

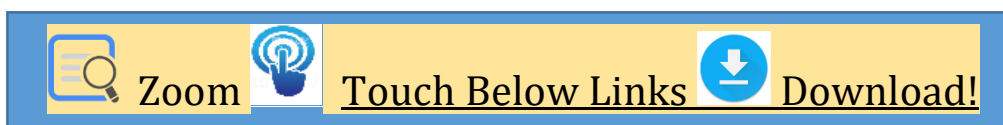


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	Term 1	Term 2	Term 3	Periodical Test	SLAS	

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HIGHER SECONDARY FIRST YEAR**Unit – I Fundamentals of Computers :: Chapter – II Number Systems****Evaluation Questions****Part I****I. Choose the best answer**

1. Which refers to the number of bits processed by a computer's CPU? **Word length.**
2. How many bytes does 1 KiloByte contain? **1024**
3. Expansion for ASCII. **American Standard Code for Information Interchange**
4. 2^{50} is referred as. **Peta.**
5. How many characters can be handled in Binary Coded Decimal System? **64**
6. For 11012 what is the Hexadecimal equivalent? **D**
7. What is the 1's complement of 00100110? **11011001**
8. Which amongst this is not an Octal number? **876**

II. Very Short Answers

1. What is data?
 - The term data comes from the word datum, which means a raw fact.
 - The data is a fact about people, places or some objects.
 - Computer handles data in the form of '0' (Zero) and '1' (One).
2. Write the 1's complement procedure.

Step 1: Convert given Decimal number into Binary.

Step 2: Check if the binary number contains 8 bits, if less add 0 at the left most bit, to make it as 8 bits.

Step 3: Invert all bits (i.e. Change 1 as 0 and 0 as 1)
3. Convert $(46)_{10}$ into Binary number.

$$\begin{array}{r}
 2 \overline{) 46} \\
 \underline{23} \quad - 0 \\
 2 \overline{) 11} \quad - 1 \\
 \underline{5} \quad - 1 \\
 2 \overline{) 5} \quad - 1 \\
 \underline{2} \quad - 1 \\
 1 \quad - 0
 \end{array}
 \uparrow$$

$$46_{10} = 101110_2$$

4. We cannot find 1's complement for $(28)_{10}$. State reason.
We cannot find 1's complement for $(28)_{10}$. Because it is a positive number.
1's complement apply only with negative number.

5. List the encoding systems for characters in memory.

Several encoding systems used for computer.

- BCD – Binary Coded Decimal
- EBCDIC – Extended Binary Coded Decimal Interchange Code
- ASCII – American Standard Code for Information Interchange
- Unicode
- ISCII - Indian Standard Code for Information Interchange

III. Short Answers

1. What is radix of a number system? Give example
 - A numbering system is a way of representing numbers.
 - The most commonly used numbering system in real life is Decimal number system, others Binary, Octal, Hexadecimal number system.
 - Each number system is uniquely identified by its base value or radix.
 - Radix or base is the count of number of digits in each number system.
 - Decimal Number System - Radix or base 10 – $(150)_{10}$
 - Binary Number System - Radix or base 2 – $(101110)_2$

- Octal Number System - Radix or base 8 – $(226)_8$
- Hexadecimal Number System - Radix or base 16 – $(7E)_{16}$.

2. Write note on binary number system.

- There are only two digits in the Binary system, namely, 0 and 1.
- The numbers in the binary system are represented to the base 2 and the positional multipliers are the powers of 2.
- The left most bit in the binary number is called as the Most Significant Bit (MSB) and it has the largest positional weight.
- The right most bit is the Least Significant Bit (LSB) and has the smallest positional weight.
- Example 1101_2 .

3. Convert $(150)_{10}$ into Binary, then convert that Binary number to Octal

Decimal to Binary conversion

2	150	
2	75	- 0
2	37	- 1
2	18	- 1
2	9	- 0
2	4	- 1
2	2	- 0
	1	- 0

$150_{10} = 10010110_2$

Binary to Octal conversion

Group 3 bit format 010 010 110

$\downarrow \quad \downarrow \quad \downarrow$
 2 2 6

$010\ 010\ 110_2 = 226_8$

Octal	Binary Equivalent
0	000
1	001
2	010
3	011
4	100
5	101
6	110
7	111

4. Write short note on ISCII

- Indian Standard Code for Information Interchange (ISCII) is the system of handling the character of Indian local languages.
- This as a 8-bit coding system. Therefore it can handle 256 (28) characters.
- This system is formulated by the department of Electronics in India in the year 1986-88 and recognized by Bureau of Indian Standards (BIS).
- Now this coding system is integrated with Unicode.

