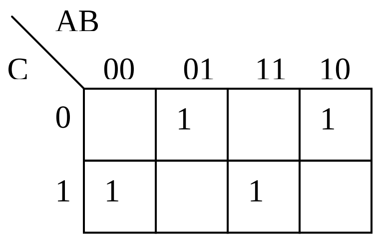
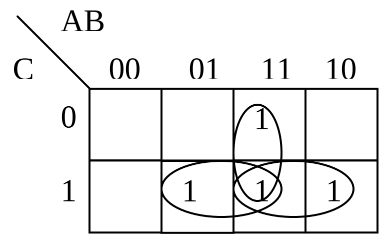
LOOKAHEAD CARRY ADDER INTRODUCTION

Let A, B, and C be the inputs to a full adder. Then, finding the Sum, S, and Carry Out, Cout, we have:



S = A XOR B XOR C



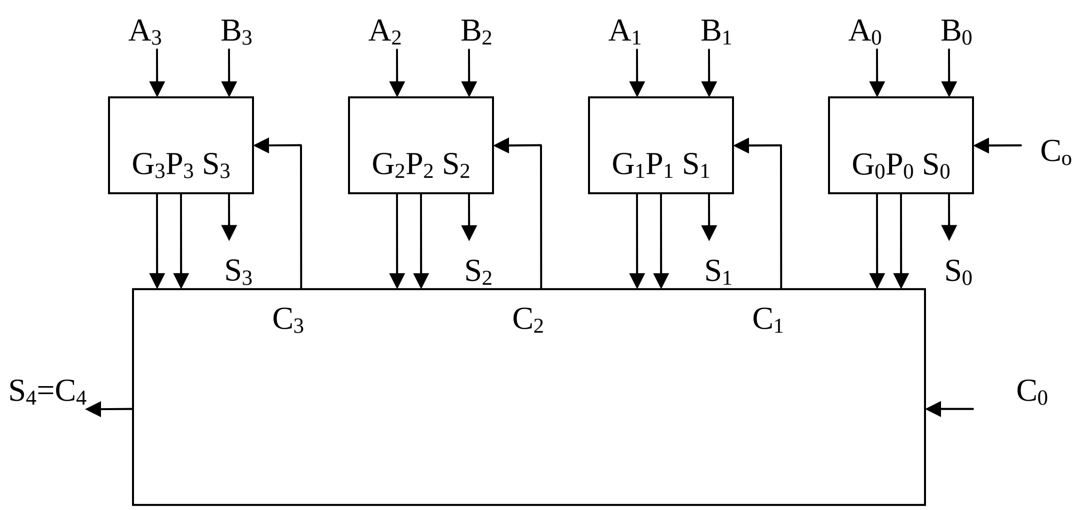
Cout = A*B + A*C + B*C

Cout = A*B + A*C + B*C = A*B + (A + B)*C, or

Cout = G + P*C, where G = A*B, P = A + B

Generalizing the result above to n bits, we have the following:

$C_1 = G_0 + P_0*C_0$
$C_2 = G_1 + P_1*C_1 = G_1 + P_1*(G_0 + P_0*C_0) = G_1 + P_1*G_0 + P_1*P_0*C_0$
$C_3 = G_2 + P_2*C_2 = G_2 + P_2*G_1 + P_2*P_1*G_0 + P_2*P_1*P_0*C_0$
$C_4 = G_3 + P_3*C_3 = G_3 + P_3*G_2 + P_3*P_2*G_1 + P_3*P_2*P_1*G_0 + P_3*P_2*P_1*P_0*C_0$
$C_5 = G_4 + P_4*C_4 = \ldots$



An n-bit Ripple-Carry Adder (RCA) takes 2n gate delays to compute an n-bit sum.

With carry lookahead, we can theoretically compute an n-bit sum in 5 gate delays!

The theoretical limit for an n-bit sum (full parallel implementation) is 2 gate delays.