

Test : 18 August - Flower Hall

Perform the following in signed binary

$$32.31 - 98.2$$

$$\% \text{err} = \frac{\text{Converted} - \text{Actual}}{\text{Actual}} \times 100$$

$$32.31 = 01000000.0101$$

$$(32.3125; 0.008\%)$$

$$98.20 = 01100010.0011$$

$$(98.1875; 0.2\%)$$

$$01100010.001101$$

$$(98.203125; 0.0032\%)$$

$$\begin{array}{r} 01000000.0101 \\ - 01100010.0011 \\ \hline [1] 10111110.0001 \end{array}$$

Q7.6 signed

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carry, no overflow

$$10111110.0001 = -128 + 32 + 16 + 8 + 4 + 2 + 2^{-4} + 2^{-5} + 2^{-6}$$

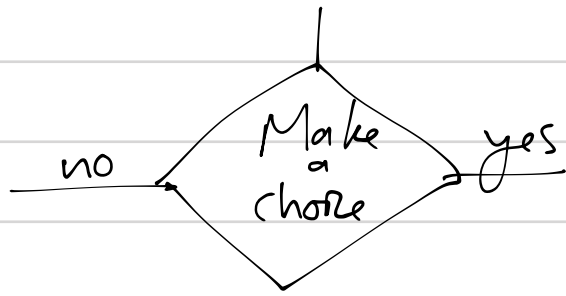
Q7.6s.

$$= -65.890625_{10} (65.89, 0.00095\%)$$

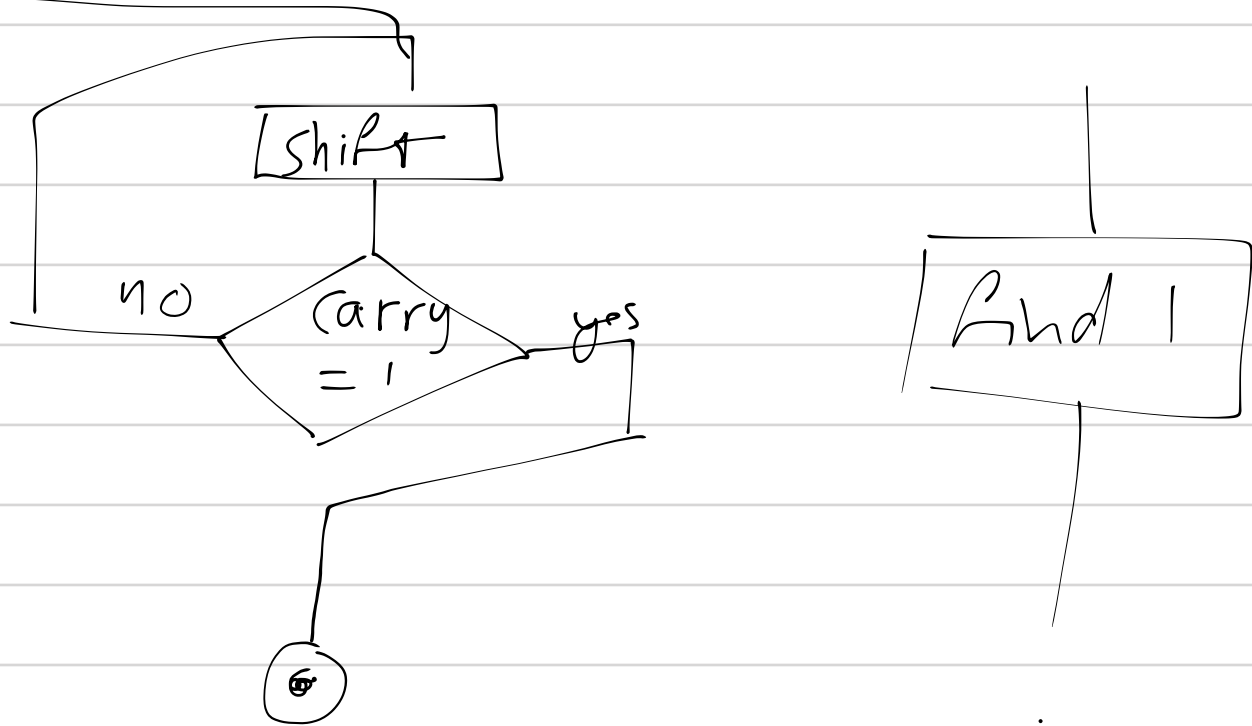
$$2^{-m} \approx \sum_{i=-m-\infty}^{-m-1} 2^i$$

