ONE STOP MCA

Gear up for COMPUTER SCIENCE Series

Target 80/80

CLASS 3

ONE STOP MCA

NUMBER REPRESENTATION

SIGNED MAGNITUDE
1'S COMPLEMENT
2'S COMPLEMENT

Target 80/80

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NUMBER REPRESENTATION

SIGNED MAGNITUDE
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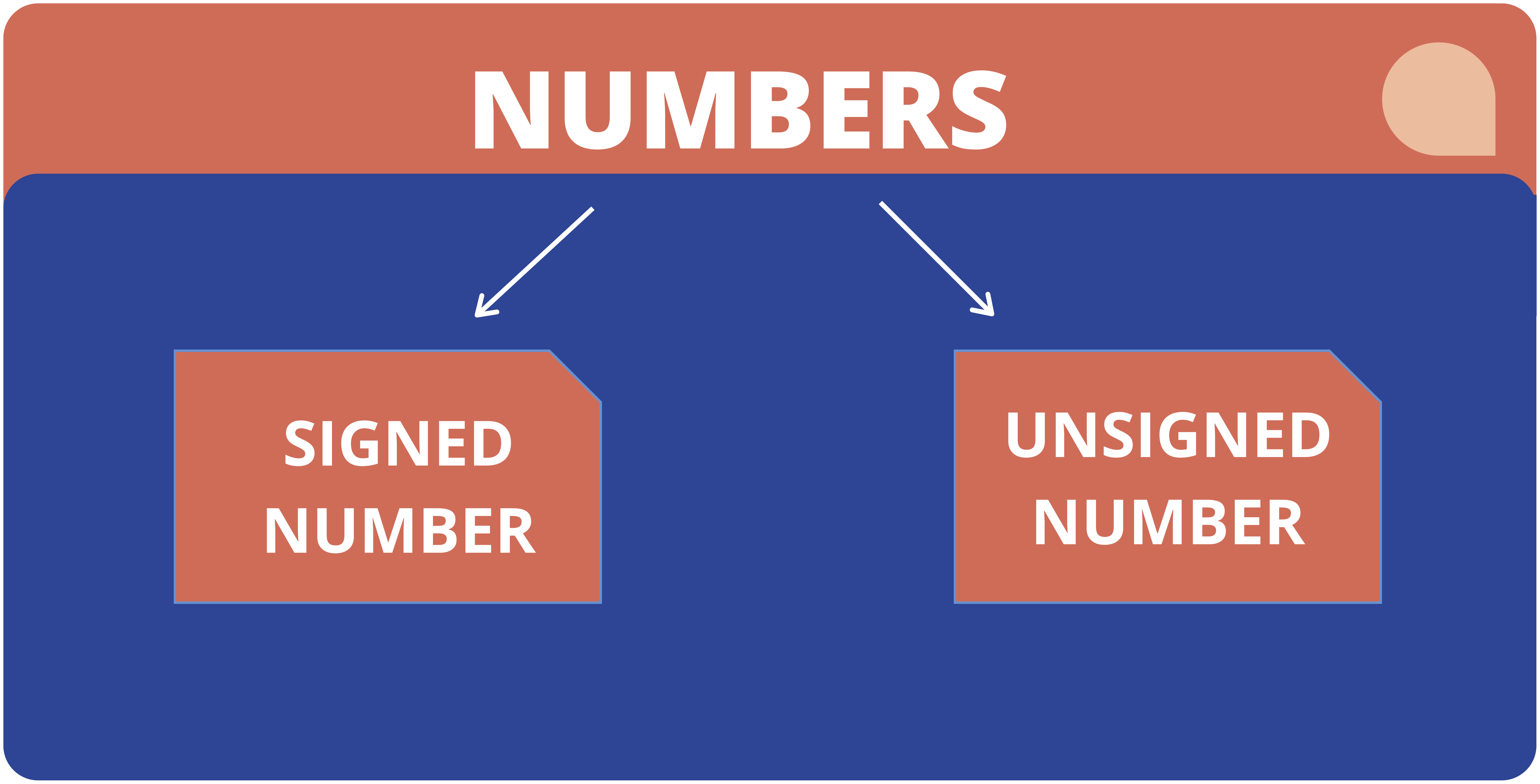
NUMBERS
SIGNED NUMBER
UNSIGNED NUMBER

Warm Up

Question 1

(547)base 8 to decimal

Solution

359 in decimal

Warm Up

Question 2

(1123)base 4 to base 16

Solution

5B

UNSIGNED NUMBER

- Unsigned numbers don't have any sign for representing negative numbers. So the unsigned numbers are always positive.

- There is no sign bit in unsigned binary numbers so it can only represent its magnitude.

Range of numbers that can be represented in UNSIGNED NUMBERS with n bits :

$$(2^n-1)$$

SIGNED NUMBER

- Signed binary number consists of both sign and magnitude
- Sign indicates whether a number is positive or negative and the magnitude is the value of the number

Sign Bit

- Left- most bit in a signed binary number is the sign bit, that determines whether the number is positive or negative
- 0 is for positive and 1 is for negative
- Three representations of signed integer

✓Sign-magnitude

✓1’s complement

✓2’s complement

Representation in SIGNED MAGNITUTUDE

- Sign bit – a 0 is for positive a 1 is for negative
- **Sign-Magnitude form** – a negative number has the same magnitude as the corresponding positive number but the sign bit is a 1 rather than a zero.
- Example:

