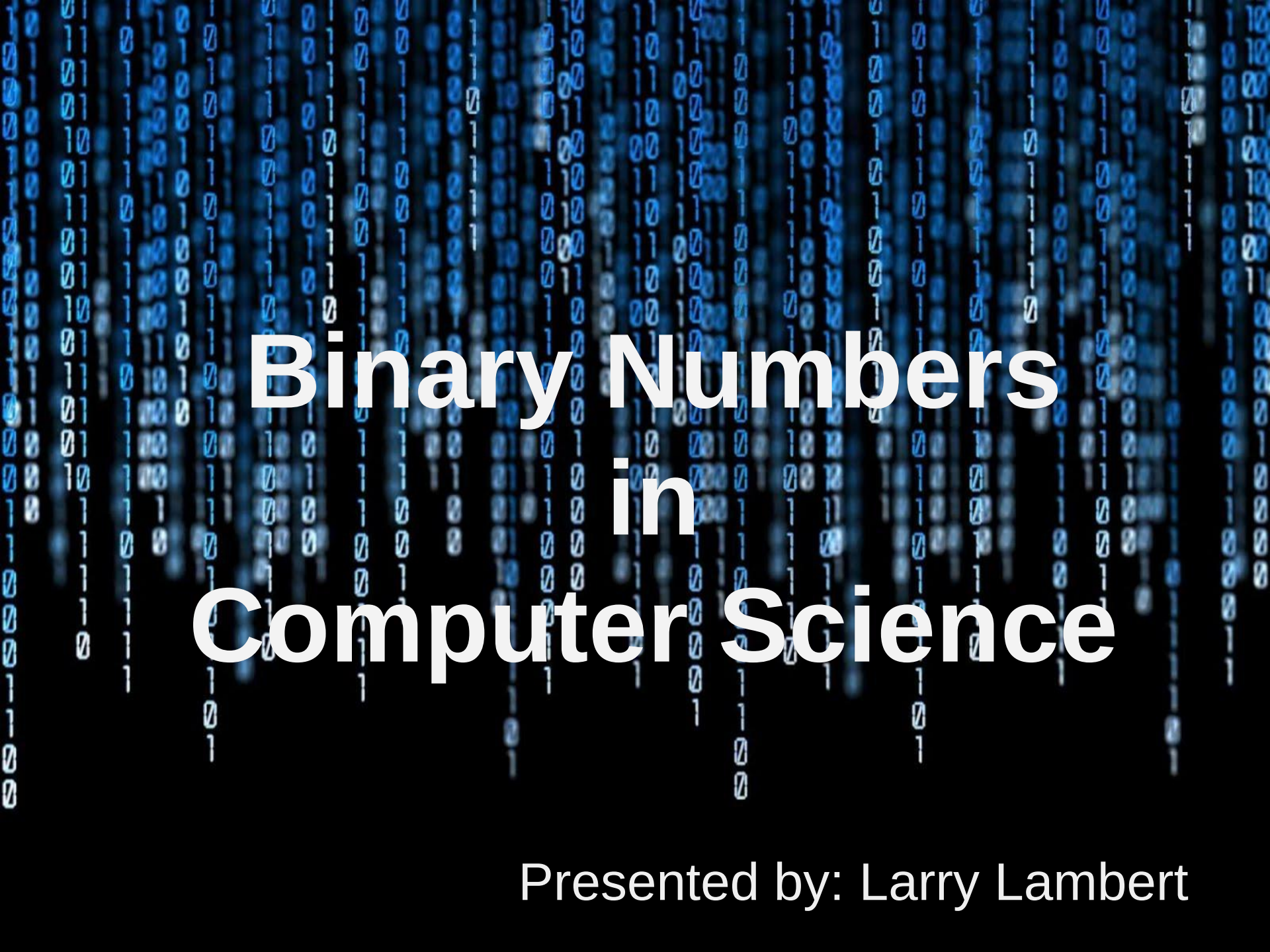


Binary Numbers in Computer Science

Presented by: Larry Lambert

Number Systems

The number system that we are accustomed to using is known as Decimal or Base 10 and makes use of 10 digits:

0,1,2,3,4,5,6,7,8,9

Place Value: Decimal or Base 10

10000	1000	100	10	1

$$(D4*10^4) + (D3*10^3) + (D2*10^2) + (D1*10^1) + (D0*10^0)$$

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

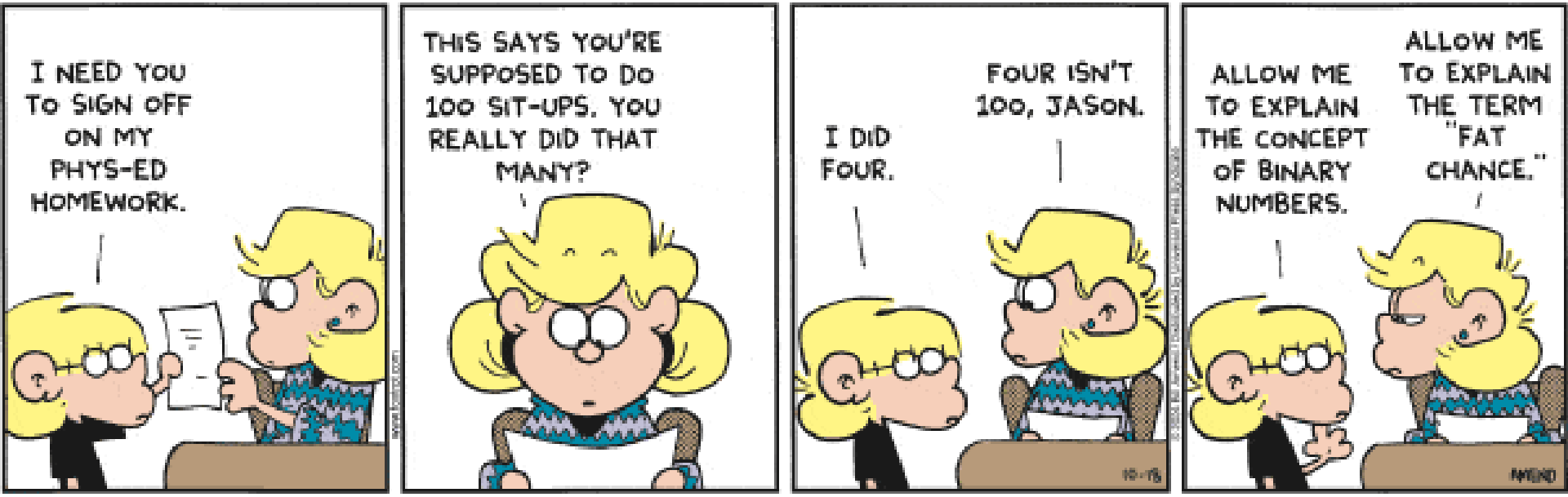
$$= 5 \times 100 + 9 \times 10 + 2 \times 1$$

$$= 500 + 90 + 2$$

Binary Numbers

Digital computers are comprised of transistor based electronic circuits, which have exactly two states: ON and OFF.

Computers utilize the binary number system which has exactly two symbols, 1 representing "ON" and 0 representing "OFF".


I NEED YOU TO SIGN OFF ON MY PHYS-ED HOMEWORK.
THIS SAYS YOU'RE SUPPOSED TO DO 100 SIT-UPS. YOU REALLY DID THAT MANY?
I DID FOUR.
FOUR ISN'T 100, JASON.
ALLOW ME TO EXPLAIN THE CONCEPT OF BINARY NUMBERS.
ALLOW ME TO EXPLAIN THE TERM "FAT CHANCE."

Place Value: Binary or Base 2

16 8 4 2 1

$$(D4*2^4) + (D3*2^3) + (D2*2^2) + (D1*2^1) + (D0*2^0)$$

$$10110_2 = 1 \times 2^4 + 0 \times 2^3 + 1 \times 2^2 + 1 \times 2^1 + 0 \times 2^0$$

$$= 1 \times 16 + 0 \times 8 + 1 \times 4 + 1 \times 2 + 0 \times 1$$

$$= 16 + 0 + 4 + 2 + 0$$

$$= 22_{10}$$

Binary to Decimal Conversion

64	32	16	8	4	2	1
0	0	1	0	1	0	1

0 0 16 0 4 0 1

$16 + 4 + 1 = 21$

Binary to Decimal Conversion

64	32	16	8	4	2	1
1	0	0	1	1	0	0

64 0 0 8 4 0 0

64 + 8 + 4 =76

Binary to Decimal Conversion

64	32	16	8	4	2	1
0	1	0	1	1	0	1

Counting In Binary

00000	0	10000	16
00001	1	10001	17
00010	2	10010	18
00011	3	10011	19
00100	4	10100	20
00101	5	10101	21
00110	6	10110	22
00111	7	10111	23
01000	8	11000	24
01001	9	11001	25
01010	10	11010	26
01011	11	11011	27
01100	12	11100	28
01101	13	11101	29
01110	14	11110	30
01111	15	11111	31