5. Add a) $-22_{10} + 15_{10}$ b) $20_{10} + 25_{10}$

a) $-22_{10} + 15_{10}$

Binary equivalent of 22	10110
8 bit format	00010110
1's Complement	11101001
Add 1 to LSB	1
2's Complement	11101010
Binary equivalent of 15	1111
8 bit format	00001111
Binary addition of -22 and 15	11101010
	00001111
	11111001

2|22

2	11	- 0	LSB
2	5	- 1	
2	2	- 1	
	1	- 0	

MSB

2|15

2	7	- 1	LSB
2	3	- 1	
	1	- 1	

MSB

$$\begin{array}{r}
 11101001 \\
 1 + \\
 \hline
 11101010
 \end{array}$$

$$\begin{array}{r}
 11101010 \\
 00001111 + \\
 \hline
 11111001
 \end{array}$$

b) $20_{10} + 25_{10}$

Binary equivalent of 20	10100
8 bit format	00010100
Binary equivalent of 25	11001
8 bit format	00011001
Binary addition of 20 and 25	00010100 00011001 00101101

$\begin{array}{r} 2 \overline{) 20} \\ 2 \overline{) 10 - 0} \text{ LSB } \uparrow \\ 2 \overline{) 5 - 0} \\ 2 \overline{) 2 - 1} \\ \text{MSB } 1 - 0 \end{array}$	$\begin{array}{r} 2 \overline{) 25} \\ 2 \overline{) 12 - 1} \text{ LSB } \uparrow \\ 2 \overline{) 6 - 0} \\ 2 \overline{) 3 - 0} \\ \text{MSB } 1 - 1 \end{array}$
$\begin{array}{r} 00010100 \\ 00011001 + \\ \hline 00101101 \end{array}$	

IV. Short Answers

1. A) Write the procedure to convert fractional Decimal to Binary.

The method of repeated multiplication by 2 has to be used to convert such kind of decimal fractions.

The steps involved in the method of repeated multiplication by 2.

Step 1: Multiply the decimal fraction by 2 and note the integer part. The integer part is either 0 or 1.

Step 2: Discard the integer part of the previous product. Multiply the fractional part of the previous product by 2. Repeat Step 1 until the same fraction repeats or terminates (0).

Step 3: The resulting integer part forms a sequence of 0s and 1s that become the binary equivalent of decimal fraction.

Step 4: The final answer is to be written from first integer part obtained till the last integer part obtained.

- B) Convert
- $(98.46)_{10}$
- to Binary.

i) Integer Part conversion	ii) Fractional part conversion
$\begin{array}{r} 2 \overline{) 98} \\ 2 \overline{) 49 - 0} \text{ LSB } \uparrow \\ 2 \overline{) 24 - 1} \\ 2 \overline{) 12 - 0} \\ 2 \overline{) 6 - 0} \\ 2 \overline{) 3 - 0} \\ \text{MSB } 1 - 1 \end{array}$	$\begin{array}{l} 0.46 \times 2 = 0.92 = 0 \\ 0.92 \times 2 = 1.84 = 1 \\ 0.84 \times 2 = 1.68 = 1 \\ 0.68 \times 2 = 1.36 = 1 \\ 0.36 \times 2 = 0.72 = 0 \\ 0.72 \times 2 = 1.44 = 1 \\ 0.44 \times 2 = 0.88 = 0 \end{array} \downarrow$
$98_2 = 1100010_2$	$0.46_{10} = 0111010_2$
$98.46_{10} = 1100010.0111010_2$	

2. Find 1's Complement and 2's Complement for the following Decimal number

A) -98 B) -135

A) -98	
Binary equivalent of 98	1110110
8 bit format	01110110
1's Complement	10001001
Add 1 to LSB	1
2's Complement	10001010

$\begin{array}{r} 2 \overline{) 98} \\ 2 \overline{) 49 - 0} \text{ LSB } \uparrow \\ 2 \overline{) 29 - 1} \\ 2 \overline{) 14 - 1} \\ 2 \overline{) 7 - 0} \\ 2 \overline{) 3 - 1} \\ \text{MSB } 1 - 1 \end{array}$
--

B) -135

Binary equivalent of 135	10000111
1's Complement	01111000
Add 1 to LSB	1
2's Complement	01111001

