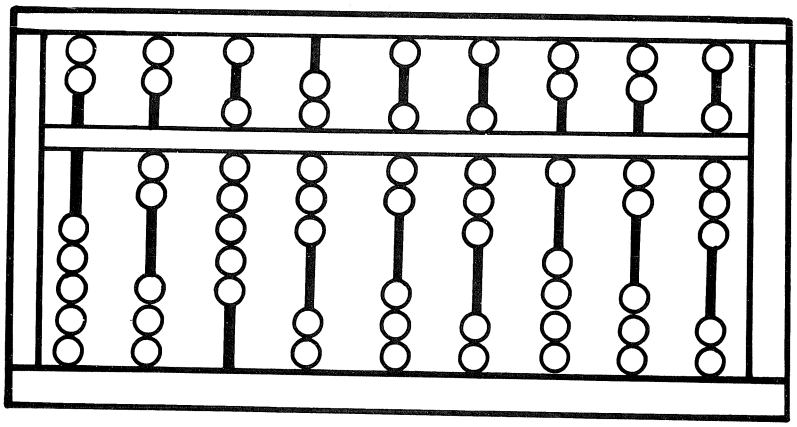
THE ABACUS

THE HISTORY OF COMPUTING DEVICES DEVELOPMENT PROBABLY STARTED WITH THE INVENTION OF THE ABACUS. THIS DEVICE WAS CREATED IN CHINA APPROXIMATELY 600 B.C.



THE ABACUS

* IT SHOULD BE NOTED THAT THE ABACUS IS STILL USED EXTENSIVELY IN THE ORIENT!

PASCAL'S ADDING MACHINE

* IN 1642 BLAISE PASCAL, A FRENCH MATHEMATICIAN BUILT WHAT WAS PROBABLY THE WORLD'S FIRST DESK CALCULATOR. THE MACHINE WAS DESIGNED TO HELP PASCAL'S FATHER IN KEEPING BOOKS OF THE FAMILY STORE *

LOGARITHMS

* IN THE EARLY 17th CENTURY JOHN NAPIER INVENTED LOGARITHMS AND ALSO A MULTIPLICATION TABLE THAT WAS REPRODUCED ON PIECES OF BONE AND SUBSEQUENTLY REFERRED TO AS 'NAPIERS BONES'

SHORTLY AFTER THE INVENTION OF LOGARITHMS WILLIAM OUGHTRED INSCRIBED LOGARITHMS ON SLIDING PIECES OF WOOD AND THE EVER PRESENT SLIDE-RULE CAME INTO EXISTENCE *

BABBAGE'S CONTRIBUTION

* THE NEXT MAJOR MILESTONE WAS CONTRIBUTED BY CHARLES BABBAGE. IN 1842 BABBAGE DEMONSTRATED HIS "DIFFERENCE ENGINE", A MACHINE DESIGNED TO PREPARE TABLES SUCH AS COMPOUND INTEREST, LOGS AND TRIGONOMETRIC FUNCTIONS, WITH THE HELP OF A HUMAN OPERATOR *

* * *

MARCHANT

* FINALLY FIFTY YEARS AGO THE MARCHANT CALCULATOR WAS TOUTED AS THE LAST WORD IN CALCULATORS AND WORKED ON THE PRINCIPAL OF THE CRANK HANDLE AND WHEELS

* * *

THE PUNCHED CARD

* IN 1890 HERMAN HOLLERITH INVENTED THE PUNCHED CARD. THE ORIGINAL MOTIVATION FOR THIS INVENTION WAS A DESIRE TO SPEED UP THE JOB OF TAKING THE CENSUS OF THE UNITED STATES.

THE FORMAT USED TO DESCRIBE ALPHANUMERIC DATA IN MODERN COMPUTERS IS CALLED "H" OR 'HOLLERITH' FORMAT. *

STEPS TO THE MODERN COMPUTER

* IN 1939 SAMUEL WILLIAMS OF BELL LABS BUILT THE RELAY COMPUTER. THIS WAS THE FIRST ELECTRICAL DIGITAL COMPUTER AND THE FIRST BINARY MACHINE. *

* IN 1944 PROFESSOR HOWARD AIKEN DESIGNED THE HARVARD MARK I. THIS WAS THE FIRST OF THE LARGE SCALE GENERAL PURPOSE RELAY COMPUTERS. BUILT DURING THIS PERIOD. *

