

computer?

calculator -> computer

computer -> 1 and 0

32 -> computer?

how?

convert 32 -> 10

convert decimal -> binary

- 0 -> 0
- 1 -> 1
- 2 -> 10
- 3 -> 11
- 4 -> 100
- 5 -> 101
- 6 -> 110
- 7 -> 111

B

99 -> 000099

give -> size of page

1 GB -> 1024 MByte  
1 MB -> 1024 KByte  
1 KB -> 1024 Byte  
1 Byte -> 8 bits

8ms

4ms

1ms

6-77

100 101 102

101 102 103  
7-77

1 byte -> 1/0 7

32

7

byte ->

8 bits

6-77  
6-77

7 6 5 4 3 2 1 0

Dec  $\rightarrow$  Bin

$$\begin{array}{r} 2 \overline{) 7} \\ 2 \overline{) 3} \quad -1 \uparrow \\ \underline{1} \quad \rightarrow 1 \end{array}$$

Dec  $\rightarrow$  Bin

$$\begin{array}{r} 2 \overline{) 21} \\ 2 \overline{) 10} \quad -1 \uparrow \\ 2 \overline{) 5} \quad -0 \\ 2 \overline{) 2} \quad \rightarrow 1 \\ \underline{1} \quad \rightarrow 0 \end{array}$$

Dec  $\rightarrow$  Bin

$$\begin{array}{r} 16 \quad 8 \quad 4 \quad 2 \quad 1 \\ 1 \quad 0 \quad 1 \quad 0 \quad 1 \end{array}$$

(21)

Dec  $\rightarrow$  Bin

$$\begin{array}{r} 21 \rightarrow 1 \\ 0 \quad 1 \quad 0 \quad 1 \end{array}$$

Dec  $\rightarrow$  Bin

Dec  $\leftarrow$

$$\begin{array}{ccccccc} 1 & 0 & 1 & 0 & 1 & 0 & 1 \\ 2^4 & 2^3 & 2^2 & 2^1 & 2^0 & 2^{-1} & 2^{-2} \end{array}$$

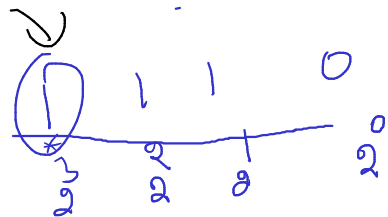
$$(2^4 * 1) + (2^3 * 0) + (2^2 * 1) + (2^1 * 0) + (2^0 * 1)$$

$$16 + 0 + 4 + 0 + 1 = 21$$

14

Dec  $\rightarrow$  Binary14  $\rightarrow$  1110

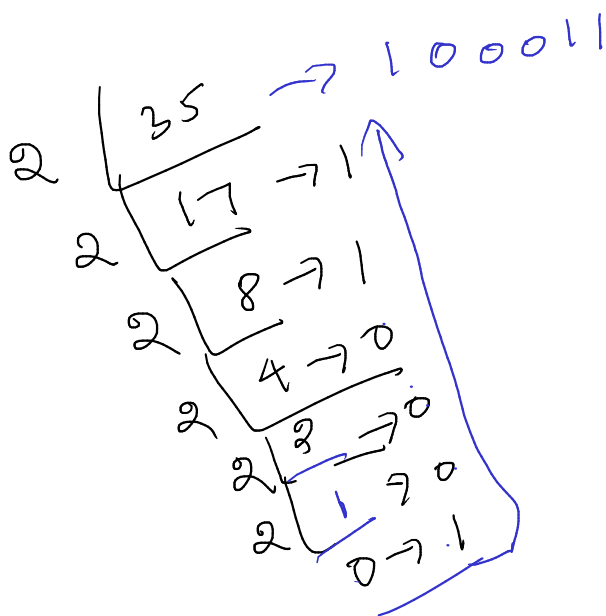
1110

Binary  $\rightarrow$  Dec

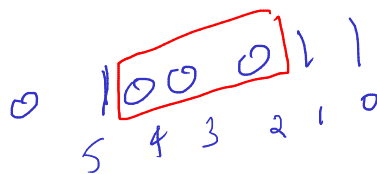
$$= (2^3 \times 1) + (2^2 \times 1) + (2^1 \times 1) + (2^0 \times 0)$$