2	135	
2	67 - 1	LSB▲
2	33 - 1	
2	16 - 1	
2	8 - 0	
2	4 - 0	
2	2 - 0	
2	1 - 0	

MSB

3) A) Add $1101010_2 + 101101_2$ B) Subtract $1101011_2 - 111010_2$

<p>A)</p> <table style="margin-left: 40px;"> <tr><td>1101010</td><td>+</td></tr> <tr><td>101101</td><td></td></tr> <tr><td style="border-top: 1px solid black;">10110111</td><td></td></tr> </table> <p>$1101010_2 + 101101_2 = 10110111_2$</p>	1101010	+	101101		10110111		<p>B)</p> <table style="margin-left: 40px;"> <tr><td>1101011</td><td>-</td></tr> <tr><td>111010</td><td></td></tr> <tr><td style="border-top: 1px solid black;">100001</td><td></td></tr> </table> <p>$1101011_2 - 111010_2 = 110001_2$</p>	1101011	-	111010		100001	
1101010	+												
101101													
10110111													
1101011	-												
111010													
100001													

0+1=1
 1+0=1
 1+1=10
 1+1+1=11
 1-0=0
 1-1=0
 10-1=1

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HIGHER SECONDARY FIRST YEAR**Unit – I Fundamentals of Computers :: Chapter – II Number Systems – One Marks**

1. The term data comes from the word **datum**, which means a raw fact.
2. The data is a fact about **people, places or some objects**.
3. Computer only handles data in the form of **‘0’(Zero) and ‘1’ (One)**.
4. ‘0’ or ‘1’ are called **Binary Digits(BIT)**.
5. **Binary Digit(BIT)** is the basic unit of data in computers.
6. **Bit** is the basic unit of data in computers.
7. A collection of 4 bits is called **nibble**.
8. A collection of 8 bits is called **Byte**.
9. A byte is considered as the basic unit of **measuring the memory size** in the computer.
10. The number of bits processed by a Computer’s CPU refers to **Word length**.
11. A word length can have **8 bits, 16 bits, 32 bits and 64 bits**. Present day Computers use **32 bits or 64 bits**.
12. 1 KiloByte represents **1024 bytes** that is 2^{10} .
13. 1 MegaByte represents **1024 KiloByte** that is 2^{20} .
14. 1 GigaByte represents **1024 MegaByte** that is 2^{30} .
15. 1 TeraByte represents **1024 GigaByte** that is 2^{40} .
16. 1 PetaByte represents **1024 TeraByte** that is 2^{50} .
17. 1 ExaByte represents **1024 PetaByte** that is 2^{60} .
18. 1 ZettaByte represents **1024 ExaByte** that is 2^{70} .
19. 1 YottaByte represents **1024 ZettaByte** that is 2^{80} .
20. The most commonly used coding scheme is **the American Standard Code for Information Interchange (ASCII)**.
21. The range of ASCII values for **lower case alphabets** is from **97 to 122** and
22. The range of ASCII values for **the upper case alphabets** is **65 to 90**.
23. Number systems are **Decimal, Binary, Octal, Hexadecimal** number system.
24. Each number system is uniquely identified by its **base value or radix**.
25. Decimal Number System consists of **0,1,2,3,4,5,6,7,8,9(base 10)**.
26. There are only two digits in the Binary system **0 and 1** (base 2).
27. The left most bit in the binary number is called as the **Most Significant Bit (MSB)** and it has the largest positional weight.
28. The right most bit is the **Least Significant Bit (LSB)** and has the smallest positional weight.
29. Octal number system digits are **0,1,2,3,4,5,6 and 7** (base 8).
30. A hexadecimal number is represented using base 16 (0 to 9, A to F).
31. To convert Decimal to Binary **“Repeated Division by 2”** method can be used.
32. To convert Decimal to Octal **“Repeated Division by 8”** method can be used.
33. To convert Decimal to Hexadecimal **“Repeated division by 16”** method can be used.
34. ISCII system is formulated by the department of **Electronics in India in the year 1986-88** and recognized by **Bureau of Indian Standards (BIS)**. Now this coding system is integrated with **Unicode**.
35. Unicode was generated to handle all the coding system of **Universal languages**.
36. Unicode is 16 bit code and can handle **65536** characters.
37. Unicode scheme is denoted by **hexadecimal numbers**.

