

# IDS - Homework 1

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1.

	Base 2	Base 4	Base 7	Base 8	Base 10	Base 16
a.	11 01011	1223	212	153	107	6B
b.	110101101	12231	1152	655	429	1AD
c.	101001101	11031	654	515	333	14D
d.	111000001	13001	1211	701	449	1C1
e.	1011001000	23020	2035	1310	712	2C8
f.	10001010001	101101	3136	2121	1105	451

a.  $(1101011)_2 \xrightarrow{\text{base 4}} 1\ 10\ 10\ 11 = (1223)_4$   
 $(1101011)_2 \xrightarrow{\text{base 8}} 1\ 101\ 011 = (153)_8$   
 $(1101011)_2 \xrightarrow{\text{base 16}} 110\ 1011 = (6B)_{16}$   
 $(1101011)_2 \xrightarrow{\text{base 10}} 2^6 + 2^5 + 2^3 + 2^1 + 2^0 = (107)_{10}$   
 $(107)_{10} \xrightarrow{\text{base 7}}$

7	107	
7	15	R2
7	2	R1
7	0	R2 = $(212)_7$

b.  $(12231)_4 \xrightarrow{\text{base 2}} (1\ 10\ 10\ 11\ 01)_2$   
 $(110101101)_2 \xrightarrow{\text{base 8}} 110\ 101\ 101 = (655)_8$   
 $(110101101)_2 \xrightarrow{\text{base 16}} 1\ 1010\ 1101 = (1AD)_{16}$   
 $(110101101)_2 \xrightarrow{\text{base 10}} 2^8 + 2^7 + 2^5 + 2^3 + 2^2 + 2^0 = (429)_{10}$   
 $(429)_{10} \xrightarrow{\text{base 7}}$

7	429	
7	61	R2
7	8	R5
7	1	R1
7	0	R1 = $(1152)_7$

c.  $(654)_7 \xrightarrow{\text{base } 10} (6 \cdot 7^2) + (5 \cdot 7^1) + (4 \cdot 7^0) = (333)_{10}$   
 $(333)_{10} \xrightarrow{\text{base } 2} 256 + 64 + 8 + 4 + 1 = (101001101)_2$   
 $(101001101)_2 \xrightarrow{\text{base } 4} 101001101 = (11031)_4$   
 $(101001101)_2 \xrightarrow{\text{base } 8} 101001101 = (515)_8$   
 $(101001101)_2 \xrightarrow{\text{base } 16} 101001101 = (14D)_{16}$

d.  $(701)_8 \xrightarrow{\text{base } 10} (7 \cdot 8^2) + 0 + (1 \cdot 8^0) = (449)_{10}$   
 $(449)_{10} \xrightarrow{\text{base } 2} 256 + 128 + 64 + 1 = (111000001)_2$   
 $(111000001)_2 \xrightarrow{\text{base } 4} 111000001 = (13001)_4$   
 $(111000001)_2 \xrightarrow{\text{base } 16} 111000001 = (1C1)_{16}$   
 $(449)_{10} \xrightarrow{\text{base } 7}$

7	449
7	64 R1
7	9 R1
7	1 R2
7	1 R1 = (1211)_7

e.  $(712)_{10} \xrightarrow{\text{base } 2} 512 + 128 + 64 + 8 = (1011001000)_2$   
 $(1011001000)_2 \xrightarrow{\text{base } 4} 1011001000 = (23020)_4$   
 $(1011001000)_2 \xrightarrow{\text{base } 8} 1011001000 = (1310)_8$   
 $(1011001000)_2 \xrightarrow{\text{base } 16} 1011001000 = (2C8)_{16}$   
 $(712)_{10} \xrightarrow{\text{base } 7}$

7	712
7	101 R5
7	14 R3
7	2 R0
7	0 R2 = (2035)_7

f.  $(451)_{16} \xrightarrow{\text{base } 2} (10001010001)_2$   
 $(10001010001)_2 \xrightarrow{\text{base } 4} 10001010001 = (101101)_4$   
 $(10001010001)_2 \xrightarrow{\text{base } 8} 10001010001 = (2121)_8$   
 $(451)_{16} \xrightarrow{\text{base } 10} (4 \cdot 16^2) + (5 \cdot 16^1) + (1 \cdot 16^0) = (1105)_{10}$   
 $(1105)_{10} \xrightarrow{\text{base } 7}$

