

1.11 Perform the following division in binary: $111111 \div 101$.

Ans.

$$\begin{array}{r}
 1100.1001 \\
 101 \overline{) 111111} \\
 \underline{101} \\
 101 \\
 \underline{101} \\
 00110 \\
 \underline{00101} \\
 01000 \\
 \underline{101} \\
 011
 \end{array}$$

(a) 1100.1001 1001 1001 or

(b) 1100...11

1.14 Obtain the 1's and 2's complements of the following binary numbers:

(a) 11110000

(b) 00000000

(c) 11011000

(d) 01010101

Ans.

(a) 1's complements: 00001111, 2's complements: 00010000

(b) 1's complements: 11111111, 2's complements: 00000000

(c) 1's complements: 00100111, 2's complements: 00101000

(d) 1's complements: 10101010, 2's complements: 10101011

1.18 Perform subtraction on the given unsigned binary numbers using the 2's complement of the subtrahend. Where the result should be negative, find its 2's complement and affix a minus sign.

(a) $10101 - 10010$

(b) $10010 - 100110$

Ans.

(a) Let $X=10101$ and $Y=10010$,

X=	10101
2's complements of Y=	01110
SUM=	100011
	- 100000
X-Y=	00011

(b) Let $X=10010$ and $Y=100110$,

X=	010010
2's complements of Y=	011010

SUM=	101100
X-Y=	– (2's complements of SUM)
X-Y=	– 010100

1.20 Convert decimal +56 and +35 to binary, using the signed-2's-complement representation and enough digits to accommodate the numbers. Then perform the binary equivalent of $(+56) + (+35)$, $(+56) + (-35)$, and $(-56) + (+35)$. Convert the answers back to decimal and verify that they are correct.

Ans.

$$+56: 0111000, -56: 0111000 \xrightarrow{2's} 1001000$$

$$+35: 0100011, -35: 0100011 \xrightarrow{2's} 1011101$$

(a) increase word size by 0 (sign extension) to accommodate overflow of values:

$$(+56) + (+35) = 00111000 + 00100011 = 01011011 \text{ (0 indicates positive value)}$$

$$\text{Magnitude} = 01011011 = 91$$

$$\text{Result} = +91$$

$$\text{Decimal: } 56 + 35 = 91$$

$$(b) (+56) + (-35) = 0111000 + 1011101 = 0010101 \text{ (0 indicates positive value)}$$

$$\text{Magnitude} = 0010101 = 21$$

$$\text{Result} = +21$$

$$\text{Decimal: } 56 - 35 = 21$$

$$(c) (-56) + (+35) = 1001000 + 0100011 = 1101011 \text{ (1 indicates negative value)}$$

$$\text{Magnitude} = 1101011 \xrightarrow{2's} 0010101 = 21$$

$$\text{Result} = -21$$

$$\text{Decimal: } -56 + 35 = -21$$

1.23 Represent the unsigned decimal numbers 694 and 538 in BCD, and then show the steps necessary to form their sum.

Ans.

$$694_{10} = (0110 \ 1001 \ 0100)_{BCD}$$

$$538_{10} = (0101 \ 0011 \ 1000)_{BCD}$$

<i>BCD</i>	0110	1001	0100
+	0101	0011	1000
	1100	1101	1100
	+0110	+0110	+0110
	110010	10011	10010
	1	1	1

$(1 \ 0010 \ 0011 \ 0010)_{BCD} = 1232_{10}$