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HIGHER SECONDARY FIRST YEAR
Unit – I Fundamentals of Computers :: Chapter – II Number Systems
Workshop Questions

1. Identify the number system for the following numbers

S.No	Number	Number System
1	(1010)10	here the base is 10 so Decimal Number System
2	(1010)2	here the base is 2 so Binary Number System
3	(989)16	here the base is 16 so Hexadecimal Number System
4	(750)8	here the base is 8 so Octal Number System
5	(926)10	Here the base is 10 so Decimal Number System

2. State whether the following numbers are valid or not. If invalid, give reason.

S.No	Statement	Yes / No	Reason (If invalid)
1.	786 is an Octal number	No	Octal Numbers 0 to 7 (base 8) here 2 nd digit 8 not correct
2.	101 is a Binary number	Yes	Binary numbers 0 and 1 (base 2)
3.	Radix of Octal number is 7	No	Radix and Base same meaning. Octal number 0 to 7, so Radix 7 is not correct.

3. Convert the following Decimal numbers to its equivalent Binary, Octal, Hexadecimal.

A) 1920

B) 255

C) 126

A) Decimal to Binary

2	1920	
2	960 - 0	LSB
2	480 - 0	
2	240 - 0	
2	120 - 0	
2	60 - 0	
2	30 - 0	
2	15 - 0	
2	7 - 1	
2	3 - 1	
2	1 - 1	
MSB		
$1920_{10} = 1111000000_2$		

Decimal to Octal

8	1920	
8	240 - 0	LSB
8	30 - 0	
	3 - 6	
MSB		
$1920_{10} = 3600_8$		

Decimal to Hexadecimal

16	1920	
16	120 - 0	LSB
	7 - 8	
MSB		
$1920_{10} = 780_{16}$		

B) 255 Decimal to Binary

2	255	
2	127 - 1	LSB
2	63 - 1	
2	31 - 1	
2	15 - 1	
2	7 - 1	
2	3 - 1	
2	1 - 1	
MSB		
$255_{10} = 11111111_2$		

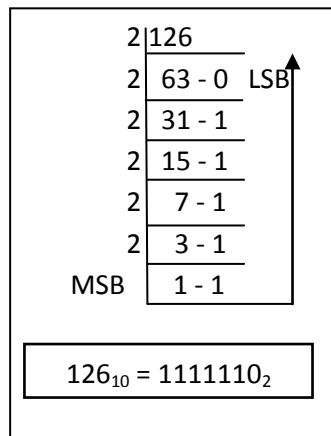
Decimal to Octal

8	255	
8	31 - 7	LSB
	3 - 7	
MSB		
$255_{10} = 377_8$		

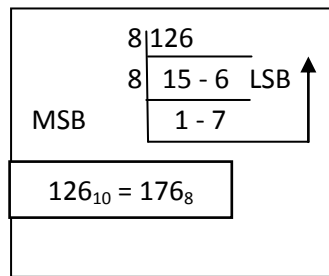
Decimal to Hexadecimal

16	255	
	15 - 15	LSB
MSB		
$255_{10} = FF_{16}$		

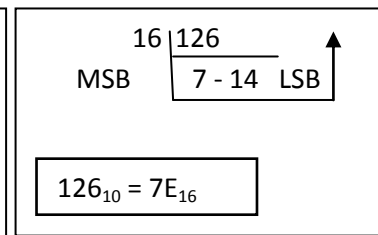
C) Decimal to Binary



Decimal to Octal



Decimal to Hexadecimal



*** Understand these tables for easy conversion

Octal to Binary equivalent

Octal	Binary Equivalent
0	000
1	001
2	010
3	011
4	100
5	101
6	110
7	111

Hexadecimal to Binary Equivalent

Hexadecimal	Binary Equivalent	Hexadecimal	Binary Equivalent
0	0000	8	1000
1	0001	9	1001
2	0010	A	1010
3	0011	B	1011
4	0100	C	1100
5	0101	D	1101
6	0110	E	1110
7	0111	F	1111