7	1105
7	157 R6
7	22 R3
7	3 R1
7	0 R3 = (3136)_7

2. a. 
$$\begin{array}{r} 0000 \\ 10011 \\ \hline 1100 \end{array} +$$
  

$$11111 = 2^4 + 2^3 + 2^2 + 2^1 + 2^0 = (31)_{10}$$

b. 
$$\begin{array}{r} 011111 \\ 11010110 \\ \hline 10110111 \end{array} -$$
  

$$00011111 = 2^4 + 2^3 + 2^2 + 2^1 + 2^0 = (31)_{10}$$

c. 
$$\begin{array}{r} 00100 \\ 100100 \\ \hline 110100 \end{array} + \rightarrow \begin{array}{r} 11111 \\ 1011000 \\ \hline 11001 \\ 011111 \end{array} -$$
  

$$1011000 = 2^5 + 2^4 + 2^3 + 2^2 + 2^1 + 2^0 = (63)_{10}$$

d. 
$$\begin{array}{r} 0111100 \\ 11001011 \\ \hline 1100 \end{array} -$$
  

$$1011111 = 2^7 + 2^5 + 2^4 + 2^3 + 2^2 + 2^1 = (191)_{10}$$

e. 
$$(1100)_4 = (1010000)_2$$
  

$$\begin{array}{r} 1110000 \\ 10111010 \\ \hline 1010000 \end{array} +$$
  

$$100001010 = 2^8 + 2^3 + 2^1 = (266)_{10}$$

3. a. 
$$(AED)_{16} = (10 \cdot 16^3) + (14 \cdot 16^1) + (13 \cdot 16^0) = (2797)_{10}$$
  

$$(78)_9 = (7 \cdot 9^1) + (8 \cdot 9^0) = (71)_{10}$$
  

$$(2797)_{10} + (71)_{10} = (2868)_{10}$$

b. 
$$(123123)_9 = (1 \cdot 9^5) + (2 \cdot 9^4) + (3 \cdot 9^3) + (1 \cdot 9^2) + (2 \cdot 9^1) + (3 \cdot 9^0) = (74460)_{10}$$
  

$$(41321312)_5 = (4 \cdot 5^7) + (1 \cdot 5^6) + (3 \cdot 5^5) + (2 \cdot 5^4) + (1 \cdot 5^3) + (3 \cdot 5^2) + (1 \cdot 5^1) + (2 \cdot 5^0) = (338957)_{10}$$
  

$$(123123)_9 - (41321312)_5 = (-264997)_{10}$$

c. 
$$(2004)_6 = (2 \cdot 6^3) + 0 + 0 + (4 \cdot 6^0) = (436)_{10}$$
  

$$(100204)_5 = (1 \cdot 5^5) + 0 + 0 + (2 \cdot 5^2) + 0 + (4 \cdot 5^0) = (3199)_{10}$$
  

$$(2004)_6 + (100204)_5 = (3615)_{10}$$

d. 
$$(1EEE)_{18} = (1 \cdot 18^3) + (14 \cdot 18^2) + (14 \cdot 18^1) + (14 \cdot 18^0) = (10634)_{10}$$
  

$$(98)_{10} \cdot (1EEE)_{18} = 98 \cdot 10634 = (1042132)_{10}$$

e. 
$$(20312)_5 = (2 \cdot 5^4) + 0 + (3 \cdot 5^2) + (1 \cdot 5^1) + (2 \cdot 5^0) = (1332)_{10}$$
  

$$(20312)_5 / (3)_{10} = (444)_{10}$$

1. <sup>1 2 3 4 5 6 7 8 9 10</sup>  
1 0 1 0 1 0 1 1 0 1

$P_1$  1 1 1 1 0 = even ✓

$P_2$  1 0 1 0 0 1 = odd ✗

$P_4$  0 1 0 1 = even ✓

$P_8$  1 0 1 = even ✓

The error is in  $P_2$ : 1 0 1 0 1 0 1

↳ it is supposed to be 1