

NDA 2 2024

LIVE

MATHS

BINARY NUMBERS



NAVJYOTI SIR

Crack
EXAMS



11 July 2024 Live Classes Schedule

8:00AM	11 JULY 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	11 JULY 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:00AM	OVERVIEW OF GPE & PRACTICE SESSION	ANURADHA MA'AM
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NDA 2 2024 LIVE CLASSES

1:00PM	GS - PHYSICS - CLASS 10	NAVJYOTI SIR
4:00PM	MATHS - BINARY NUMBERS	NAVJYOTI SIR
5:30PM	ENGLISH - SENTENCE COMPLETION - CLASS 1	ANURADHA MA'AM

CDS 2 2024 LIVE CLASSES

1:00PM	GS - PHYSICS - CLASS 10	NAVJYOTI SIR
5:30PM	ENGLISH - SENTENCE COMPLETION - CLASS 1	ANURADHA MA'AM



BINARY SYSTEM

0, 1 } Numbers having only these two digits, (base is 2)

Eg - 01101111 or $(01101111)_2 = (1101111)_2$

011.1101

→ (fraction)

CONVERSION : DECIMAL TO BINARY

$$(81)_{10} \rightarrow (?)_2$$

2	81	
2	40	1
2	20	0
2	10	0
2	5	0
2	2	1
1		0

$$(81)_{10} = \underline{(1010001)_2}$$

(Divide by 2 till you get 1) — collect all remainders from each step,

CONVERSION : DECIMAL TO BINARY (FRACTIONS)

$(0.35)_{10}$

$$(0.35)_{10} = (0.010110)_2$$

$0.35 \times 2 = 0.70 \quad 0$
 $0.70 \times 2 = 1.40 \quad 1$
 $0.40 \times 2 = 0.80 \quad 0$
 $0.80 \times 2 = 1.60 \quad 1$
 $0.60 \times 2 = 1.20 \quad 1$
 $0.20 \times 2 = 0.40 \quad 0$

(Note: In the original image, the integral parts 0, 1, 0, 1, 1, 0 are circled in blue. The fractional parts 0.70, 0.40, 0.80, 0.60, 0.20 are underlined in green. A red arrow points down from the first step to the final result. An orange arrow points from the final result back to the first step.)

collect integral parts (it will be 1 or 0, left side of point)

Multiply only with digits to right of point.

stop when you get 1.00, or repeating step,

CONVERSION : BINARY TO DECIMAL

$$(81)_{10} = (1010001)$$

(numbering from right to left)

$$2^6 + 2^4 + 2^0 = 2^6 + 2^4 + 1$$

$$= 64 + 16 + 1 = 81$$

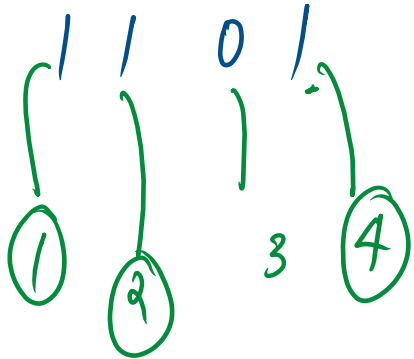
$$(1010110)_2 \longrightarrow (?)_{10}$$

$$\begin{array}{ccccccc}
 1 & 0 & 1 & 0 & 1 & 1 & 0 \\
 | & | & | & | & | & | & | \\
 \textcircled{6} & 5 & \textcircled{4} & 3 & \textcircled{2} & \textcircled{1} & 0
 \end{array}
 \longrightarrow
 \begin{array}{l}
 * \\
 \text{(start from 0 on right - most digit} \\
 * \text{ and count till left - most).}
 \end{array}$$

$$\begin{aligned}
 2^6 + 2^4 + 2^2 + 2^1 &= 64 + 16 + 4 + 2 \\
 &= \textcircled{86}
 \end{aligned}$$

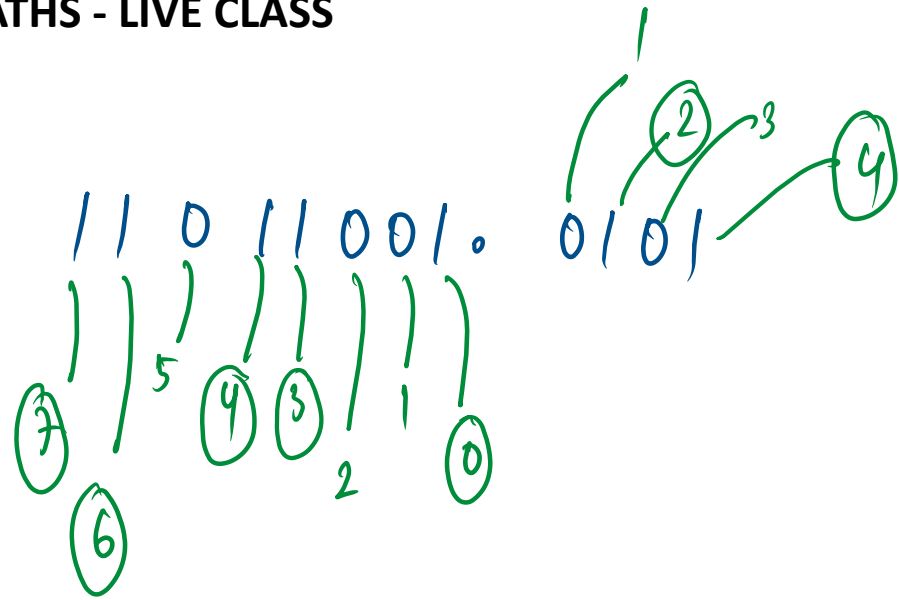
CONVERSION : BINARY TO DECIMAL (FRACTIONS)