4. Convert the following Binary numbers to its equivalent Decimal, Octal, Hexadecimal.

a) 101110101

b) 1011010

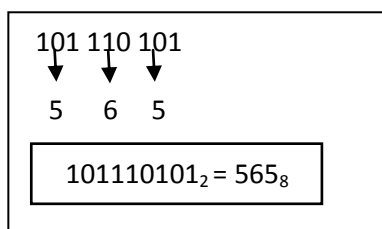
c) 101011111

a) 101110101 **Binary to Decimal conversion**

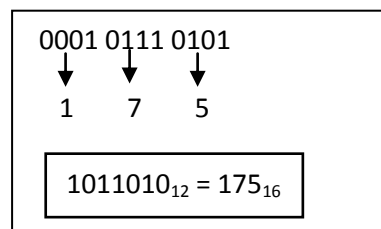
$$\begin{aligned}
 &= (1 \times 2^8) + (0 \times 2^7) + (1 \times 2^6) + (1 \times 2^5) + (1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) \\
 &\quad + (0 \times 2^1) + (1 \times 2^0) \\
 &= 256 + 0 + 64 + 32 + 16 + 0 + 4 + 0 + 1 \\
 &= 373
 \end{aligned}$$

$$101110101_2 = 373_{10}$$

Binary to Octal Conversion



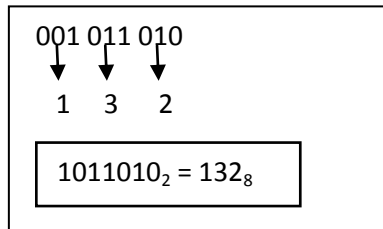
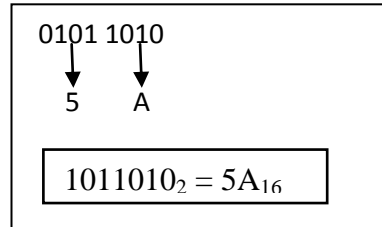
Binary to Hexadecimal conversion



b) 1011010 **Binary to Decimal conversion**

$$\begin{aligned}
 &= (1 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) + (1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (0 \times 2^0) \\
 &= 64 + 0 + 16 + 8 + 0 + 2 + 0 \\
 &= 90
 \end{aligned}$$

$$1011010_2 = 90_{10}$$

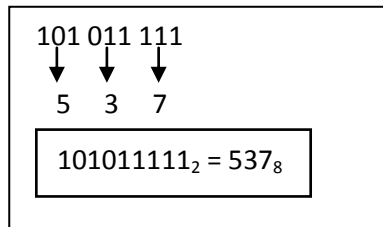
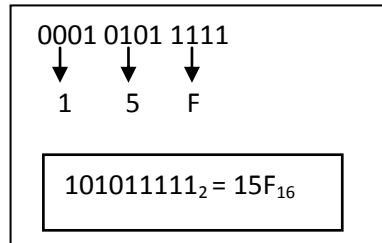
Binary to Octal Conversion**Binary to Hexadecimal conversion**

c) 101011111

Binary to Decimal conversion

$$\begin{aligned}
 &= (1 \times 2^8) + (0 \times 2^7) + (1 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) \\
 &\quad + (1 \times 2^1) + (1 \times 2^0) \\
 &= 256 + 0 + 64 + 0 + 16 + 8 + 4 + 2 + 1 \\
 &= 351
 \end{aligned}$$

$$101011111_2 = 351_{10}$$

Binary to Octal Conversion**Binary to Hexadecimal conversion**

5. Convert the following Octal numbers into Binary numbers. (A) 472 (B) 145 (C) 347 (D) 6247 (E) 645

Use this table for easy conversion

Octal	Binary Equivalent
0	000
1	001
2	010
3	011
4	100
5	101
6	110
7	111

A) 472₈

4 7 2
↓ ↓ ↓
100 111 010

$472_8 = 100111010_2$

B) 145₈

1 4 5
↓ ↓ ↓
001 100 101

$145_8 = 001100101_2$

C) 347₈

3 4 7
↓ ↓ ↓
011 100 111

$347_8 = 011100111_2$

D) 6247₈

6 2 4 7
↓ ↓ ↓ ↓
110 010 100 111

$6247_8 = 110010100111_2$

E) 645₈

6 4 5
↓ ↓ ↓
110 100 101

$645_8 = 110100101_2$

6. Convert the following Hexadecimal numbers to Binary numbers (A) A6 (B) BE (C) 9BC8 (D) BC9
Hexadecimal to Binary Equivalent

Hexadecimal	Binary Equivalent	Hexadecimal	Binary Equivalent
0	0000	8	1000
1	0001	9	1001
2	0010	A	1010
3	0011	B	1011
4	0100	C	1100
5	0101	D	1101
6	0110	E	1110
7	0111	F	1111