$$= 14 (8 + 4 + 2 + 0)$$

$$= 14$$



35



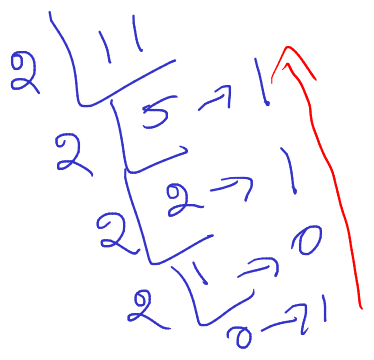
$$(2^5 \times 1) + (2^4 \times 0) + (2^3 \times 0) + (2^2 \times 0) + (2^1 \times 1) + (2^0 \times 1)$$

$$32 + 2 + 1$$

35

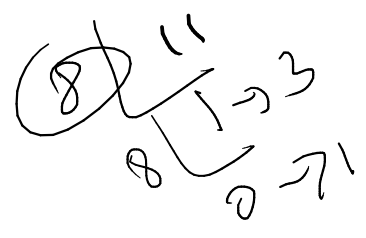
7 6 5 4 3 2 1 0  
 2 2 2 2 2 2 2 2

$$\begin{aligned}
 & (2^5 * 1) + (2^4 * 0) + (2^3 * 0) + (2^2 * 0) + (2^1 * 1) + (2^0 * 1) \\
 & 32 + 0 + 0 + 0 + 2 + 1 \\
 & = 35
 \end{aligned}$$



4 3 2 1 0  
 1 0 1 1  
 3 2 2 2

$$\begin{aligned}
 & - (2^3 * 1) + (2^2 * 0) + (2^1 * 1) + (2^0 * 1) \\
 & = 8 + 0 + 2 + 1 = 11
 \end{aligned}$$