0.1101



(powers will be negative)
(numbering will start from 1 and not 0)

$$\begin{aligned}
 &= 2^{-1} + 2^{-2} + 2^{-4} \\
 &= \frac{1}{2} + \frac{1}{2^2} + \frac{1}{2^4} = \frac{1}{2} + \frac{1}{4} + \frac{1}{16} = \frac{8+2+1}{16} = \frac{11}{16}
 \end{aligned}$$



$$(2^7 + 2^6 + 2^4 + 2^3) + (2^{-2} + 2^{-4})$$

OPERATIONS ON BINARY NUMBERS

1. Addition :

$$0 + 0 = 0$$

$$0 + 1 = 1$$

$$1 + 0 = 1$$

$$1 + 1 = 0 \text{ (carry of 1)}$$

$$\begin{array}{r} 110 \\ + 011 \\ \hline 1001 \end{array}$$

$$2^3 + 2^0 = 8 + 1 = 9$$

The handwritten work shows the binary addition of 110 and 011 resulting in 1001. Below this, the decimal value 9 is calculated as $2^3 + 2^0 = 8 + 1 = 9$. The number 6 is also written, which is the decimal value of the binary number 110. Arrows indicate the relationship between the binary numbers and their decimal equivalents.

OPERATIONS ON BINARY NUMBERS

1. Subtraction :

$$0 - 0 = 0$$

$$0 - 1 = 1 \text{ (borrow of 1 from next higher column)}$$

$$1 - 0 = 1$$

$$1 - 1 = 0$$

OPERATIONS ON BINARY NUMBERS

1. Multiplication :

$$0 \times 0 = 0$$

$$0 \times 1 = 0$$

$$1 \times 0 = 0$$

$$1 \times 1 = 1$$

* COMPLEMENT OF A BINARY NUMBER

- Take 1 as complement of 0 and 0 as the complement of 1.
- 1's Complement : Replace 1 by 0 and 0 by 1 in a binary number
- 2's Complement : To the 1's complement, add 1.

011010

1's complement → 100101

2's complement →
$$\begin{array}{r} 100101 \\ + \\ \hline 100110 \end{array}$$

What is the difference between the smallest five digit binary integer and the largest four digit binary integer?

- (a) The smallest four digit binary integer α
- (b) The smallest one digit binary integer
- (c) The greatest one digit binary integer
- (d) The greatest three digit binary integer α

$$\begin{array}{r}
 10000 \\
 - 1111 \\
 \hline
 \end{array}$$

$\xrightarrow{\text{decimal}} 2^4 = 16$
 $\xrightarrow{\text{decimal}} 2^3 + 2^2 + 2^1 + 2^0 = 15$

$$\begin{array}{r}
 16 \\
 - 15 \\
 \hline
 1
 \end{array}$$

↘

What is the difference between the smallest five digit binary integer and the largest four digit binary integer?

- (a) The smallest four digit binary integer
- (b) The smallest one digit binary integer
- (c) The greatest one digit binary integer
- (d) The greatest three digit binary integer

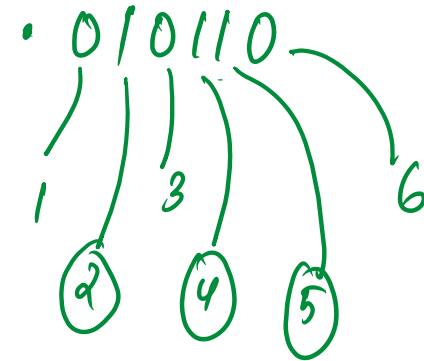
Answer : (c)

containing point (.)

For conversion of a fraction in binary to decimal form, the binary number is multiplied by

- (a) 2 having negative powers
- (b) 2 having positive powers
- (c) 2 only
- (d) None of the above

Eg:



$$2^{-2} + 2^{-4} + 2^{-5}$$

For conversion of a fraction in binary to decimal form, the binary number is multiplied by

- (a) 2 having negative powers
- (b) 2 having positive powers
- (c) 2 only
- (d) None of the above

Answer : (a)

2's complement of $(1011001100)_2$ is

- (a) $(0100110100)_2$ (b) $(0100110010)_2$
 (c) $(0100110101)_2$ (d) $(0100110111)_2$

$$\begin{array}{r}
 01001100\overset{1}{1}1 \\
 + 1 \\
 \hline
 0100110100
 \end{array}$$

2's complement of $(1011001100)_2$ is

- (a) $(0100110100)_2$ (b) $(0100110010)_2$
(c) $(0100110101)_2$ (d) $(0100110111)_2$

Answer : (a)

The decimal equivalent of $(101011)_2$ is

- (a) $(43)_{10}$ (b) $(59)_{10}$
(c) $(47)_{10}$ (d) None of these

The decimal equivalent of $(101011)_2$ is

- (a) $(43)_{10}$ (b) $(59)_{10}$
(c) $(47)_{10}$ (d) None of these

Answer : (a)

Which one of the following binary numbers is the prime number?

(a) 111101

(b) 111010

(c) 111111

(d) 100011

Which one of the following binary numbers is the prime number?

- (a) 111101 (b) 111010
(c) 111111 (d) 100011

Answer : (a)