(A) A6 ₁₆	(B) BE ₁₆	(C) 9BC8 ₁₆	(D) BC9 ₁₆
A 6 ↓ ↓ 1010 0110	B E ↓ ↓ 1011 1110	9 B C 8 ↓ ↓ ↓ ↓ 1001 1011 1100 1000	B C 9 ↓ ↓ ↓ 1011 1100 1001
A6 ₁₆ = 10100110 ₂	BE ₁₆ = 10111110 ₂	9BC8 ₁₆ = 1001101111001000 ₂	BC9 ₁₆ = 101111001001 ₂

7. Write the 1's complement number and 2's complement number for the following decimal numbers: (A) 22 (B) -13 (C) -65 (D) -46
 (A) 22

We cannot find 1's complement for (22)₁₀. Because it is a positive number.

1's complement apply only with negative number.

(B) -13

Binary equivalent of 13	1101
8 bit format	00001101
1's Complement	11110010
Add 1 to LSB	1
2's Complement	11110011

(C) -65

Binary equivalent of 65	1000001
8 bit format	01000001
1's Complement	10111110
Add 1 to LSB	1
2's Complement	10111111

(D) -46

Binary equivalent of 46	101110
8 bit format	00101110
1's Complement	11010001
Add 1 to LSB	1
2's Complement	11010010

8. Perform the following binary computations: (A) 10₁₀ + 15₁₀ (B) -12₁₀ + 5₁₀ (C) 14₁₀ - 12₁₀
 (A) 10₁₀ + 15₁₀

Binary equivalent of 10 = 1010

Binary equivalent of 15 = 1111

Binary addition of 10₁₀ and 15₁₀ = 11001₂

$\begin{array}{r} 2 \overline{) 10} \\ 2 \overline{) 5 - 0 \text{ LSB}} \\ 2 \overline{) 2 - 1} \\ \text{MSB} \quad 1 - 0 \end{array}$	$\begin{array}{r} 2 \overline{) 15} \\ 2 \overline{) 7 - 1 \text{ LSB}} \\ 2 \overline{) 3 - 1} \\ \text{MSB} \quad 1 - 1 \end{array}$
$\begin{array}{r} 1010 + \\ 1111 \\ \hline 11001 \end{array}$	

(B) $-12_{10} + 5_{10}$

Binary equivalent of 12	1100
8 bit format	00001100
1's Complement	11110011
Add 1 to LSB	1
2's Complement	11110100
Binary equivalent of 5	101
8 bit format	0000 0101
Binary addition of $-12_{10} + 5_{10}$	11111001 ₂

$\begin{array}{r} 2 \overline{)12} \\ 2 \overline{)6 - 0 \text{ LSB}} \\ 2 \overline{)3 - 0} \\ 1 - 1 \end{array}$	$\begin{array}{r} 2 \overline{)5} \\ 2 \overline{)2 - 1 \text{ LSB}} \\ 1 - 0 \end{array}$
MSB	MSB
11110100 +	
00000101	
11111001	

(C) $14_{10} - 12_{10}$

Binary equivalent of 14	1110
8 bit format	00001110
Binary equivalent of -12	1100
8 bit format	00001100
1's Complement	11110011
Add 1 to LSB	1
2's Complement	11110100
Binary addition of 14_{10} and -12_{10}	100000010₂

$\begin{array}{r} 2 \overline{)14} \\ 2 \overline{)7 - 0 \text{ LSB}} \\ 2 \overline{)3 - 1} \\ 1 - 1 \end{array}$	$\begin{array}{r} 2 \overline{)12} \\ 2 \overline{)6 - 0 \text{ LSB}} \\ 2 \overline{)3 - 0} \\ 1 - 1 \end{array}$
MSB	MSB
00001110 +	
11110100	
100000010	

(D) $(-2_{10}) - (-6_{10})$

Binary equivalent of 2	10
8 bit format	00000010
1's complement	11111101
Add 1 to LSB	1
2's Complement	11111110
Binary equivalent of 6	110
8 bit format	00000110
1's complement	11111001
Add 1 to LSB	1
2's Complement of -2	11111010
Binary subtraction of -2_{10} and -6_{10}	00000100

$\begin{array}{r} 2 \overline{)2} \\ 1 - 0 \text{ LSB} \end{array}$	$\begin{array}{r} 2 \overline{)6} \\ 2 \overline{)3 - 0 \text{ LSB}} \\ 1 - 1 \end{array}$
MSB	MSB
11111110 -	
11111010	
00000100	

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