 \overline{) 8} \\ \underline{56} \phantom{00} \\ 57 \phantom{00} \overline{) 8} \\ \underline{48} \phantom{00} \\ 9 \end{array}$$

$(703,15)_8$

$$0,203125 \cdot 8 = 1,625$$

$$0,625 \cdot 8 = 5$$

f)  $(21,102)_3 = (?)_5$

$$= 1 \cdot 3^1 + 1 \cdot 3^0 + 1 \cdot \frac{1}{3} + 0 + 2 \cdot \frac{1}{27}$$

$$= 3 + 1 + \frac{1}{3} + \frac{2}{27}$$

$$= \left(\frac{92}{27}\right)_{10}$$

$$= (3,407)_{10}$$

$$0,407,5 = 2,035$$

$$0,035 \cdot 5 = 0,175$$

$$0,175 \cdot 5 = 0,875$$

$$0,875 \cdot 5 = 4,375$$

$$0,375 \cdot 5 = 1,875$$

$(3,20041)_5$

g)  $(1101,11)_2 = (?)_3 =$

$$= 1 \cdot 2^3 + 1 \cdot 2^2 + 0 + 1 \cdot 2^0 + 1 \cdot \frac{1}{2} + 1 \cdot \frac{1}{4}$$

$$= 8 + 4 + 1 + \frac{3}{4}$$

$$= \frac{55}{4}$$

$$= (13,75)_{10}$$

$$\begin{array}{r} 13 \overline{) 3} \\ \underline{9} \phantom{00} \\ 4 \phantom{00} \overline{) 3} \\ \underline{3} \phantom{00} \\ 0 \end{array}$$

$$0,75 \cdot 3 = 2,25$$

$$0,25 \cdot 3 = 0,75$$

$$0,75 \cdot 3 = 2,25$$

$(104,20)_3$

$$h) \quad {}^{10}_{-1-2} (57, 42)_8 = (?)_2$$

$$= 5 \cdot 8^1 + 7 \cdot 8^0 + \frac{4}{8} + \frac{2}{64}$$

$$= 40 + 7 + \frac{34}{32}$$

$$= \frac{1361}{32}$$

$$= (42,53125)_{10}$$

$$i) \quad {}^{3210}_{-1-2} (1223, 22)_4 = (?)_6$$

$$= 1 \cdot 4^3 + 2 \cdot 4^2 + 2 \cdot 4^1 + 3 \cdot 4^0 + \frac{1}{4} + \frac{1}{16}$$

$$= 64 + 32 + 8 + 3 + \frac{5}{16}$$

$$= 107 + \frac{5}{16}$$

$$= \frac{1717}{16} = (107,3125)_{10}$$

$$\begin{array}{r} 42 \overline{) 1361} \\ \underline{84} \phantom{00} \\ 521 \phantom{0} \\ \underline{420} \phantom{0} \\ 1010 \phantom{0} \\ \underline{840} \phantom{0} \\ 1700 \phantom{0} \\ \underline{1680} \phantom{0} \\ 20 \phantom{0} \end{array}$$

$$0,53125 \cdot 2 = 1,0625$$

$$0,0625 \cdot 2 = 0,125$$

$$0,125 \cdot 2 = 0,25$$

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

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

$$(110,10001)_2$$

$$\begin{array}{r} 107 \overline{) 1717} \\ \underline{107} \phantom{00} \\ 647 \phantom{0} \\ \underline{64} \phantom{0} \\ 607 \phantom{0} \\ \underline{60} \phantom{0} \\ 7 \phantom{0} \end{array}$$

$$03125 \cdot 6 = 1,875$$

$$0,875 \cdot 6 = 5,25$$

$$0,25 \cdot 6 = 1,5$$

$$0,5 \cdot 6 = 3$$

$$(225,151)_6$$

3)  $(241)_m = (97)_{10}$  ise  $m = ?$

$4 < m$

$2 \cdot m^2 + 4 \cdot m + 1 \cdot m^0 = 97$

$2m^2 + 4m + 1 = 97$

$2m^2 + 4m = 96$

$m = 6$

4)  $(203)_a = (110101)_2$  ise  $a = ?$

$(110101)_2 = 1 \cdot 2^5 + 1 \cdot 2^4 + 0 + 1 \cdot 2^2 + 0 + 1$

$= 32 + 16 + 4 + 1$

$= (53)_{10} = (203)_a$

$2 \cdot a^2 + 3 = 53$

$2 \cdot a^2 = 50$

$a = 5$

5)  $(13)_a \cdot (15)_a = (231)_a$  ise  $a$  kaçtır?

$$\begin{array}{r} 15 \\ \times 13 \\ \hline 01 \\ + 23 \\ \hline 231 \end{array}$$

$a = 2$

6)  $(321)_m \cdot (3)_m = (2013)_m$  ise  $m$  kaçtır?

$$\begin{array}{r} 321 \\ \times 3 \\ \hline 2013 \end{array}$$

$m > 3$

$m = 5$

$$\begin{array}{r} 6/5 \\ -2/1 \\ \hline 7 \end{array} \quad \begin{array}{r} 19/5 \\ -2/2 \\ \hline \end{array}$$

2013



7)  $(431)_n \cdot (4)_n = (2354)_n$  ise  $n$  kaçtır?

$$\begin{array}{r} 431 \\ \times 4 \\ \hline 54 \end{array}$$

$$\begin{array}{r} 12 \overline{) 7} \\ \underline{7} \\ 0 \end{array} \quad \begin{array}{l} 1 \text{ elde} \\ 5 \end{array}$$

$$\begin{array}{r} 17 \overline{) 7} \\ \underline{14} \\ 3 \end{array} \quad \begin{array}{l} 2 \text{ elde} \\ 3 \end{array}$$

$n=7$

2354

8)  $124 + 103 = abc$   
 $5^2 5^1 5^0 \quad 5^2 5^1 5^0 \quad 7^2 7^1 7^0$

$$25 + 10 + 4 + 25 + 3 = 49a + 7b + c$$

$$67 = 49a + 7b + c$$

$$9 = 7a + b$$

$c=3$   
 $b=2$   
 $a=1$

6

9)  $30_9 2 = 31_b$   
 $4^2 4^1 4^0 \quad 8^2 8^1 8^0$

$$1324 + 4a = 134 + 8 + b$$

$$4a - b = 8$$

$a=3$   
 $b=4$

7

10)  $12x = 34$   
 $8^2 8^1 8^0 \quad x^1 x^0$

$$64 + 16x = 3x + 4$$

$$2x = 76$$

$x=38$