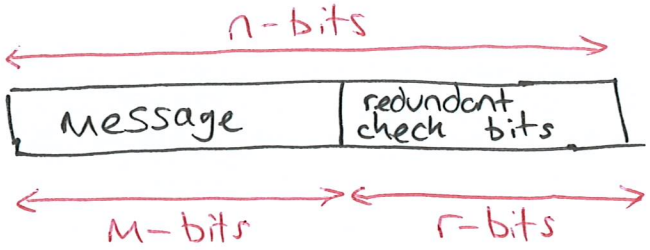
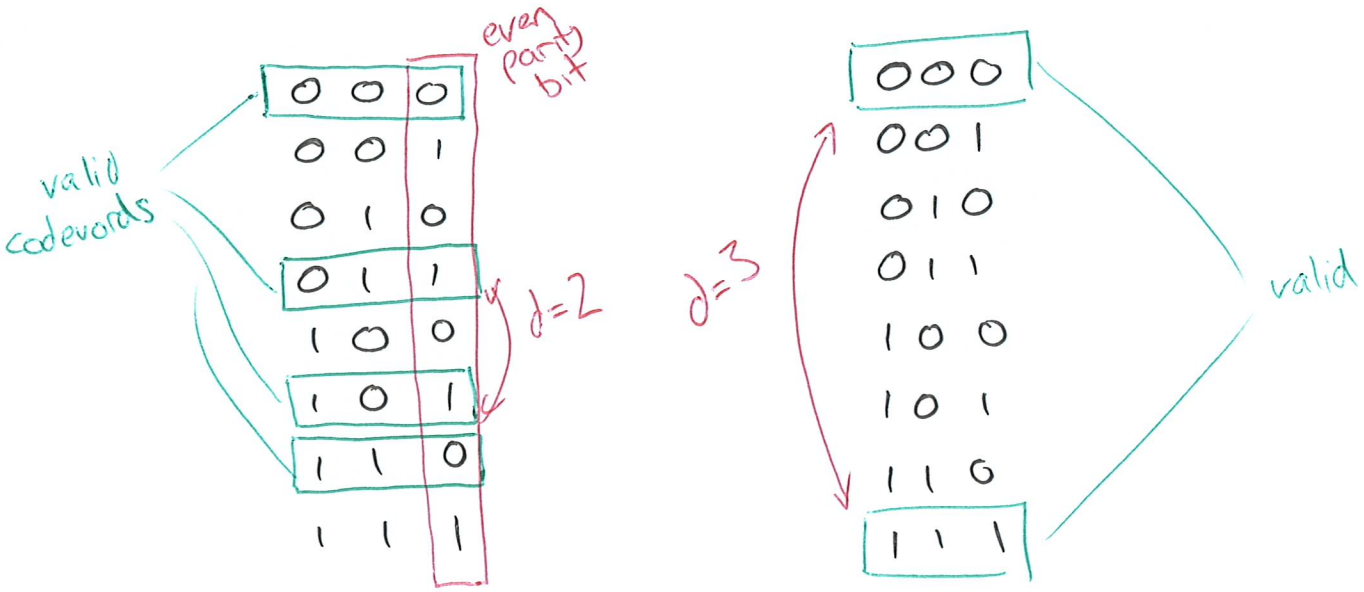
n-bit codeword

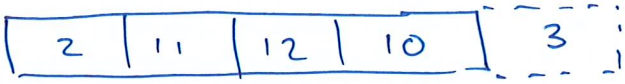


- an (n, M) code
- code rate M/n

Hamming Distance



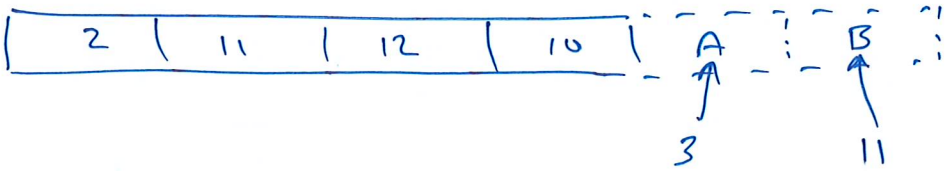
Checksums (4-bit)



Fletcher's Checksum

A: 2 13 25 35 Mod 2^n = 3

B: 2 15 40 75 Mod 2^n = 11



CRCs

message: 1101011111_2

generator: 10011_2 $\Rightarrow x^4 + x + 1$ (degree = 4)

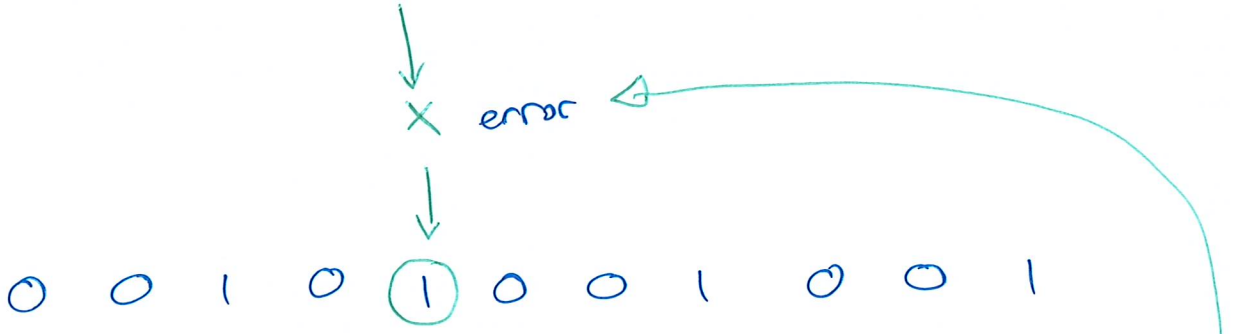
Hamming Codes

(11, 7) Hamming Code

Message 1 0 0 0 0 0 1

n = 11, m = 7

		2+1		4+1	4+2	4+2+1		8+1	8+2	8+2+1
1	2	3	4	5	6	7	8	9	10	11
P_1	P_2	M_3	P_4	M_5	M_6	M_7	P_8	M_9	M_{10}	M_{11}
0	0	1	0	0	0	0	1	0	0	1



P_8 : 1 0 0 1 — 0

P_4 : 0 0 0 0 — 1

P_2 : 0 1 0 0 0 1 — 0

P_1 : 0 1 1 0 0 1 — 1

error syndrome

$0\,1\,0\,1_2 = 5_{10}$