

## 9.4.1 Restoring Division

$$\begin{array}{r} 5771 \\ \overline{)135} \\ 101 \\ \hline 42 \end{array}$$

CNT	A	Q	M
000	$  \begin{array}{r}  0010 \quad 1101 \\  -1000 \quad 0111 \\  \hline  1010 \quad 0110 \\  +1000 \quad 0111 \\  \hline  00101101 \\  01011010  \end{array}  $ <p>mn intra</p>	$00010110$ <p>C</p>	$10000111$
001	$  \begin{array}{r}  -10000111 \\  11010011 \\  +10000111 \\  \hline  01011010 \\  10110100  \end{array}  $	$01011000$	
010	$  \begin{array}{r}  -10000111 \\  01011011 \\  +10000111 \\  \hline  01011010 \\  10110000  \end{array}  $ <p>incr</p>	$10110000$	
011	$  \begin{array}{r}  -10000111 \\  10010011 \\  +10000111 \\  \hline  01011010 \\  10110101  \end{array}  $	$01100010$	

### 1.4.1 Restoring division

$$\begin{array}{r}
 5771 \\
 540 \\
 \hline
 = 371 \\
 270 \\
 \hline
 101
 \end{array}
 \quad
 \begin{array}{r}
 135 \\
 42 \\
 \hline
 128 \\
 512 \\
 1024 \\
 4096 \\
 \hline
 5771
 \end{array}$$

M

128

512

1024

4096

5771

128

7

135

COUNT	A	Q	M
000	0010 1101	0001 0110	1000 0111
-	1000 0111		
(1)	0110 0110	0001 0110	
+	1000 0111		
	0010 1101		
	0101 1010	0010 1100	
001	1000 0111		
(1)	1101 0011	0010 1100	
+	1000 0111		
	0101 1010		
	1011 0101	0101 1100	
010	-1000 0111		
(0)	010 1101	0101 1101	
	0101 1010	1011 0010	
(1)	101 0011	1011 0010	
+	1000 0111		
	0101 1010		
	1011 0101	1011 0100	
100	-1000 0111		
(0)	010 1110	0110 0101	
	0101 1100	1100 1010	
(1)	110 0101	1100 1010	
+	1000 0111		
	0101 1100		
	1011 1001	1011 1000	
101	-1000 0111		
(1)	110 0101	1100 1010	
+	1000 0111		
	0101 1100		
	1011 1001	1011 1000	
110	-1000 0111		
(0)	011 0010	1010 1010	
	0110 0101	0101 1010	

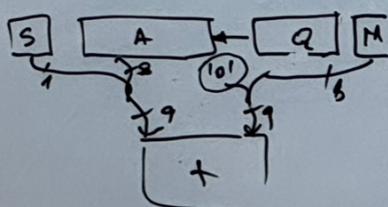
	1011 1001	1010 1010
110	1000 0111	
(0)	011 0010	1010 1010
	0110 0101	0101 1010
111	1000 0111	
(1)	110 1110	010 1010
		(42) <sub>ten</sub>
COL	+1000 0111	
	0110 0101	
		(101) <sub>ten</sub>

## 1.4.2 Non restoring division

Rep. in  
deficit de M

	1011110001	100101000
110-	100000111	100101000
	00110010	100101000
	01100101	100101000
	00101010	100101000

$$\begin{aligned}
 S=1 & \quad r_i - M \\
 q & \quad \textcircled{1} \\
 2r_i - 2M & \\
 +M & \\
 2r_i - M & \\
 (42)_{f_4} &
 \end{aligned}
 \quad
 \begin{aligned}
 S=0 & \quad r_i \\
 q & \quad \textcircled{1} \\
 2r_i - 2M & \\
 -M & \\
 2r_i - 3M &
 \end{aligned}$$



37+  
64  
101

### 1.4.2. Non-restoring division

$$\begin{aligned}
 r_i - M & \\
 0 & \quad \textcircled{0} \\
 1 & \quad \textcircled{1} \\
 2(r_i - M + M) & \\
 2(r_i - M) & \\
 2r_i - M & \\
 2r_i - 2M - M & \\
 2r_i - 3M & \\
 (42)_{f_4} &
 \end{aligned}$$

