$x(n) = \{1, 2, 3, 4\}$ $h(n) = \{-1, -1\}$

$LC = N_1 + N_2 - 1 = 4 + 2 - 1 = 5$

$y(n) = \{-1, -3, -5, -7, -4\}$

	-1	-1
1	-1	-1
2	-2	-2
3	-3	-3
4	-4	-4

Using DFT

$y(n) = \{\delta(n) + 2\delta(n-1) + 3\delta(n-2) + 4\delta(n-3)\} * \{-\delta(n) - \delta(n-1)\}$

$= \{-1, -3, -5, -7, -4\}$

Using FFT

$N = 2$

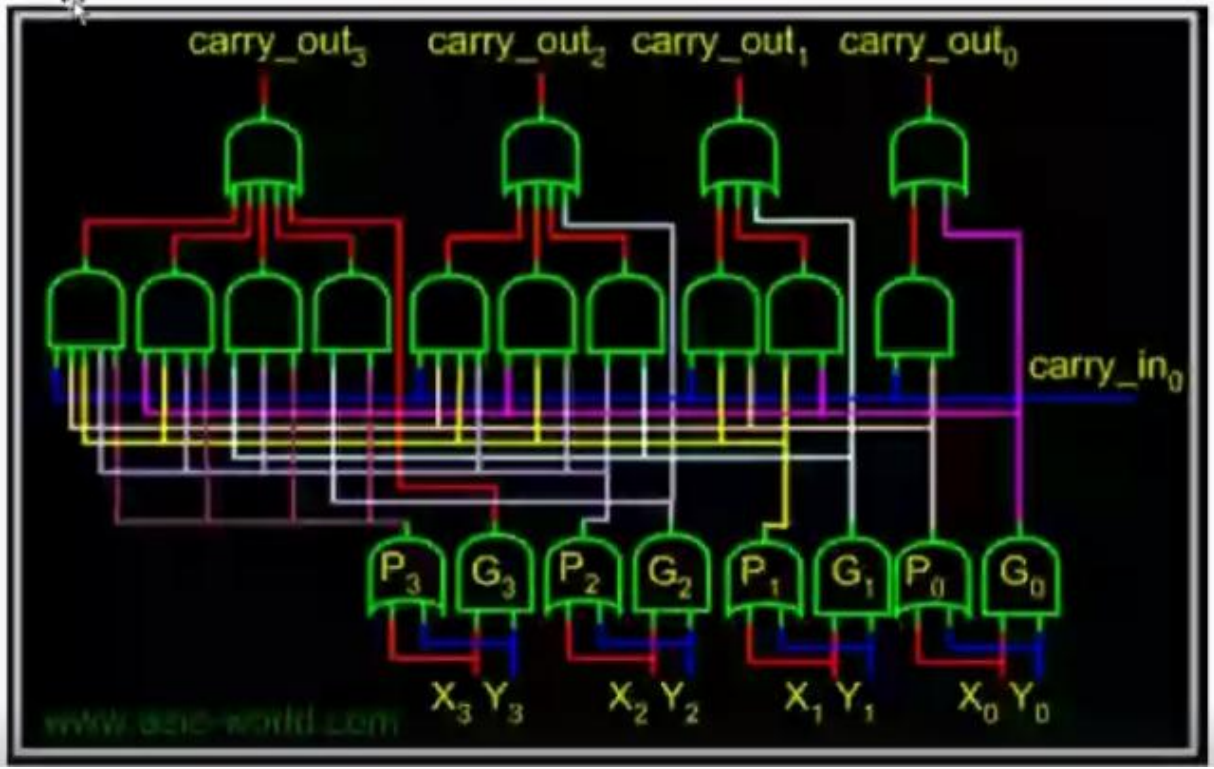
$\{1, 2, 3, 4, 0, 0, 0, 0\}$

$\{-1, -1, 0, 0, 0, 0, 0, 0\}$

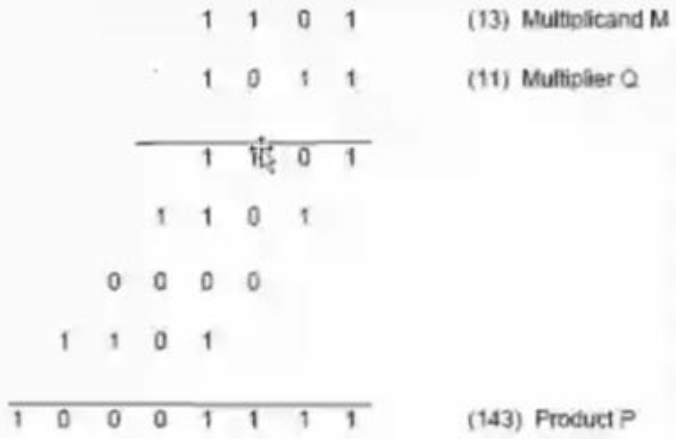
$Y(K) = X(K) \cdot H(K)$

$y(n) =$

4-bit carry-lookahead Adder



Multiplication of unsigned numbers



Product of 2 *n*-bit numbers is at most a *2n*-bit number.