* IN 1946 J. P. ECKERT AND DR. J.W. MAUCHLEY OF THE MOORE SCHOOL OF ENGINEERING DEVELOPED THE ENIAC. THIS WAS THE FIRST ELECTRONIC COMPUTER AND CONTAINEN 18000 VACUUM TUBES. *

AUTOMATIC

* AUTOMATIC MOTOR DRIVEN MODELS BEGAN TO APPEAR ON THE MARKET IN THE 1920's WHEN. IN THE U.S.A. BURROUGHS MONROE. MARCHANT AND FRIDEN BECAME RECOGNISED STANDARDS. *

* SOME MACHINES EVEN INCLUDED SQUARE ROOTS *

ELECTRONIC

* ELECTRONIC CALCULATORS FIRST MADE THEIR APPEARANCE ABOUT TEN YEARS AGO.*

*IN 1968 HEWLETT-PACKARD CAME ON TO THE MARKET WITH THE 9100 CALCULATOR AND THEN LATER WITH THE 9800 SERIES AND OF COURSE THE RANGE OF POCKET OR HANDHELD CALCULATORS *

NUMBER SYSTEMS

0. 1. 2. 3. 4. 5. 6. 7. 8. 9 ARE THE <u>TEN</u> NUMERALS OF THE <u>DECIMAL</u> SYSTEM.

DECIMAL VALUES LARGER THAN <u>9</u> REQUIRE MORE THAN ONE DIGIT. FOR EXAMPLE. THE <u>DECIMAL</u> NUMBER 109 REALLY STANDS FOR :-

$$(1 \times 10^2) + (0 \times 10^1) + (9 \times 10^0)$$

HUNDRED'S TEN'S ONE'S

$$100 + 0 + 9 = 109_{10}$$

<u>IN GENERAL</u> :

ANY NUMBER $= N \times b^n + N \times b^{n-1} + N \ldots\ldots\ldots N \times b^2 + \ldots\ldots$

WHERE N = DIGIT

b = BASE

$b^0 = 1$ (BY DEFINITION)

BINARY NUMBERS

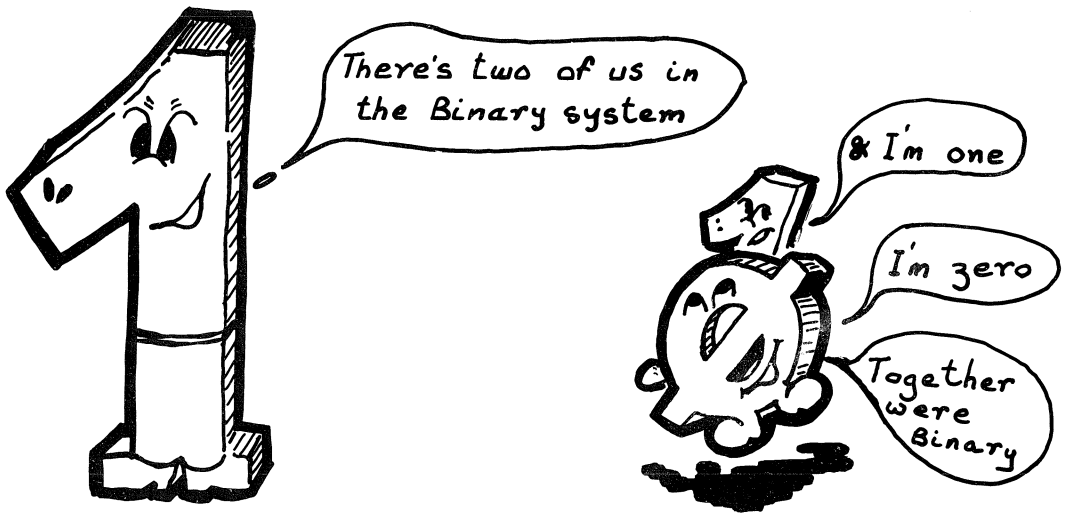
0 AND 1 ARE THE TWO NUMERALS OF THE BINARY SYSTEM. BINARY VALUES LARGER THAN 1 REQUIRE MORE THAN ONE DIGIT. FOR EXAMPLE THE BINARY NUMBER 1101101 REALLY STANDS FOR :-

$$(1 \times 2^6) + (1 \times 2^5) + (0 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0)$$

