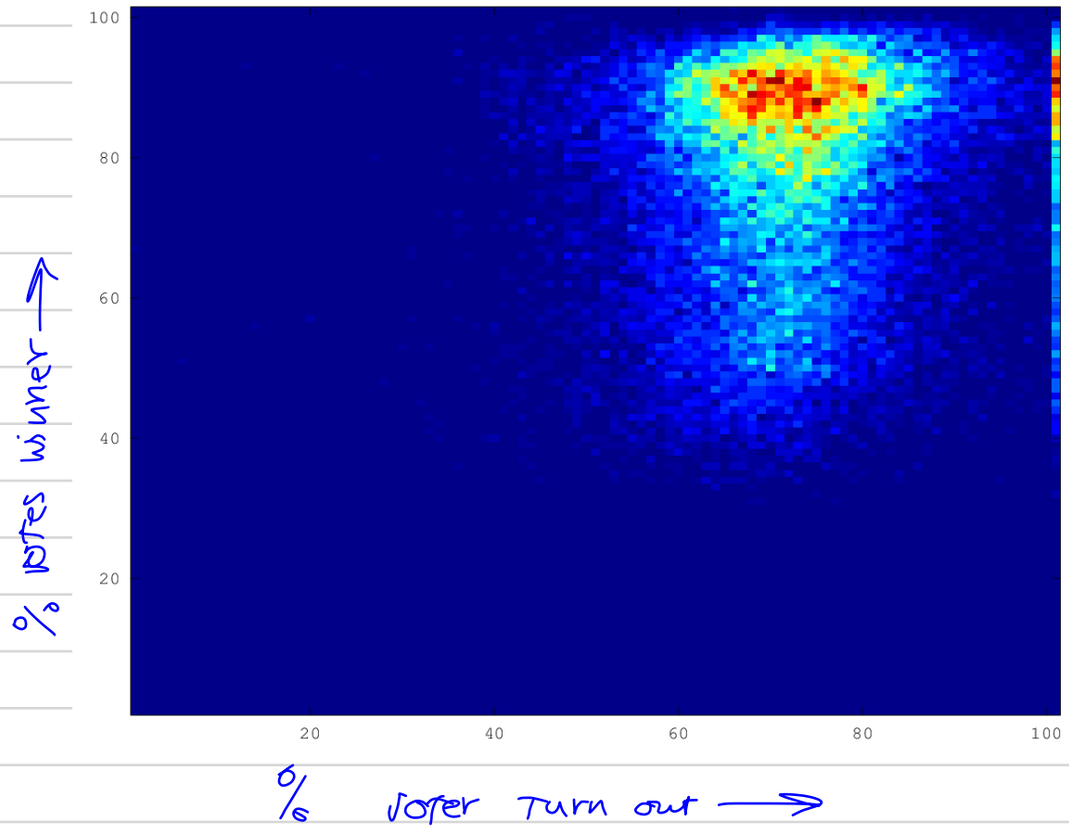
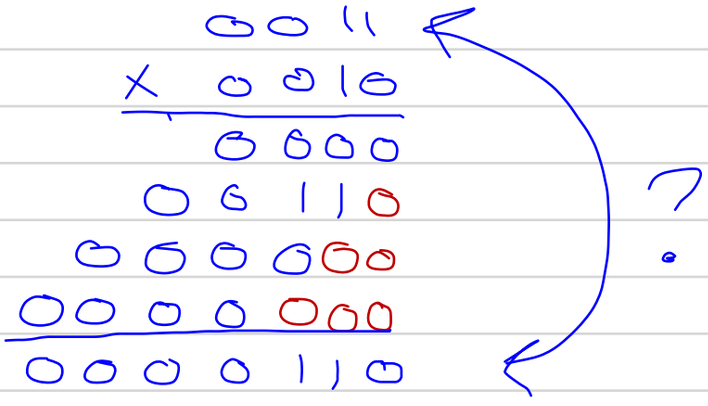
Peter Klimek.



Edward Tufte → Visual display of quantitative information.



left shift ≡ x 2.

