

Homework # 1:

5-10, 16, 17, 19, 21

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©



MULTIPLICATION

ex $5 \times 7 = 35$

$$\begin{array}{r}
 0111 \\
 \times 0101 \\
 \hline
 q_0 = \underline{0} 0111 \\
 \hline
 p_0 0111 \\
 \hline
 q_1 = \underline{0} 0111 \\
 0111 \\
 \hline
 q_2 = \underline{1} 011100 \\
 0111 \\
 \hline
 100011 \\
 \hline
 32 21 35
 \end{array}$$

M	$m_3 m_2 m_1 m_0$	0111	Multiplicand
Q x		0101	Multiplier
P		$q_3 q_2 q_1 q_0$	Product

$m_3 q_0 \quad m_2 q_0 \quad m_1 q_0 \quad m_0 q_0$

* V N S I B N U D N U M B E R S

ex: $-8 \times 3 = -18$ $n=4$ (Obtain the product $n=8$ bits)

$-6 = 1010$ M

$3 = 0011$ Q $\frac{1001}{1010}$

$m_3 \oplus q_3 \Rightarrow$ If 1 then

The result is NEGATIVE

Then multiply them as if they were both positive numbers:

If 0 then the result is POSITIVE

$-6 \Rightarrow 0110_+6$

$$\begin{array}{r} 0110 \\ \times 0011 \\ \hline 0110 \\ + 01100 \\ \hline 10010 \\ 16 \quad 2 = 18_{10} \end{array}$$

$n=5$ -2^{5-1} , 2^{5-1}
 -16 , 15

$$\begin{array}{r} 00010010 \\ 11101101 \\ \hline 11101110 \end{array}$$

$$M = m_3 m_2 m_1 m_0$$

$$Q = q_3 q_2 \textcircled{q_1} q_0$$

$$m_3 q_0 \quad m_2 q_0 \quad m_1 q_0 \quad m_0 q_0$$

$$m_3 q_1 \quad m_2 q_1 \quad m_1 q_1 \quad m_0 q_1$$

$$\begin{array}{r} PP0: \\ + \\ \hline PP1: \end{array} \begin{array}{r} 0 \\ m_3 q_1 \\ \hline pp1_4 \\ \hline \end{array} \begin{array}{r} pp0_3 \\ m_2 q_1 \\ \hline pp1_3 \\ \hline \end{array} \begin{array}{r} pp0_2 \\ m_1 q_1 \\ \hline pp1_2 \\ \hline \end{array} \begin{array}{r} pp0_1 \\ m_0 q_1 \\ \hline pp1_1 \\ \hline \end{array} \begin{array}{r} pp0_0 \\ 0 \\ \hline pp1_0 \\ \hline \end{array}$$

q_1 16 bits left

$n=4$

