

1.4.2 Non-restoring division

$$\begin{array}{c} \textcircled{0} \quad r_i \quad \textcircled{1} \\ \swarrow \quad \searrow \\ r_{i-M+M} \quad r_{i-M} \end{array}$$

$$r_{i+1} = 2r_i \quad r_{i+1} = 2r_i - 2M$$

$s=1$
 $\textcircled{0} \quad r_{i-M}$
 $r_{i+1} = 2r_i - 2M$
 $\downarrow +M$
 $r_{i+1} = 2r_i - M$

$\textcircled{1} \quad s=0$
 $r_{i+1} = 2r_i - 2M$
 $\downarrow -M$
 $r_{i+1} = 2r_i - 3M$

-M -M

COUNT	S	A	Q	M
000	0	0010 1101	0001 0110	1000 0111
-	0	1000 0111		
	1	1010 0110	0001 0110	
	1	0100 1100	0010 1100	
001+	0	1000 0111		
	1	1101 0011	0010 1100	
	1	1010 0110	0101 1000	
010+	0	1000 0111		
	0	0010 1101	0101 1001	
	0	0101 1010	1011 0010	
011-	0	1000 0111		
	1	1101 0011	1011 0010	
	1	1010 0110	0110 0100	
100+	0	1000 0111		
	0	0010 1110	0110 0101	
	0	0101 1100	1100 1010	
101-	0	1000 0111		
	1	1101 0101	1100 1010	
	1	1010 0111	1001 0100	
110+	0	1000 0111		
	0	0011 0010	1001 0101	
	0	0110 0101	0010 1010	
111-	0	1000 0111		
	1	1101 1110	0010 1010	
or +	0	1000 0111		
	0	0110 0101	42ten	Quotient

