

## 474 Notes on Day 4 slides:

### Slide 12: The Power of Encoding

What are some common ways of encoding integers:

Decimal

Binary

Hex

Unary

### Slide 13: Web Pattern Matching

Obviously we would need to define the criteria for candidacy more precisely in order to make this a reasonable language to study.

### Slide 20: Turning Problems into Decision Problems

First string is in the language; other two are not.

### Slide 22: An Example

Given a machine that does integer multiplication how can we build a machine to recognize the multiplication language?

Suppose we have a machine  $M(x,y)$  that multiplies two integers.

Given a string in the form  $\langle \text{int1} \rangle * \langle \text{int2} \rangle = \langle \text{int3} \rangle$

$X = \text{convertToInt}(\langle \text{int1} \rangle)$

$Y = \text{convertToInt}(\langle \text{int2} \rangle)$

$Z = \text{convertToInt}(\langle \text{int3} \rangle)$

If  $z = M(x,y)$  then accept. Else reject

The other way around?

Suppose we have a program  $P$  that checks whether strings like the one above are in INTEGERPROD.

This program computes the product of two integers  $x$  and  $y$ .

Enumerate the strings that are encodings of natural numbers.

For each one,  $\langle z \rangle$ , feed  $\langle x \rangle * \langle y \rangle = \langle z \rangle$  to  $P$ .

If  $P$  accepts, return  $z$ . Otherwise, keep going.

$P$  will eventually accept