11 → 13

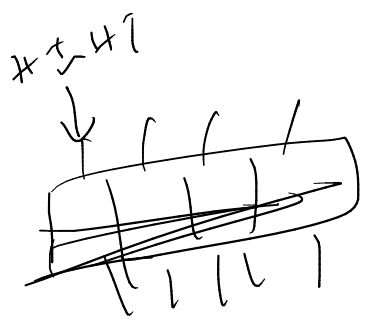
Binary → 61

Octal → 0 1 2 3 4 5 6 7

8 10 2 8

3 → 11

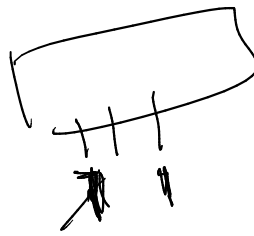
10 2 1 1 0



1 0  
 (8 \* 1) 8 \* 0

67

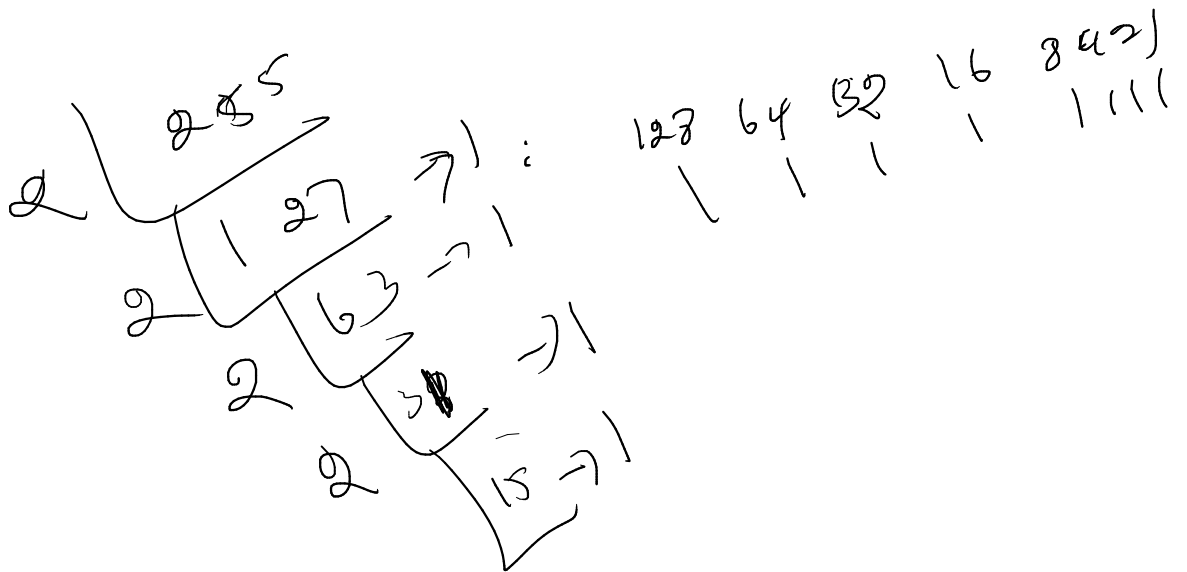
1010  
ASCII



ASCII

67

can you give me 32?



A (char to binary)

1. get ascii value(decimal) of A
2. convert this decimal to binary
3. store

32 (Decimal to binary)

divide by 2

C A N  
1000011 11000001 100110

Addition

$$\begin{array}{r} 10 \\ 20 \\ \hline 30 \end{array}$$

$$\begin{array}{r} A + B \\ \hline 1 \quad 1 \\ 1 \quad 0 \\ 0 \quad 1 \\ 0 \quad 0 \end{array}$$

$$\begin{array}{r} 10 \rightarrow 0 \quad 1 \quad 0 \quad 1 \quad 0 \\ 20 \rightarrow 1 \quad 0 \quad 1 \quad 0 \quad 0 \\ \hline 1 \quad 1 \quad 1 \quad 1 \quad 0 \\ \hline 2 \quad 4 \quad 2 \quad 2 \quad 2 \end{array}$$

$$16 + 8 + 4 + 2 = 30$$

$$\begin{array}{r} 10 \quad 1 \quad 0 \quad 1 \quad 0 \\ 5 \quad 0 \quad 1 \quad 0 \quad 1 \end{array}$$

$$\begin{array}{r} 15 \quad 1 \quad 1 \quad 1 \quad 1 \end{array}$$

$$\begin{array}{r} 10 \quad 1 \quad 8 \quad 4 \quad 2 \quad 1 \\ 10 \quad 0 \quad 1 \quad 0 \quad 1 \quad 0 \end{array}$$

$$\begin{array}{r} 20 \quad 1 \quad 0 \quad 1 \quad 0 \quad 0 \end{array}$$

$$\begin{array}{r} 1 \quad 1 \\ \hline 10 \end{array}$$

$$\begin{array}{r} 8 \quad 4 \quad 2 \\ \hline 6 \quad 0 \quad 1 \quad 1 \quad 0 \\ 6 \quad 0 \quad 1 \quad 1 \quad 0 \\ \hline 12 \quad 1 \quad 1 \quad 0 \quad 0 \end{array}$$

$$\begin{array}{r} 1 \\ \hline 10 \end{array}$$

$$\begin{array}{r} 10 \\ 10 \\ 10 \\ 10 \end{array}$$

$$\begin{array}{r}
 2 \overline{) 20} \\
 2 \overline{) 10} \rightarrow 0 \\
 2 \overline{) 5} \rightarrow 0 \\
 2 \overline{) 2} \rightarrow 1 \\
 2 \overline{) 1} \rightarrow 0 \\
 0 \rightarrow 1
 \end{array}$$

(20)