$$\begin{array}{r} 128+ \\ 7 \\ \hline 135 \end{array}$$

$$\begin{array}{r} 11+ \\ 128 \\ 512 \\ 1024 \\ 4096 \end{array}$$

$$\begin{array}{r|l} 5771 & 135 \\ \hline 540 & 42 \\ \hline \end{array}$$

$$\begin{array}{r} 371 \\ 270 \\ \hline 101 \end{array}$$

Reminder
101ten

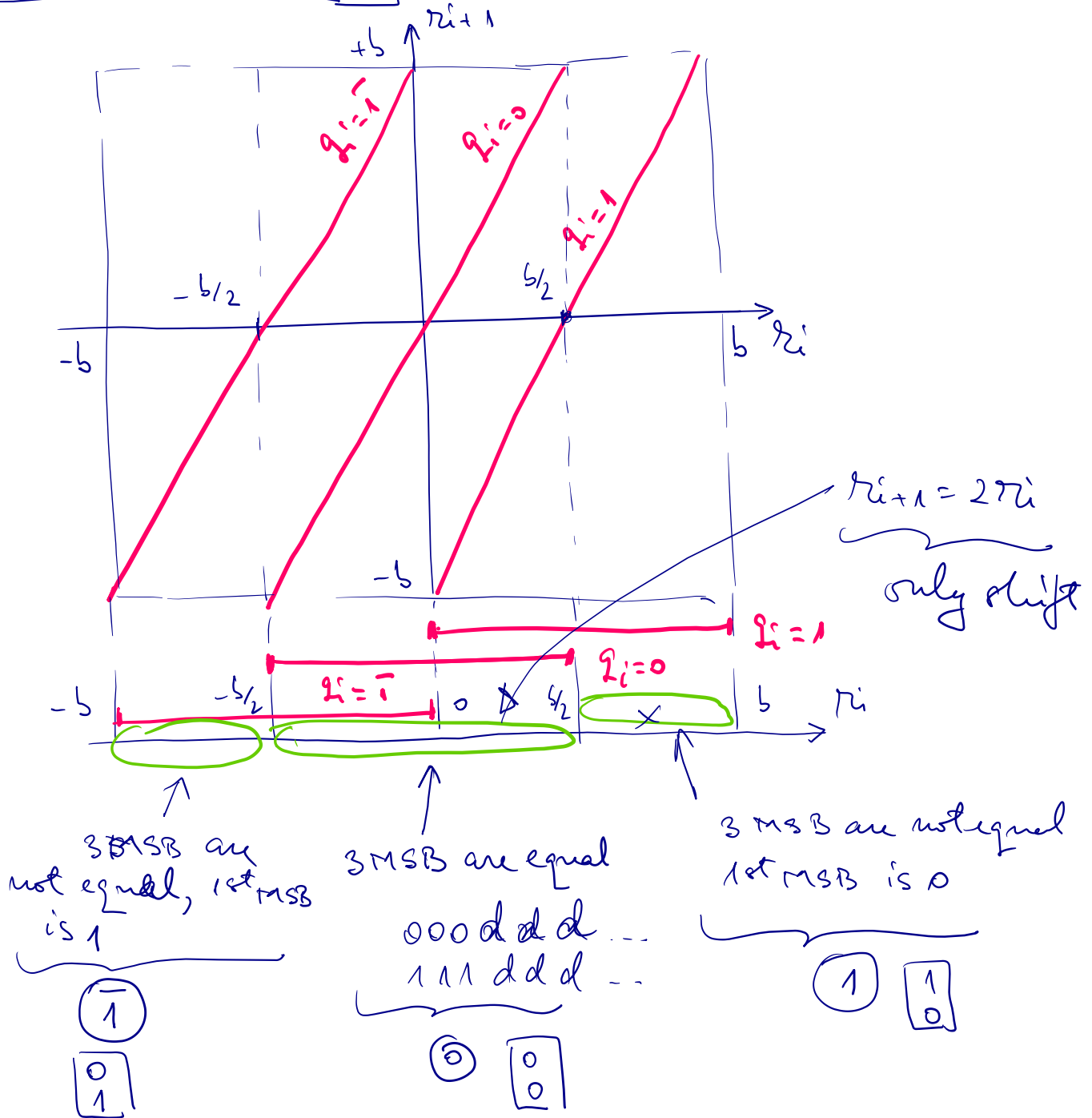
$$\begin{array}{r} 37+ \\ 64 \\ \hline 101 \end{array}$$

1.5 Speeding up division with the SRT algorithm

Radix 2 redundant set of digits $\{\bar{1}, 0, 1\}$

Divisor (M) , b if $|r_i| < b \Rightarrow |r_{i+1}| < b$

$$r_{i+1} = 2r_i - q_i \cdot b \quad q_i \in \{\bar{1}, 0, 1\}$$



1.5.1 Radix-2 SRV example

 $2n + 1$ bits

1m-Werts

n-bit

$$\frac{D \cdot 2^k}{d \cdot 2^k} = \frac{14}{43 + 64}$$

COUNT	P	A	B
000	$Q_0 = 0$ $00000 \ 00000$ $000001 \ 1101$ 000111010	$1110 \ 1011$ $0110 \ 0000$ $1100 \ 0000$	leading $k=5$ 0's $00000 \ 0100$ $1000 \ 0000$
001	$Q_1 = 0$ 001110101	$1000 \ 0000$	
010	$Q_2 = 1$ 011101011 $- 010000000$ 001101011	$0000 \ 0000$	
011	$Q_3 = 1$ 011010110 $- 010000000$ 001010110	$0000 \ 0000$	
100	$Q_4 = 1$ 010101100 $- 010000000$ 000101100	$000 \ 0000$	
101	$Q_5 = 0$ 001011000	$0000 \ 1110$	
110	$Q_6 = 1$ 010110000 $- 010000000$ 000110000	$000 \ 1100$	
111	$Q_7 = 0$ 001100000	$000 \ 1010$	
conv shift	$00000 \ 0011$ Remainder = 3	00111010 Quotient = 58	

shift
over
0's

$$\begin{array}{r} 128 \\ \hline 235 \overline{) 458} \\ \underline{20} \\ 235 \\ \underline{32} \\ 2 \end{array}$$
 $\Delta z +$
$$\begin{array}{r} 26 + \\ 32 \\ \hline 58 \end{array}$$

1.5.2 Sweeney, Robertson & Tocher (SRT)

Divident

Pinson

P

A

3

$$(n+1) \text{ bits}$$

a bit

~ bit

Reminder

Quotient

