HW 6: Unsigned Binary Subtraction

For each of the <**X**, **Y**> pairs below:

a) Convert **X** and **Y** → binary

b) Compute $\ddot{\mathbf{Y}}$, the 2's complement of **Y**

c) Compute 8-bit **diff** using 2's complement addition

d) Convert **diff** → hexadecimal

e) Indicate whether 8-bit subtraction produces a **carry**

f) Convert **X**, **Y**, $\ddot{\mathbf{Y}}$, **diff** → decimal (check your work)

Where <**X**, **Y**> =

1) <0x**4F**, 0x**6D**>

2) <0x**C8**, 0x**2B**>

3) <0x**A3**, 0x**95**>

4) <0x**B4**, 0x**E1**>

Example X1

$X = 0x9E$, $Y = 0x7A$

$X = 0b10011110$, $Y = 0b01111010$

$\overline{Y} = 10000101$

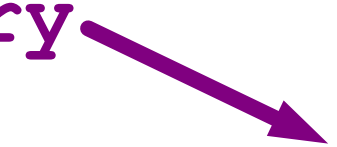
$\overline{Y}+1 = 10000110$

$X \ddot{-} Y = X + (\overline{Y}+1)$

10011110

10000110

carry



1 0 0 1 1 1 1 0

$100100100 \rightarrow 0x24 \ (+ 0x100)$

$X = 9 \cdot 16 + 14 = 158$

$Y = 7 \cdot 16 + 10 = 122$

$\ddot{Y} = 8 \cdot 16 + 6 = 134$

$X \ddot{-} Y = 2 \cdot 16 + 4 = 36$

$X - Y = 36 = 36$

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#X1 X = 0x9E, Y = 0x7A

a) X = 0b10011110, Y = 0b01111010

Y'= 10000101

b) ~Y = Y'+1 = 10000110

cde) X~Y = 10011110

10000110

10011110

carry 00100100 → 0x24 (+ 0x100)

f) X = 9·16 + 14 = 158

Y = 7·16 + 10 = 122

~Y = 8·16 + 6 = 134

X~Y = 2·16 + 4 = 36

X−Y = 36 = 36

Example X2

$X = 0x3C, \quad Y = 0xB5$

$X = 0b00111100, \quad Y = 0b10110101$

$\overline{Y} = 01001010$

$\ddot{\overline{Y}} = \overline{Y}+1 = 01001011$

$X \ddot{-} Y = 00111100 + 01001011$

carry: 0 1 1 1 1 0 0 0

$010000111 \rightarrow 0x87 \quad (+ \quad 0x0)$

$X = 3 \cdot 16 + 12 = 60$

$Y = 11 \cdot 16 + 5 = 181$

$\ddot{\overline{Y}} = 4 \cdot 16 + 11 = 75$

$X \ddot{-} Y = 8 \cdot 16 + 7 = 135$

$X - Y = -121 + 256 = 135$

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```
#X2        X = 0x3C,          Y = 0xB5
a)         X = 0b00111100, Y = 10110101
                           Y'= 01001010
b)        ~Y =          Y'+1 = 01001011
cde)     X~Y = 00111100
               01001011
              01111000
    no carry  10000111 → 0x87 (+ 0x0)
f)          X =    3·16 +  12 =  60
            Y =   11·16 +   5 = 181
           ~Y =    4·16 +  11 =  75
         X~Y =    8·16 +   7 = 135
         X-Y = -121    + 256 = 135
```