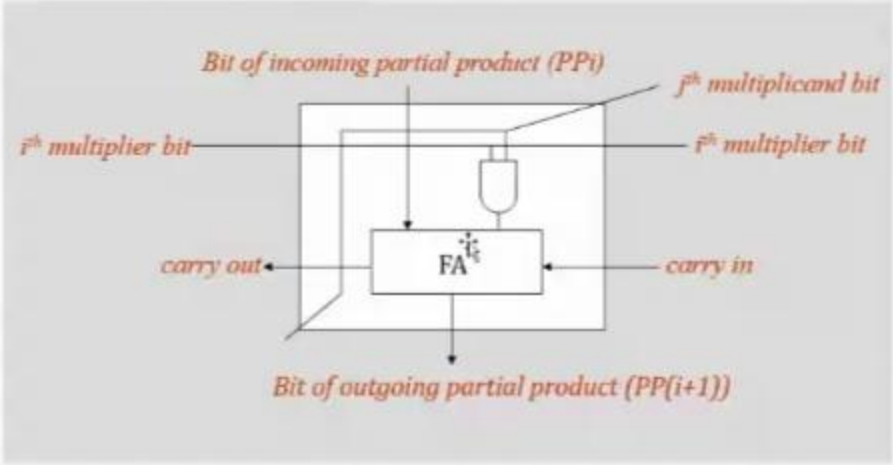
Unsigned multiplication can be viewed as addition of shifted versions of the multiplicand.

Multiplication of unsigned numbers (contd..)

- We added the partial products at end.
  - Alternative would be to add the partial products at each stage.
- Rules to implement multiplication are:
  - If the i^{th} bit of the multiplier is 1, shift the multiplicand and add the shifted multiplicand to the current value of the partial product.
  - Hand over the partial product to the next stage
  - Value of the partial product at the start stage is 0.

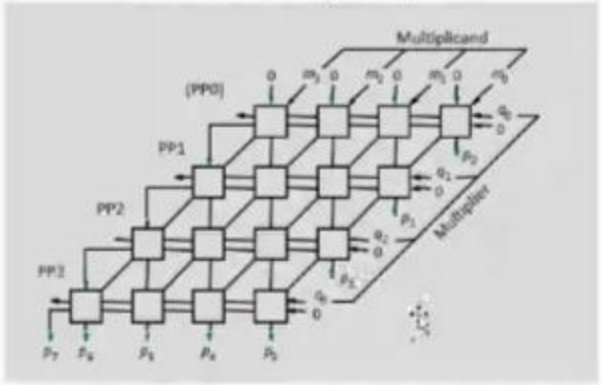
Multiplication of unsigned numbers

Typical multiplication cell



Combinatorial array multiplier

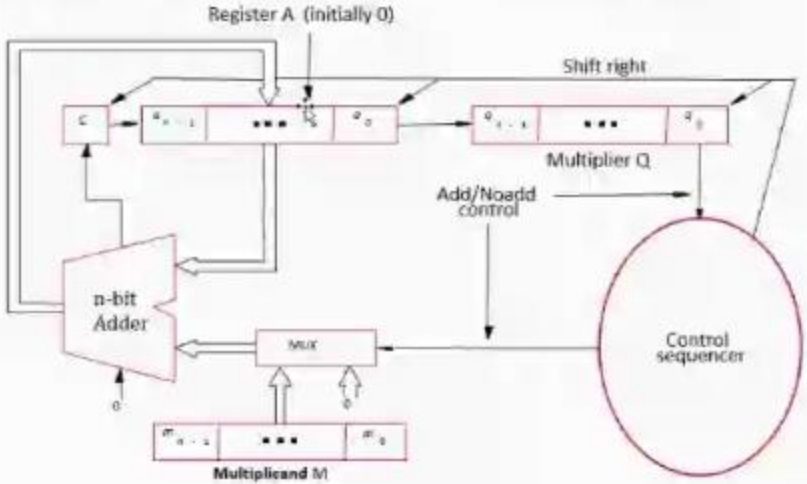
Combinatorial array multiplier



Product is: $p_7 p_6 \ldots p_0$

Multiplicand is shifted by displacing it through an array of adders.

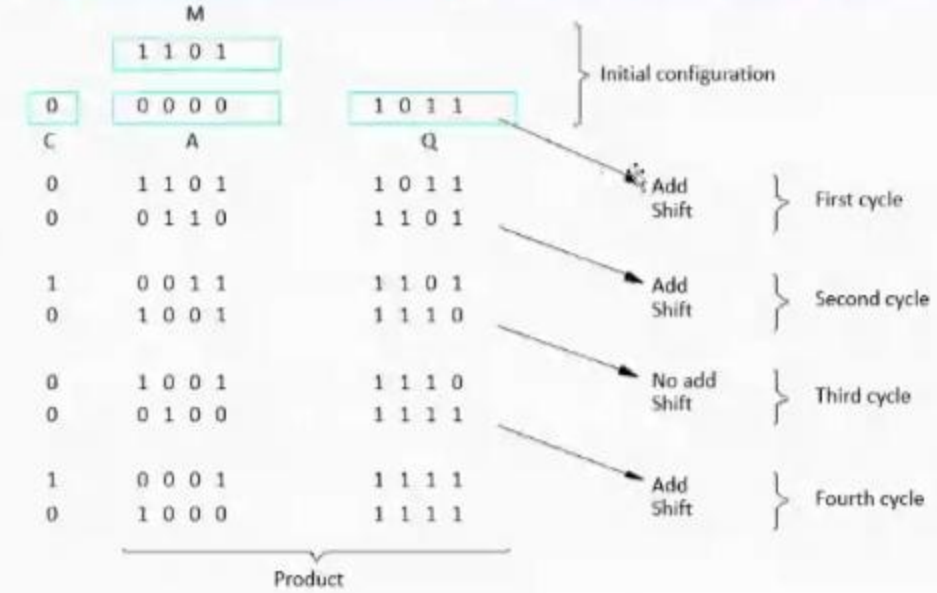
Sequential Circuit Multiplier



LSB OF Q-0 NO ADD SIGNAL IS GENERATED

LSB OF Q-1 ADD SIGNAL IS GENERATED

Sequential multiplication (contd..)



Booth Algorithm

- Since 0011110 = 0100000 – 0000010, if we use the expression to the right, what will happen?