COUNT	S	A	Q	M
000	0	0010 1101	0001 0110	1000 0111
	-10	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	0101 1101	0101 1001	
	0	0101 1010	1011 0100	
011-	0	1000 0111		
	1	1101 0011	1011 0100	
	1	1010 0111	0110 0100	
100+	0	1000 0111		
	0	0101 1110	0110 0101	
	0	0101 1100	1110 0100	1010
101-	0	1000 0111		
	1	1101 0101	1100 1010	
	1	1010 1011	1001 0100	
110+	0	1000 0111		
	0	0011 0010	1001 0101	
	0	0110 0101	0010 1010	
111-	0	1000 0111		
	1	1101 1110	0101 1010	
	0	1010 0110	(42)_{f_4}	
001+	0	1000 0111		
	0	0110 0101	(101)_{f_4}	

### 1.4.3. Radix-2 SRT

#### 1.4.3 Radix-2 SRT

$$|r_i| < b$$

$$|r_{i+1}| < b$$

$$q_{i+1} \leftarrow 2r_i - q_i b$$

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

$$2b - q_i b \leq b$$

$$q_i = 1$$

$$2b - b = b$$

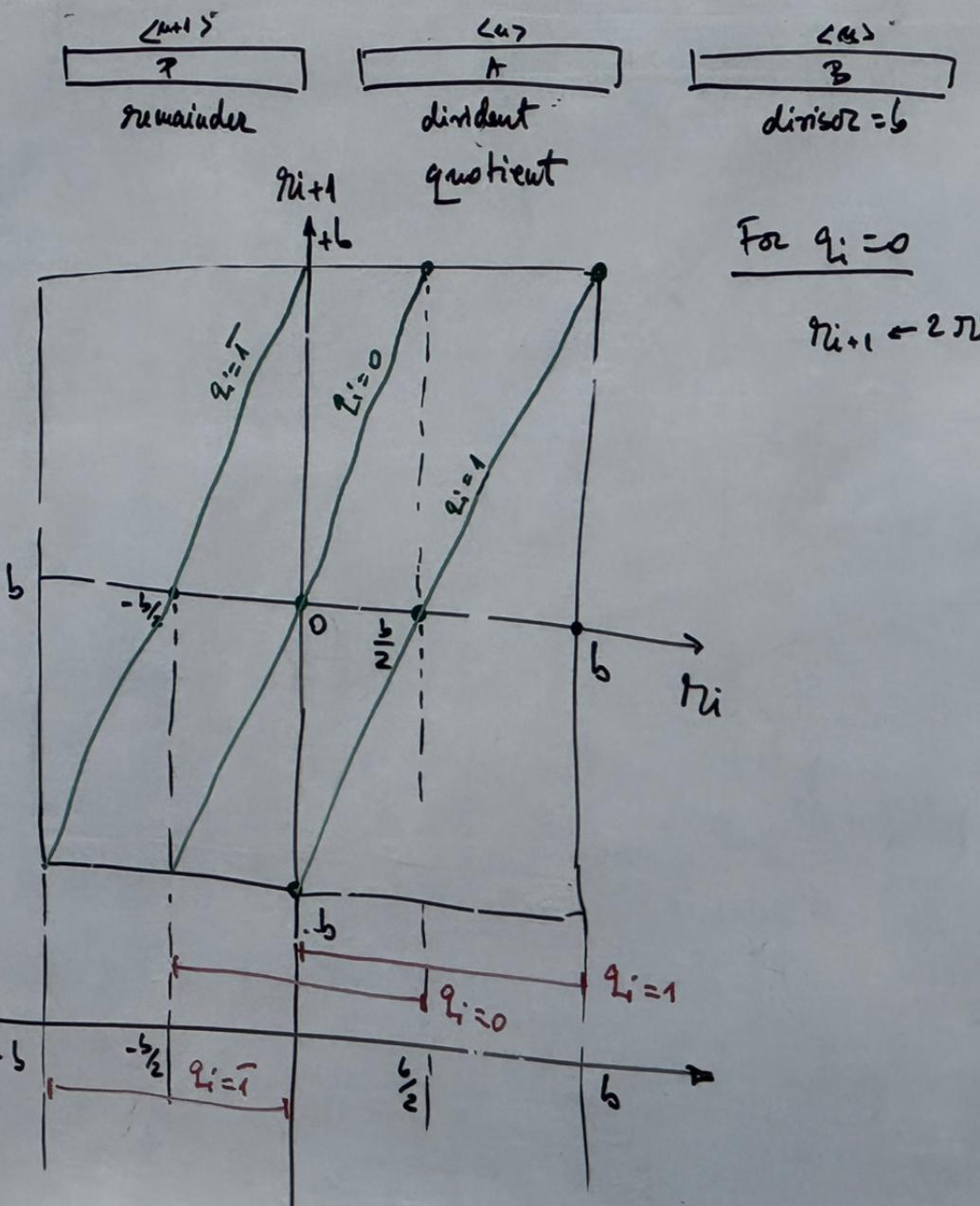
For  $q_i = 1$

$$-b = 2r_i - b$$

$$r_i = 0$$

$$b = 2r$$

$$\Rightarrow r = \frac{b}{2}$$



- Shift P. A.B  $k$  positions left ( $k$  is the number of leading 0s in B)
  - For  $i := 0, n-1$ 
    - If  $P[u] = P[u-1] = P[u-2]$  then
      - Shift P. A 1 position left,  $q_i = 0$
      - Else, if  $P[u] = 0$ 
        - Shift P. A 1 position left,  $q_i = 1$
        - $P \leftarrow P - B$
        - Else
          - Shift P. A 1 position left,  $q_i = \bar{1}$
          - $P \leftarrow P + B$
      - end if
      - end if
    - If  $P[u] = 1$  then
      - $P \leftarrow P + B$
      - $Q \leftarrow Q - 1$
    - end if
- 4 Shift P  $k$  positions right

COUNT	P	A	$k=4$ B
000	0 0000 0000 0 0000 1110 0 0001 1100	1110 0111 0111 0000 1110 0000	0000 1001 1001 0000
001	0 0011 1001	1100 0000	0000
010	0 0111 1001 - 0111 1001 ————— 0 0101 0111	1000 0000 0000	0000
011	0 1110 0111 - 0100 1000 ————— 0 0101 0111	0000 0000 0000	0001
