CMSC131 Lab

Sections 0108 or 0109

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OH: Tue. 6-7pm

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Intro

- Piazza, Class Website
- Course Questions?
- Eclipse
  - Workspaces & Perspectives
  - Creating/Importing Projects
  - A Basic Program
  - Submitting Projects

Number Bases

592_{10}

Number Bases

$$592_{10} = 5 \times 10^2 + 9 \times 10^1 + 2 \times 10^0$$

$$645_4 = 6 \times 4^2 + 4 \times 4^1 + 5 \times 5^0$$

$$9AF_{16} = 9 \times 16^2 + 10 \times 16^1 + 15 \times 16^0$$

(All numbers on the right of `=` are in decimal.)

Base 7 to Base 10

241_7

Base 7 to Base 10

$$241_7 = 2 \times 7^2 + 4 \times 7^1 + 1 \times 7^0$$

$$= 98_{10} + 28_{10} + 1_{10}$$

$$= 127_{10}$$

Base 10 to Base 5

177_{10}

Base 10 to Base 5

177_{10} =

Base 10			
Integer ÷			
Remainder			

Base 10 to Base 5

177_{10} =

Base 10	177	35	7	1
Integer ÷	177 // 5 = 35	35 // 5 = 7	7 // 5 = 1	1 // 5 = 0
Remainder	2	0	2	1

= 1202_5

Base 10 to Base 2

75_{10} =

Base 10							
Integer ÷							
Remainder							

Base 10 to Base 2

75_{10} =

Base 10	75	37	18	9	4	2	1
Integer ÷	37	18	9	4	2	1	0
Remainder	1	1	0	1	0	0	1

= 1001011_2

Other Examples

$45_{10} \rightarrow X_3$

$253_6 \rightarrow X_{10}$

$113_{10} \rightarrow X_7$

$132_5 \rightarrow X_9$

$AC3_{16} \rightarrow X_{10}$

$45_{10} \rightarrow X_3$

```
45 / 3 = 15r0

15 / 3 =  5r0

 5 / 3 =  1r2

 1 / 3 =  0r1

  ⇒ 1200₃
```

$\Rightarrow 1200_3$

$$253_6 \rightarrow X_{10}$$

$$253_6 = 2 \times 6^2 + 5 \times 6^1 + 3 \times 6^0$$

$$= 105_{10}$$

$$113_{10} \rightarrow X_7$$

```
113 / 7 = 16r1
 16 / 7 =  2r2
  2 / 7 =  0r2
  ⇒ 221₇
```

$$113 / 7 = 16r1$$
$$16 / 7 = 2r2$$
$$2 / 7 = 0r2$$
$$\Rightarrow 221_7$$

$$132_5 \rightarrow X_9$$

$$132_5 = 1 \times 5^2 + 3 \times 5^1 + 2 \times 5^0 = 42_{10}$$

$$42 / 9 = 4r6$$

$$4 / 9 = 0r4$$

$$\Rightarrow 46_9$$

$$\mathbf{AC3}_{16} \rightarrow \mathbf{X}_{10}$$

$$\mathbf{AC3}_{16} = 10 \times 16^2 + 12 \times 16^1 + 3 \times 16^0$$

$$= 2755_{10}$$

Special Bases

Binary: **base 2 (0-1)**

Octal: **base 8 (0-7)**

Hexadecimal: base 16 (0-9, A-F)

It's easier to convert between these.

2-8-16 Conversions

$22,235_{10}$ = 0101 0110 1101 1011_2

= 5 6 D B_{16}

= 0 101 011 011 011 011_2

= 0 5 3 3 3 3_8

Base 2 to Base 8

$$011101101_2$$

$000_2 = 0_8$
$001_2 = 1_8$
$010_2 = 2_8$
$011_2 = 3_8$
$100_2 = 4_8$
$101_2 = 5_8$
$110_2 = 6_8$
$111_2 = 7_8$

Base 2 to Base 8

$011 \ 101 \ 101_2$

$3 \quad 5 \quad 5_8$

$000_2 = 0_8$
$001_2 = 1_8$
$010_2 = 2_8$
$011_2 = 3_8$
$100_2 = 4_8$
$101_2 = 5_8$
$110_2 = 6_8$
$111_2 = 7_8$

Base 2 to Base 16

00100110111101101_2

$0000_2 = 0_{16}$
$0001_2 = 1_{16}$
$0010_2 = 2_{16}$
$0011_2 = 3_{16}$
$0100_2 = 4_{16}$
$0101_2 = 5_{16}$
$0110_2 = 6_{16}$
$0111_2 = 7_{16}$
$1000_2 = 8_{16}$
$1001_2 = 9_{16}$
$1010_2 = A_{16}$
$1011_2 = B_{16}$
$1100_2 = C_{16}$
$1101_2 = D_{16}$
$1110_2 = E_{16}$
$1111_2 = F_{16}$

Base 2 to Base 16

$0010\ 0110\ 1110\ 1101_2$

$2 \qquad 6 \qquad E \qquad D_{16}$

$0000_2 = 0_{16}$
$0001_2 = 1_{16}$
$0010_2 = 2_{16}$
$0011_2 = 3_{16}$
$0100_2 = 4_{16}$
$0101_2 = 5_{16}$
$0110_2 = 6_{16}$
$0111_2 = 7_{16}$
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$1111_2 = F_{16}$