  +43 in 8-bit S-M form = 0 0101011

  -43 in 8-bit S-M form = 1 0101011

Representation in 1'S COMPLEMENT

1's complement form- a negative number is the 1's complement of the corresponding positive number

- Example:

  +43 in 8-bit 1's complement form = 00101011

  -43 in 8-bit 1's complement form = 11010100

Binary Subtraction Using 1's Compliment

Range of numbers that can be represented in SIGNED MAGNITUDE/ 1'S COMPLEMENT with n bits :

$$-(2^{(n-1)}-1) \text{ to } (2^{(n-1)}-1)$$

$b_3 b_2 b_1 b_0$	Sign and magnitude	1's complement	2's complement
0 1 1 1	+ 7	+ 7	+ 7
0 1 1 0	+ 6	+ 6	+ 6
0 1 0 1	+ 5	+ 5	+ 5
0 1 0 0	+ 4	+ 4	+ 4
0 0 1 1	+ 3	+ 3	+ 3
0 0 1 0	+ 2	+ 2	+ 2
0 0 0 1	+ 1	+ 1	+ 1
0 0 0 0	+ 0	+ 0	+ 0
1 0 0 0	− 0	− 7	− 8
1 0 0 1	− 1	− 6	− 7
1 0 1 0	− 2	− 5	− 6
1 0 1 1	− 3	− 4	− 5
1 1 0 0	− 4	− 3	− 4
1 1 0 1	− 5	− 2	− 3
1 1 1 0	− 6	− 1	− 2
1 1 1 1	− 7	− 0	− 1

Representation in 2'S COMPLEMENT

- **2’s complement form-** a negative number is the 2’s complement of the corresponding positive number

Example:

+43 in 8-bit 2’s complement form = 00101011

-43 in 8-bit 2’s complement form = 11010101

Binary Subtraction Using 2's Compliment

Range of numbers that can be represented in 2'S COMPLEMENT with n bits :

$$-(2^{(n-1)}) \text{ to } (2^{(n-1)}-1)$$

PREVIOUS YEAR PROBLEMS

2009

Assuming all numbers are in 2's complement representation, which of the following numbers is divisible by 11111011?

(a) 11100100 (b) 11010111

(c) 11011011 (d) 00000110

Solution

PREVIOUS YEAR PROBLEMS

2009

A computer with a 32 bit word size uses 2's complement to represent numbers. The range of integers that can be represented by this computer is

(a) -2^{32} to 2^{32}
(b) -2^{31} to 2^{32}
(c) -2^{31} to $2^{31}-1$
(d) -2^{32} to 2^{31}

Solution

PREVIOUS YEAR PROBLEMS

2012

The range of numbers that can be stored in 8 bits, if negative numbers are stored in 2's complement form is

(a) – 128 to + 128
(b) – 128 to + 127
(c) – 127 to + 128
(d) – 127 to + 127

Solution

PREVIOUS YEAR PROBLEMS

2014

What is the 2's complement of 00110101 1001 1100?

(*a*) 1100 1010 1100 1011

(*b*) 1100 1010 0110 0011

(*c*) 1100 1010 0110 0100

(*d*) 1100 1010 1111 1111

Solution

PREVIOUS YEAR PROBLEMS

2014

What is the 8 bit 2's complement representation of the negative intergers-93?

(*a*) 1010011 (*b*) 10100010

(*c*) 0*XA*2 (*d*) None of these

Solution

PREVIOUS YEAR PROBLEMS

2015

P is a 16-bit signed integer. The 2's complement representation of P is $(F87B)_{18}$. The 2's complement representation of 8P is

(*a*) $(C3D8)_{36}$

(*b*) (187B)16

(*c*) $(187B)_{16}$

(*d*) $(987B)_{16}$

Solution

PREVIOUS YEAR PROBLEMS

2016

The range of n-bit signed magnitude representation is

(a) 0 to $2^n - 1$

(b) $-(2^{n-1} - 1)$ to $(2^{n-1} - 1)$

(c) $-(2^n - 1)$ to $(2^{n-1} - 1)$

(d) 0 to $2^{n-1} - 1$

Solution

PREVIOUS YEAR PROBLEMS

2016

The 2's complement representation of the number $(-100)_{10}$ in an 8-bit computer is

(*a*) 10011011 (*b*) 01100100

(*c*) 11100100 (*d*) 10011100

Solution

PREVIOUS YEAR PROBLEMS

2017

Which of the following is the representation of decimal number (–147) in 2's complement notation on a 12 bit machine?

(a) 111101101100 (b) 110001001101

(c) 111101101101 (d) 000001101101

Solution

PREVIOUS YEAR PROBLEMS

2019

With 4-bit 2's complement arithmetic. Which of the following addition will result in overflow?

(*a*) 1111 + 1101 (*b*) 01110 + 0110

(*c*) 1101 + 0101 (*d*) 0101 + 1011

Solution

PREVIOUS YEAR PROBLEMS

2019

If the 2's complement representation of a number is $(011010)_2$, What is its equivalent hexadecimal representation?

(*a*) $(110)_{16}$

(*b*) $(IA)_{16}$

(*c*) $(16)_{16}$

(*d*) $(26)_{16}$

Solution

PREVIOUS YEAR PROBLEMS

2019

In an 8 bit representation of computer system the decimal number 47 has to be subtracted from 38 and the result in binary 2's complement is________

(*a*) 11110111 (*b*) 10001001

(*c*) 11111001 (*d*) 11110001

Solution

COMING UP NEXT

- Grey Codes
- Bit Overflow
- Boolean Algebra
- Logic Gates

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