100	0 1010 0111 - 0100 1000 ————— 0 0001 1110	0000 0011 0 0000	0000
101	0 0011 1100	0000 0110 00 0000	0000
110	0 0111 1000	0000 1100 000 0000	0000
111	0 1111 0000 - 0100 1000 ————— 0 0110 0000	0001 100 0000 0000	0000
Shift	0 0000 0110  (6) <sub>ten</sub>	0001 1001  (25) <sub>ten</sub>	

### 1.4.3 Radix-2 SRT

COUNT	P	A	M
000	0 0000 0000	1001 0000	$\cancel{0000 \ 0101}$
	$\underline{+ 0001 \ 0010}$	$\underline{0000 \ 0000}$	$\underline{1010 \ 0000}$
000	$q_0 = 0$		
	$\underline{00010 \ 0100}$	$\underline{0000 \ 0000}$	$\downarrow$
	$q_1 = 0$		
001	$\underline{\cancel{00100 \ 1000}}$	$\underline{0000 \ 0000}$	$\downarrow$
	$q_2 = 1$		
010	$\underline{- 01001 \ 0000}$	$\underline{0000 \ 0001}$	
	$- 01010 \ 0000$		
	$\underline{11111 \ 0000}$		
011	$q_3 = 0$		
	$\underline{11110 \ 0000}$	$\underline{0000 \ 0010}$	$\downarrow$
100	$q_4 = 0$		
	$\underline{11100 \ 0000}$	$\underline{0000 \ 0100}$	$\downarrow$
	$q_5 = 0$		
101	$\underline{11000 \ 0000}$	$\underline{0000 \ 1000}$	$\downarrow$
	$q_6 = 1$		
110	$\underline{10000 \ 0000}$	$\underline{0001 \ 0000}$	
	$+ 01010 \ 0000$		
	$\underline{11010 \ 0000}$	$\underline{0000 \ 0001}$	
111	$q_7 = 1$		
	$\underline{10100 \ 0000}$	$\underline{0010 \ 0000}$	$\downarrow$
	$+ 01010 \ 0000$	$\underline{0000 \ 0000}$	
	$\underline{\cancel{01110 \ 0000}}$	$\underline{0000 \ 0011}$	
002	$01010 \ 0000$	$0010 \ 0000$	
	$\underline{0100 \ 0000}$	$\underline{0000 \ 0100}$	$-$
Skif	$00000 \ 0100$	$00011100$	
Cov!	$(41)_{4^4}$	$(28)_{4^4}$	

$$\begin{array}{r}
 128 + \\
 21 \\
 \hline
 144 \quad 15
 \end{array}$$

$$\begin{array}{r}
 10 \\
 \hline
 49 \quad 45
 \end{array}$$

$$\begin{array}{r}
 128 \\
 16 \\
 \hline
 144
 \end{array}$$