$$64 + 32 + 0 + 8 + 4 + 0 + 1 = 109_{10}$$

THEREFORE :-

$$1101101_2 = 109_{10}$$



OCTAL NUMBERS

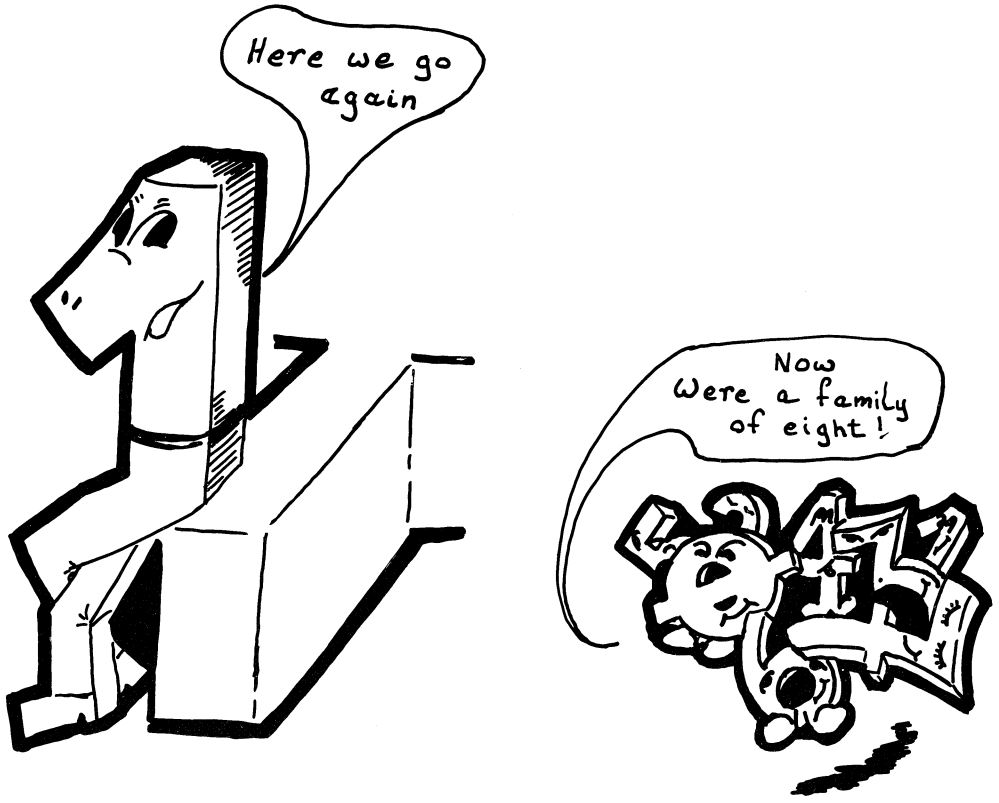
0.1.2.3.4.5.6 AND 7 ARE THE *EIGHT* NUMERALS IN THE OCTAL SYSTEM. OCTAL VALUES LARGER THAN 7 REQUIRE MORE THAN ONE DIGIT. FOR EXAMPLE, THE OCTAL NUMBER 155 REALLY STANDS FOR :-

$$(1 \times 8^2) + (5 \times 8^1) + (5 \times 8^0)$$

$$64 + 40 + 5 = 109_{10}$$

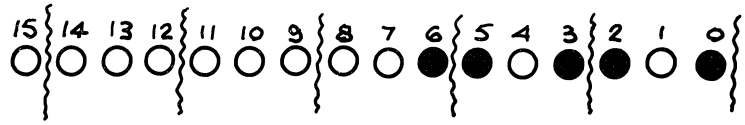
THEREFORE :-

$1101101_2 = 155_8 = 109_{10}$



BINARY / OCTAL RELATIONSHIP

WHEN BINARY DIGITS ARE ARRANGED IN GROUPS OF 3 (THREE BITS) i.e. IN A 16 BIT WORD, OCTAL VALUES CAN BE READ DIRECTLY :—



1 1 0 1 1 0 1 = 109_{10}

1 5 5_8

WHERE ○ = Ø

AND ● = 1

BINARY 4 2 1		BINARY 4 2 1	
○ ○ ○	0_8	● ○ ○	4_8
○ ○ ●	1_8	● ○ ●	5_8
○ ● ○	2_8	● ● ○	6_8
○ ● ●	3_8	● ● ●	7_8