

DOUBLE NOTATION

- LIKE PEANO NUMBERS IN THAT ITS A LIST REPRESENTATION OF NUMBERS
- LIMITED TO THREE SYMBOLS
 - ↳ zero
 - ↳ THE NUMBER zero (0)
 - ↳ THE "STARTING POINT"
 - ↳ D
 - ↳ "DOUBLE"
 - ↳ DOUBLES WHATS IN PARENTHESES
 - ↳ SAME AS $2(x)$
 - ↳ DP1
 - ↳ "DOUBLE PLUS 1"
 - ↳ DOUBLES WHATS IN PARENTHESES THEN ADDS ONE
 - ↳ SAME AS $2(x) + 1$

NUM	DOUBLE NOTATION	MATHEMATICAL PROOF
0	zero	0
1	(zero) DP1	$2(0) + 1$
2	((zero) DP1) D	$2(2(0) + 1)$
3	((zero) DP1) DP1	$2(2(0) + 1) + 1$
4	((zero) DP1) D) D	$2(2(2(0) + 1))$
5	((zero) DP1) D) DP1	$2(2(2(0) + 1)) + 1$
6	((zero) DP1) DP1) D	$2(2(2(0) + 1) + 1)$
7	((zero) DP1) DP1) DP1	$2(2(2(0) + 1) + 1) + 1$

- LOOKS A LOT LIKE BINARY
 - ↳ $D = 0$; $DP1 = 1$
 - ↳ $6 \rightarrow ((zero) DP1) DP1) D \rightarrow 0110$

0°

ADDITION

$$(\boxed{D}(DP1(\text{zero}))) + (\boxed{DP1}(DP1(DP1(\text{zero}))))$$

- LET'S BREAK THIS DOWN
- FOCUS ON THE OUTER MOST TERMS FIRST
- THREE COMBINATIONS OF OUTER TERMS
 - ↳ $D + D$
 - ↳ $D + DP1$
 - ↳ $DP1 + DP1$

D + D

- DOUBLE MEANS $2 \times$ SOMETHING

$$\begin{aligned} D(\text{SOMETHING}) + D(\text{SOMETHING}) \\ \downarrow \\ 2(x) + 2(x) \\ 4(x) \\ 2(2(x)) \\ \downarrow \\ D(D(\text{SOMETHING})) \end{aligned}$$

- BASIC PROCESS IS AS FOLLOWS
 - ↳ TRANSLATE DOUBLE NOTATION INTO ITS MATHEMATIC COUNTERPART
 - ↳ USE BASIC MATH TO TURN TWO TERMS INTO ONE WE CAN USE
 - ↳ TRANSLATE BACK INTO DOUBLE NOTATION

D + DP1

$$D(\text{SOMETHING}) + DP1(\text{SOMETHING})$$

$$\downarrow$$
$$2(x) + 2(x) + 1$$

$$4(x) + 1$$

$$2(2x) + 1$$

$$\downarrow$$
$$DP1(D(\text{SOMETHING}))$$

DP1 + DP1

$$DP1(\text{SOMETHING}_1) + DP1(\text{SOMETHING}_2)$$

$$\downarrow$$
$$2(x) + 1 + 2(x) + 1$$

$$4(x) + 2$$

$$2(2(x) + 1)$$

$$\downarrow$$
$$D(DP1(\text{SOMETHING}_1))$$

FULL ADDITION

- WORK LEFT TO RIGHT DOING THE SMALLER ADDITIONS AND CARRYING
- WHEN ADDING TO ZERO, USE THE IDENTITY PROPERTY
 - ↳ $D + \text{zero} = D$
 - ↳ $DP1 + \text{zero} = DP1$

			D	DP1	DP1 - carry
6	D	DP1	DP1	z	
+ 2	+ D	DP1	z		
8	D	D	D	DP1	z