

① 39 to hexadecimal.

$$16 \overline{)39} \quad \begin{array}{r} 2 \\ 32 \\ \hline 7 \end{array}$$

$$16 \overline{)7} \quad \begin{array}{r} 0 \\ 7 \\ \hline 7 \end{array}$$

$$\begin{array}{l} 39/16 = 2 \quad R = 7 \\ 2/16 = 0 \quad R = 2 \end{array}$$

$$\boxed{27} = 21P1$$

$$1 = P, 0 = S = 21E$$

$$0 = S, 1 = P = 21F$$

$$0 = S, 1 = P = 21S$$

② 78

$$16 \overline{)78} \quad \begin{array}{r} 4 \\ 64 \\ \hline 14 \end{array}$$

$$(100111)_2$$

R: 14 (E in decimal).

$$0 = S, 0 = P = 6 | 8F$$

$$1 = P, 0 = S = 5 | 0E$$

$$1 = P, 0 = S = 5 | P1$$

$$1 = P, 0 = S = 5 | E$$

$$0 = S, 1 = P = 5 | F$$

③ 221

$$16 \overline{)221} \quad \begin{array}{r} 13 \\ 16 \\ \hline 6 \\ 48 \\ \hline 13 \end{array}$$

$$13 = 0 = S, 1 = P = 5 | 8$$

$$1 = P, 0 = S = 5 | 8$$

$$0 = S, 1 = P = 5 | F$$

$$1 = P, 0 = S = 5 | F$$

④ 145 (01110010) top few are wrong due to mistake

$$145 / 16 =$$

$$16 \overline{)145} \quad \begin{array}{r} 9 \\ 144 \\ \hline 001 \end{array}$$

② Binary Representation.

$$\begin{array}{r} 19 \\ 2 \overline{) 39} \\ 2 \overline{\rule[-1ex]{0pt}{2.5ex})} 19 \\ 18 \overline{\rule[-1ex]{0pt}{2.5ex})} 1 \\ 01 \end{array}$$

$Q = 19, R = 1$

$$19/2 = Q = 9, R = 1$$

$$9/2 = Q = 4, R = 1$$

$$4/2 = Q = 2, R = 0$$

$$2/2 = Q = 1, R = 0$$

Final Quotient $u \mid 2 R = 1, 1, 1, 0, 0 \& 1$

$$\text{Binary} = (111001)_2$$

Adding two zeros, we get $(00100111)_2$

② 78

$$78/2 = Q = 39, R = 0$$

$$39/2 = Q = 19, R = 1$$

$$19/2 = Q = 9, R = 1$$

$$9/2 = Q = 4, R = 1$$

$$4/2 = Q = 2, R = 0$$

$$2/2 = Q = 1, R = 0$$

The final Quotient is 1.

binary equivalent is $(1001110)_2$

Adding one zero, we get $(01001110)_2$

(3) 221

$$221/2 = Q = 110, R = 1$$

$$110/2 = Q = 55, R = 0$$

$$55/2 = Q = 27, R = 1$$

$$27/2 = Q = 13, R = 1$$

$$13/2 = Q = 6, R = 1$$

$$6/2 = Q = 3, R = 1$$

$$3/2 = Q = 1, R = 1$$

final Quotient is 1

and 1, 0, 1, 1, 1, 0 and 1.

The binary equivalent is $(11011101)_2$

$$(4) 145 \quad (P_{cx1}) + (P_{cx0}) + (A_{sx0}) + (A_{sx1}) +$$

$$145/2 = Q = 72, R = 1$$

$$72/2 = Q = 36, R = 0$$

$$36/2 = Q = 18, R = 0$$

$$18/2 = Q = 9, R = 0$$

$$9/2 = Q = 4, R = 1$$

$$4/2 = Q = 2, R = 0$$

$$2/2 = Q = 1, R = 0$$

final Quotient is 1

and 0, 0, 1, 0, 0, 0 and 0

binary equivalent is $(10010001)_2$

③ Unsigned decimal Value :-

① 11101101b

$$\begin{aligned}
 & (1 \times 2^7) + (1 \times 2^6) + (1 \times 2^5) + (0 \times 2^4) \\
 & + (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + \\
 & (1 \times 2^0) \\
 = & 128 + 64 + 32 + 0 + 8 + 4 + 0 + 1 \\
 = & 237
 \end{aligned}$$