1	3	5	7
9	11	13	15
17	19	21	23
25	27	29	31

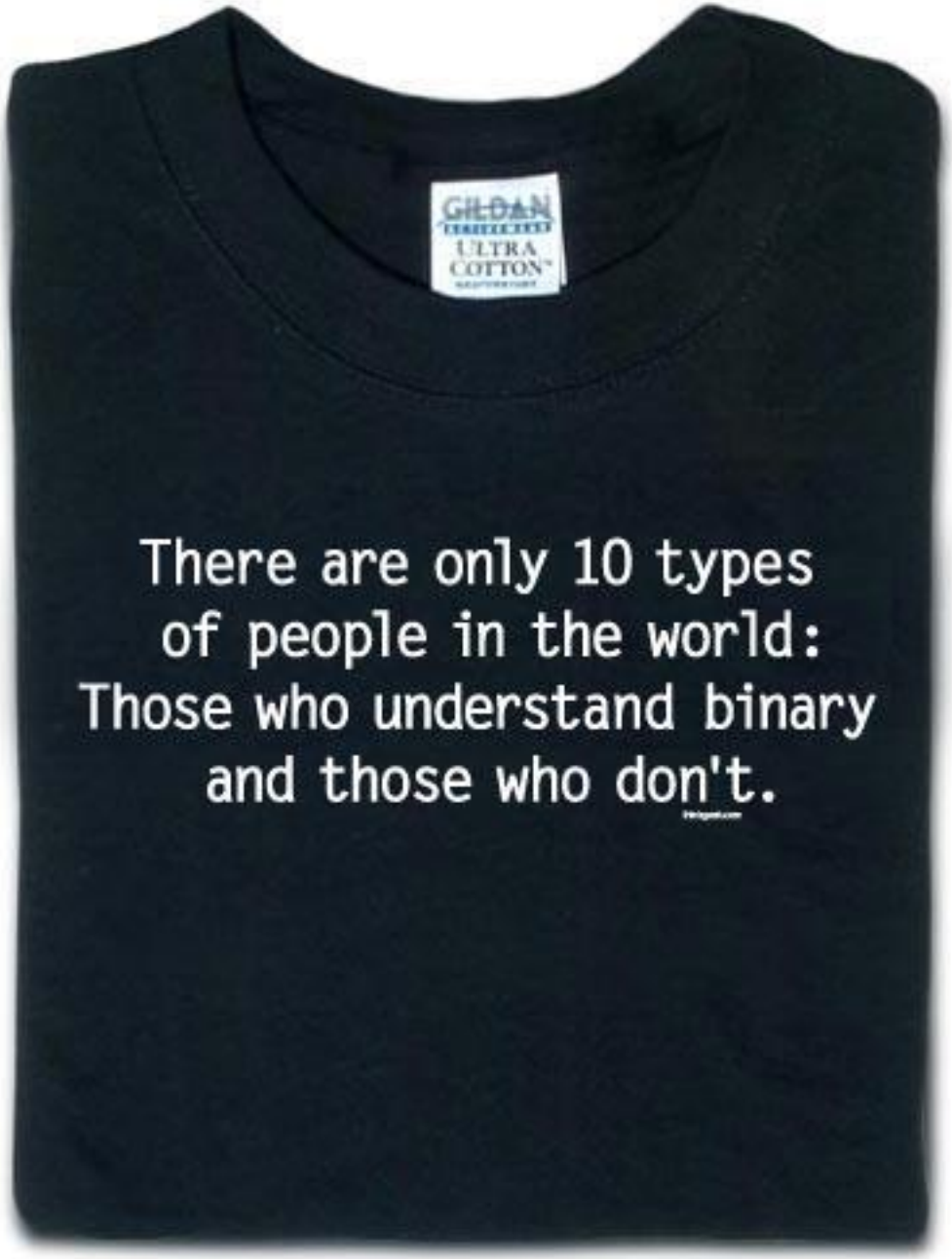
2	3	6	7
10	11	14	15
18	19	22	23
26	27	30	31

4	5	6	7
12	13	14	15
20	21	22	23
28	29	30	31

8	9	10	11
12	13	14	15
24	25	26	27
28	29	30	31

16	17	18	19
20	21	22	23
24	25	26	27
28	29	30	31

Activity


GILDAN
ULTRA
COTTON
There are only 10 types
of people in the world:
Those who understand binary
and those who don't.

Decimal to Binary Conversion

Repeated Division By 2

28