16	8	4	2	1
1	0	1	0	0
2 <sup>4</sup>	2 <sup>3</sup>	2 <sup>2</sup>	2 <sup>1</sup>	2 <sup>0</sup>

$$\begin{array}{r}
 1 \quad 0 \quad 1 \quad 0 \quad 1 \\
 1 \quad 1 \quad 1 \quad 1 \quad 1 \\
 \hline
 1 \quad 1 \quad 0 \quad 1 \quad 0
 \end{array}$$

$11 \rightarrow 10$

$(11) \rightarrow 11$

$$= (2^4 * 1) + (\cancel{2^3 * 0}) + (2^2 * 1) + (\cancel{2^1 * 0}) + (\cancel{2^0 * 0})$$

= 20

$3 * 2$

$$\begin{array}{r}
 3 \\
 3 \\
 \hline
 6
 \end{array}$$

$$3 * 4$$

10

20

(30)

$$\begin{array}{r}
 0 \quad 1 \quad 0 \quad 1 \quad 0 \\
 1 \quad 0 \quad 1 \quad 0 \quad 0 \\
 \hline
 1 \quad 1 \quad 1 \quad 1 \quad 0 \\
 16 \quad 8 \quad 4 \quad 2 \quad 0
 \end{array}$$

$$\begin{array}{r}
 3 \\
 3 \\
 3 \\
 3 \\
 \hline
 12
 \end{array}$$

multiplication

Reverse  
Addition

$$10 * 4$$

$$\begin{array}{r}
 10 \\
 10 \\
 10 \\
 10 \\
 \hline
 40
 \end{array}$$

$$\begin{array}{r} 1 \rightarrow 001 \\ 1 \rightarrow 001 \\ \hline 2 \rightarrow 0010 \end{array}$$

35 → 35

$$\begin{array}{r} 1 \\ \hline 10 \end{array}$$

$$\begin{array}{r} 1 \\ \hline 0 \end{array}$$

Recap  
1. computer  
2. 1/0 → binary

$$\begin{array}{cccccc} 5 & 4 & 3 & 2 & 1 & 0 \\ 1 & 0 & 0 & 0 & 1 & 1 \end{array}$$

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

$$32 + 0 + 0 + 0 + 2 + 1 = 35$$

$$\begin{array}{r} 2 \mid 35 \\ \hline 17 - 1 \\ 2 \mid 17 \\ \hline 8 - 1 \\ 2 \mid 8 \\ \hline 4 - 0 \\ 2 \mid 4 \\ \hline 2 - 0 \\ 2 \mid 2 \\ \hline 1 - 0 \\ 2 \mid 1 \\ \hline 0 - 1 \end{array}$$

0 → black  
1 → white  
110 → yellow

110	110	110	110
0	0	0	110
1	1	1	1
110	110	110	110

data stored in computer  
1/0

image → 1/0

Y	Y	Y	Y
B	B	B	Y
W	W	W	W
Y	Y	Y	Y

48x48

encode  
10009 → 100



add

multi  
 $A \times B$   
 $4 \times 5$

$A + A$

$4 + 4 + 4 + 4 + 4$

sub

A      B  
1      1  
-      -  
1      0  
-      -  
0      0  
-      -  
0      1

0/8

0  
1  
6  
-1 (borrow)

8 4 2 1  
11 0 1 0 1 1  
- 9 0 1 0 0 1  
-----  
0 0 1 0

div's  
 $10/2 = 5$

1      2  
10 - 2      8 - 2  
8      6  
3  
6 - 2  
4

22      16 8 4 2 1  
20      1 0 1 1 0  
         1 0 1 0 0  
-----  
         0 0 1 0  
-----  
         5  
4 - 2      2 - 2  
2      0