② 0001101b

$$\begin{aligned}
 & (0 \times 2^7) + (0 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) \\
 & + (1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (1 \times 2^0) \\
 = & 0 + 0 + 0 + 16 + 8 + 0 + 2 + 1 \\
 = & 27
 \end{aligned}$$

③ 11110101b

$$\begin{aligned}
 & (1 \times 2^7) + (1 \times 2^6) + (1 \times 2^5) + (1 \times 2^4) + \\
 & (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0)
 \end{aligned}$$

$$\begin{aligned}
 = & 128 + 64 + 32 + 16 + 0 + 4 + 0 + 1 \\
 = & 245
 \end{aligned}$$

(4) 01100100b

01100100

$$\begin{aligned}
 & (0 \times 2^7) + (1 \times 2^6) + (1 \times 2^5) + (1 \times 2^4) + \\
 & (0 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (0 \times 2^0) \\
 = & 0 + 64 + 32 + 0 + 0 + 4 + 0 + 0 \\
 = & 100
 \end{aligned}$$

(5) Signed Decimal Value :

0110101111

11101101b

$$\begin{aligned}
 & + (2 \times 0) + (2 \times 0) + (2 \times 0) \\
 = & -(00010011b + 1) = - (000100100b) \\
 & + (0 \times 2^7) + (0 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) + (0 \times 2^3) \\
 & + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0)
 \end{aligned}$$

$$= - (0 + 0 + 0 + 16 + 0 + 4 + 0 + 0)$$

$$= -(20)$$

$$= -20$$

~~$$\begin{aligned}
 & 00011011b = -(00010011b + 1) + (2 \times 0) + \\
 & (2 \times 1) + (2 \times 1) + (2 \times 0) + (2 \times 0) \\
 = & -(0001100b) \\
 = & -(0 \times 2^7) + (1 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) + (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0) \\
 = & 001
 \end{aligned}$$~~

(b) 00011011_6 00010011_6

$$(0 \times 2^7) + (0 \times 2^6) + (0 \times 2^5) + (1 \times 2^4) \\ + (1 \times 2^3) + (0 \times 2^2) + (1 \times 2^1) + (0 \times 2^0)$$

$$0 + 0 + 0 + 16 + 8 + 0 + 2 + 1 \\ = 27$$

(c) 11110101_6

$$= -(00001011_6 + 1)$$

$$= -(00001100_6)$$

$$= -(0 \times 2^7) + (0 \times 2^6) + (0 \times 2^5) + \\ (0 \times 2^4) + (1 \times 2^3) + (1 \times 2^2) + (1 \times 2^1)$$

$$= -(0 + 0 + 0 + 0 + 8 + 4 + 0 + 0)$$

$$= -12$$

$$= -12$$

(d) 01100100_6

$$(0 \times 2^7) + (1 \times 2^6) + (1 \times 2^5) + (0 \times 2^4) \\ + (0 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (0 \times 2^0)$$

$$= 0 + 64 + 32 + 0 + 0 + 4 + 0 + 0$$

$$= 100$$

(3) $A = 01100100b$
 $B = 10011010b$
 $C = 01101101b$
 $D = 11000110b$

$01100100b \oplus 10011010b = 1111110b$
 $01100100b \oplus 01101101b = 0000000b$
 $10011010b \oplus 01101101b = 1111110b$
 $11000110b \oplus 01101101b = 10100010b$

(4) $A \vee B$

$01100100b \vee 10011010b = 10011010b$
Result = $1111110b$

(5) $A \vee C$

$01100100b \vee 01101101b = 01101101b$
Result = $01101101b$

(6) $A \vee B$

$01100100b \vee 11000110b$
Result = $11100110b$

(7) $A \wedge B$

$01100100b \wedge 10011010b = 0000000b$

$A \wedge C$

$01100100b \wedge 01101101b$
 $01100100b$

$A \oplus D$

$01100100b \oplus 11000110b$
Result = $10100010b$

$$\begin{aligned} \textcircled{4} \quad Q &= 71AF2523h \\ R &= 2B988398h \\ S &= 9E5E4AD8h \\ T &= 6B7C3487h. \end{aligned}$$

$$\begin{aligned} d00100110 &= A \\ d01011011 &= B \\ d11110110 &= C \\ d01000011 &= D \end{aligned}$$

$$\textcircled{1} \quad Q + R$$

$$\begin{aligned} & 71AF2523h + 2B988398h \\ \text{decimal} &= 1930950275 + 731113240 \end{aligned}$$

