Tema 2
Cătălin Răpeanu

1) 8. a) $1111_{(2)} = ?_{(10)}$

$1111_{(2)} = 1 \cdot 2^0 + 1 \cdot 2^1 + 1 \cdot 2^2 + 1 \cdot 2^3 = 1 + 2 + 4 + 8 = 15_{(10)}$

b) $2C_{(16)} = ?_{(10)}$

$C = 12$

$2C_{(16)} = C \cdot 16^0 + 2 \cdot 16^1 = 12 \cdot 1 + 2 \cdot 16 = 12 + 32 = 44$

c) $443_{(5)} = ?_{(4)}$

$443_{(5)} = 3 \cdot 5^0 + 4 \cdot 5^1 + 4 \cdot 5^2 = 3 \cdot 1 + 4 \cdot 5 + 4 \cdot 25 =$

$= 3 + 20 + 100 = 123_{(10)}$

$123 = 30 \cdot 4 + 3$
$30 = 7 \cdot 4 + 2$
$7 = 1 \cdot 4 + 3$
$1 = 0 \cdot 4 + 1$

$123_{(10)} = 1323_{(4)}$

$\Rightarrow 443_{(5)} = 1323_{(4)}$

d) $34_{(8)} \# 15_{(8)} = ?$

$34 -$
15
17

$34_{(8)} - 15_{(8)} = 17_{(8)}$

8. $23^{79} \pmod{83} = ?$

$23^{79} \equiv 23^{1} \cdot 23^{78} \equiv 23 \cdot (23^2)^{39} \equiv 23 \cdot (529)^{39} \equiv$

$\equiv 23 \cdot 31^{39} \equiv 23 \cdot 31 \cdot (31^2)^{19} \equiv$

$\equiv 713 \cdot 961^{19} \equiv 49 \cdot 48^{19} \equiv$

$\equiv 49 \cdot 48 \cdot (48^2)^{9} \equiv 2352 \cdot (2304)^{9} \equiv$

$\equiv 28 \cdot 63^{9} \equiv 28 \cdot 63 \cdot (63^2)^{4} \equiv$

$\equiv 1764 \cdot (3969)^{4} \equiv 21 \cdot 68^{4} \equiv$

$\equiv 21 \cdot (68^2)^{2} \equiv 21 \cdot (4624)^{2} \equiv$

$\equiv 21 \cdot 59^{2} \equiv 21 \cdot 3481 \equiv$

$\equiv 21 \cdot 78 \equiv 1638 \equiv$

$\equiv 61 \pmod{83}$

529 | 83
498 | 6
31

713 | 83
664 | 8
49

2304 | 83
166 | 27
=644
581
=63

961 | 83
83 | 11
131
83
=48

1764 | 83
166 | 21
=104
83
21

2352 | 83
166 | 28
=692
664
=28

4624 | 83
415 | 55
=474
415
=59

3969 | 83
332 | 47
=649
581
=68

1638 | 83
83 | 19
=808
747
=61

3481 | 83
332 | 41
=161
83
78