Algorithms

This does stuff



Start (●) Stop (⊙)



Bitwise masking

AND

$$0 \times 0 = 0$$

$$0 \times 1 = 0$$

$$1 \times 0 = 0$$

$$1 \times 1 = 1$$

OR

$$0 + 0 = 0$$

$$0 + 1 = 1$$

$$1 + 0 = 1$$

$$1 + 1 = 1$$

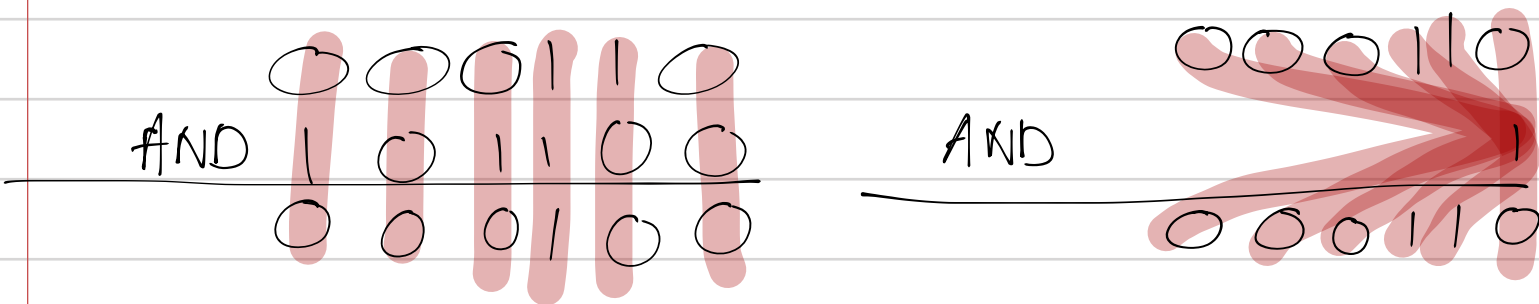
XOR

$$0 \oplus 0 = 0$$

$$1 \oplus 0 = 1$$

$$0 \oplus 1 = 1$$

$$1 \oplus 1 = 0$$



Binary multiplication

$$\begin{array}{r}
 111 \\
 \times 011 \\
 \hline
 111 \\
 1110 \\
 00000 \\
 \hline
 10101
 \end{array}$$

$Q2_u$ $Q2_u$ 7
 $Q2_u$ 3
 $Q4_u$ ($Q(2+2)$) 21 ✓

$$\begin{array}{r}
 11.01 \\
 \times 101.01 \\
 \hline
 1101 \\
 00000 \\
 110100 \\
 000000 \\
 \hline
 11010000 \\
 10001.0001
 \end{array}$$

$Q1.2_u$ 3.25
 $Q2.2_u$ 5.25
 $Q(1+2) \cdot (2+2) + \text{carry}$ 17.0625 ✓
 $Q4 \cdot 4_u$

Signed multiplication

1. Unsign both numbers
2. Do multiplication
3. Resign only if necessary.

$$-7 \times 6.25 =$$

$$-7 = -8 + 1 = 1001$$

$$+6.25 = 4 + 2 + \frac{1}{4} = 0110.01$$

unsign

0111

Q 3. 0_n - 7

x011001

Q 3. 2 + 6.25

0111

00000

000000

0111000

01110000

0000000000

Q(3+3) * (0+2)

0101011.11

Q 6. 2

Resign: 1010100.00

+LSB

$$1010100.01$$

-43.75