$10/3 = 3$       res 1  
1      2      3  
10 - 3      7 - 3      4 - 3  
7      4      1

addition -> adding  
subtraction -> sub  
  
multiplication -> repetitive addition  
division -> repetitive subtraction

11 → 10

111 → (11)

$$\begin{array}{r} 1 \\ 10 \\ \hline 11 \end{array}$$

$$\begin{array}{r} 12 \\ 14 \\ \hline 26 \end{array}$$

$$\begin{array}{r} 16 \quad 8 \quad 4 \quad 2 \quad 1 \\ (2 \rightarrow) \quad \hline 1 \quad 1 \quad 0 \quad 0 \\ (4 \rightarrow) \quad 1 \quad 1 \quad 1 \quad 0 \\ \hline 26 \quad 11 \quad 0 \quad 1 \quad 0 \end{array}$$

11 →

8 4 2 1

$$\begin{array}{r} 0001 \\ 0001 \\ \hline 0010 \\ 2 \end{array}$$

Adding two numbers

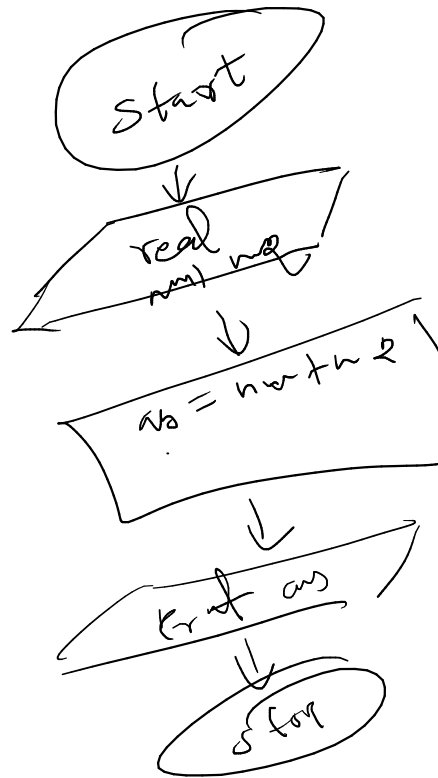
num1, num2  
 ans = num1+num2

## algorithm for adding two numbers

1. start
2. input num1 and num2
3. do addition and store it ans.  $\text{ans} = \text{num1} + \text{num2}$
4. output the ans
5. stop

### psudocode

1. start
2. input num1, num2
3.  $\text{ans} = \text{num1} + \text{num2};$
4. output ans
5. stop



decimal -> binary

30 ->

11110  
4 3 2 1 0

binary -> 100010

30

1 1 1 1 0

$$\begin{aligned} & (0 \times 2^0) + (1 \times 2^1) + (1 \times 2^2) + (1 \times 2^3) + (1 \times 2^4) + (0 \times 2^5) \\ & (1 \times 2^0) + (1 \times 2^1) + (1 \times 2^2) + (1 \times 2^3) + (0 \times 2^4) + (0 \times 2^5) \\ & (1 \times 2^0) + (0 \times 2^1) + (0 \times 2^2) + (0 \times 2^3) + (0 \times 2^4) + (1 \times 2^5) \end{aligned}$$

30

what

$$\begin{array}{r} 30 \\ 2 \overline{) 30} \\ \underline{15} \phantom{0} \\ 2 \overline{) 15} \\ \underline{7} \phantom{0} \\ 2 \overline{) 7} \\ \underline{3} \phantom{0} \\ 2 \overline{) 3} \\ \underline{1} \phantom{0} \\ 2 \overline{) 1} \\ \underline{0} \phantom{0} \end{array}$$

1. algorithm
2. flowchart
3. pseudo code

number is prime number or not?

$$1+2+3+4+5 \Rightarrow (5 \times 6)/2$$

algorithm:

1. start
2. read the number
3. result = number is prime number
3. start from 2 and go till number-1 (a)  
at any point of time, if num is divisible by a then  
result = number is not prime number
4. show the result
5. stop

pseudo code

1. start
2. read number
3. result = number is prime number
3. start from 2 and go till number-1 (a)  
if num is divisible by a  
result = number is not prime number
4. show the result
5. stop

steps

1. create new notepad file Main.java
2. write the code
3. save
4. javac Main.java (after executing, we got Main.class file)
5. java Main

compile

```
javac Main.java  
java Main
```