Division

$320 \div 6$

(DMSB)?
Divide
Multiply
Subtract
Bringdown...

$$\begin{array}{r} 053 \\ 6\overline{)320} \\ 32 \\ -30 \\ \hline 20 \\ -18 \\ \hline 2 \end{array}$$

$\therefore 320 \div 6 = 53 \text{ rem } 2$

$011001 \div 0011 = 001000 \text{ rem } 01$

$$\begin{array}{r} 001000 \\ 0011\overline{)011001} \\ 011 \\ -011 \\ \hline 0001 \end{array}$$

$$\begin{array}{r} 0.1010 \\ 0.1\overline{)01.0} \\ 01 \\ -01 \\ \hline 01 \\ -01 \\ \hline 0 \end{array}$$

$01001.0110 \div 011.1000$

$Q4.4 \div Q3.4 \quad (m_1 = m_2 \checkmark)$

$01001.0110 \div 011.1000 = 00000010$
$\text{rem } 00001.00110$
$= 00000010.0101 \text{ approx.}$

$$\begin{array}{r} 00000010.0101 \\ 0111000\overline{)01001.0110.00000} \\ 01'0'01011 \\ -\ 01\,11000 \\ \hline 000'0'01100 \\ -\ 0111000 \\ \hline 00'0'0'0100 \\ -\ 0\,1\,1\,1\,0000 \\ \hline 001\,1\,00000 \end{array}$$

Signed division

Method: Unsign all the numbers
Do division as unsigned
Resign answer if necessary ($\oplus \times \ominus$)

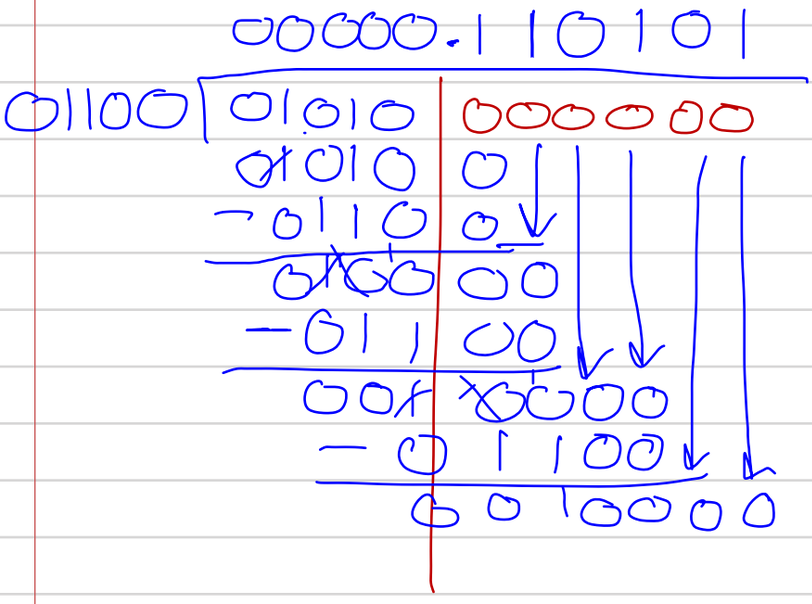
$10.110 \div 01.10 = ?$ Q4.6

$= -1 \times 01.010 \div 0110$

$= -1 \times 01.010 \div 01.100$ Q1.3

$= 00000.110101 \times -1$ Q $(n_{max}) \cdot (m_{max})$ optional

$= 11111.001011$



Floating point numbers

$$y = M \times b^E \quad (= M e E)$$

M – mantissa
b – base (of mantissa)
E – exponent.

Example 1.054×10^3
0.107×10^{-3}

Binary mantissa format Q 0.m Always
Binary exponent format Q n.0 Always
Q m e n

$y = 0.110 \text{ e } 0111$ Q3e4
$= 0.75_{10} \times 2^7$
$= 96$

$y = 1.100 \text{ e } 0100 = (-1 + 0.5) \times 2^{(4)}$
$= -8_{10} = -0.5 \times 16$

Normalisation

Process by which precision is preserved/maximised.

$y = 1.100 \text{ e } 0100$
$= 1.000 \text{ e } 0011$

Left arithmetic shift until $MSB = \overline{MSB_1}$