~~Method 1~~

$$Q + R = 1930950275 + 731113240$$

$$\begin{aligned} \text{Decimal} &= 2662063515 \\ & d10110110 \end{aligned}$$

Convert back to hexadecimal

$$9E3F6748h \quad (\text{no carry}).$$

~~Method 2~~

& if we do it like

$$\begin{aligned} & 71AF2523h \\ & + 2B988398h \end{aligned}$$

$$\overline{9D3789BB} \quad (\text{no carry})$$

(2) Q + 5

7 - 8

$$\begin{array}{r} \text{71AF2523} \\ + \text{9E5E4A08} \\ \hline \end{array}$$

NE8287AI +
NF3A83F8A

1100D7FB (carry 1)

(3) Q + T

(carry 1)

$$\begin{array}{r} \text{71AF2523} \\ + \text{6B7C3847} \\ \hline \end{array}$$

• Landed successfully 28 x

DD 2B59AA (carry 1)

(b)

Q - R

$$\begin{array}{r} \text{71AF2523h} \\ - \text{2B988398h} \\ \hline \end{array}$$

F23FFDPA - 8PC83PAH

F23FFDPA

46179A8Bh (no carry)

Q - S

$$\begin{array}{r} \text{71AF2523h} \\ - \text{9E5E4A08h} \\ \hline \end{array}$$

71AF2523h + 619BB527h + 1

[= D39A7F4Bh]

carry 1.

• (part 8) 281880211

Q-T

$$\begin{array}{r} \text{+ 1AF2523h} \\ \text{6B7C3487h} \\ \hline \end{array}$$

$$\begin{array}{r} \text{+ 1AF2523h} \\ \text{9483CB78h} \\ \hline \end{array}$$

$$\begin{array}{r} \text{+ 1AF2523h} \\ \text{9483CB78h} \\ \hline \end{array}$$

$$\boxed{\begin{array}{r} \text{+ 1AF2523h} \\ \text{- 0A32F09Ch} \\ \hline \end{array}}$$

(carry)

* 2^5 Complement Method:

①

 $\varnothing - R$ find - the 2^5 complement of R

2B988398 → 04677C67

04677C67

+

1

 $\begin{array}{r} \xrightarrow{\text{2}^5 \text{ complement}} \\ \text{+ 04677C68} \end{array}$

of R

$$\begin{array}{r} \text{+ 1AF2523h} \\ \text{+ 04677C68 P&Q} \\ \hline \end{array}$$

$$\begin{array}{r} \text{+ 1AF2523h} \\ \text{+ 04677C68 P&Q} \\ \hline \end{array}$$

$$\begin{array}{r} \text{+ 1AF2523h} \\ \text{+ 04677C68 P&Q} \\ \hline \end{array}$$

(2)

Q-5

$$\cdot 5 = 9E5E4AD8h$$

$$9E5E4AD8h \rightarrow 61A1B527$$

$$\begin{array}{r}
 61A1B527 \\
 + \quad \quad \quad 1 \\
 \hline
 61A1B528
 \end{array}$$

$$\begin{array}{r}
 71AF2523 \\
 + 61A1B528 \\
 \hline
 035E77AB
 \end{array}$$

(3)

Q-T

$$6B7C3487 \rightarrow 9483CB78$$

$$\begin{array}{r}
 9483CB78 \\
 + \quad \quad \quad 1 \\
 \hline
 9483CB79
 \end{array}$$

Perform addition of Q $71AF2523$

as complement $+ 9483CB79$

of T.

$$\begin{array}{r}
 \hline
 0162F09A2. \text{ (no carry).}
 \end{array}$$