# Homework Problem 1

In the bottom left of this panel, you see an integer ("WLAN MAC ADDRESS") written in hexadecimal notion:


(Ignore the two initial 0's.) Write down this number in

- base 2
- base 8
- base 10.

Show your steps, not just the final answer!
Due Thu, Sept 12, in class.

# Homework Problem 2

Express the number 2024 in base 5 using the "digits" -3,-2,-1,0,1 *only*.

Show your work, not just the final answer!

Due Thu, Sept 12, in class.

# Homework Problem 3

Which of the following statements are true?

(a) There are infinitely many positive integers $n$ such that computing $x^{n+1}$ by repeated squaring takes *more* multiplications than computing $x^n$ by repeated squaring.

(b) There are infinitely many positive integers $n$ such that computing $x^{n+1}$ by repeated squaring takes *exactly as many* multiplications as computing $x^n$ by repeated squaring.

(c) There are infinitely many positive integers $n$ such that computing $x^{n+1}$ by repeated squaring takes *fewer* multiplications than computing $x^n$ by repeated squaring.

Justify your answer.

Due Thu, Sept 12, in class.

# Homework Problem 4*

* This problem is optional. If you don't turn it in, it won't affect your grade. If you solve it correctly, you will receive bonus credit.

For $n \in \mathbb{N}$, let $M(n)$ denote the number of multiplications needed to compute $x^n$ if you use the repeated squares algorithms.

What is the *average* number of multiplications needed to compute $x^n$ for $1024 \leqslant n \leqslant 2047$? That is, find the value of

$$\frac{1}{1024}\Big(M(1024)+M(1025)+M(1026)+\cdots+M(2046)+M(2047)\Big)$$

Due (optionally) Thu, Sept 12, in class.

# Homework Problem 5

Go back to Homework Problem 1. You found a hexadecimal integer there (a number written in base 16 notation).

What is the remainder of that number when you divide it by 17?

Find out the answer using computations only with small integers.

Due Thu, Sept 12, in class.

# Homework Problem 6

Consider the 'remainder modulo 97' recipe found on the previous two slides.

- Is the recipe correct? Why?
- What is the special role played by 9? (Since the recipe calls for collecting *9* digits from the left.)

Due Thu, Sept 12, in class.