Corrigé des exercices CL

1. Donnez la représentation flottante, en simple précision, des nombres suivants :

1. 128

• S = 0

• |128| = 128 = 1000 0000_2

• 128 = (1,0)2 × 27 M = 00…0_2 et e = 7

• E = e + biais = 7 + 127 = 6 + 128 E = 1000 0110_2

• 128 → 0 10000110 00000000000000000000000

2. –32,75

• S = 1

• 0,75× 2 = 1,5 0,5 × 2 = 1 |–32,75| = 32,75 = 10 0000,112

• 32,75 = (1,0000011)2 × 25 M = 00000110…0_2 et e = 5

• E = e + biais = 5 + 127 = 4 + 128 E = 1000 0100_2

• –32,75 → 1 10000100 00000110000000000000000

3. 18,125

• S = 0 • 0,125× 2 = 0,25 0,25 × 2 = 0,5 0,5 × 2 = 1 |18,125| = 18,125 = 1 0010,001_2

• 18,125 = (1,0010001)2 × 24 M = 00100010…02 et e = 4

• E = e + biais = 4 + 127 = 3 + 128 E = 1000 0011_2

• 18,125 → 0 10000011 00100010000000000000000

4. 0,0625

• S = 0

• 0,0625 × 2 = 0,125 0,125 × 2 = 0,25 0,25 × 2 = 0,5 0,5 × 2 = 1 |0,0625| = 0,0625 = 0,0001_2

• 0,0625 = (1,0)2 × 2–4 M = 00…02 et e = –4

• E = e + biais = –4 + 127 E = 0111 1011_2

• 0,0625 → 0 01111011 00000000000000000000000

Donnez la représentation flottante, en double précision, des nombres suivants :

1. 1

• S = 0

• |1| = 1 = 1_2

• 1 = (1,0)2 × 20 M = 00…02 et e = 0

• E = e + biais = 0 + 1023 E = 011 1111 1111_2

• 1 → 0 01111111111 00……0

2. –64

• S = 1

• |–64| = 64 = 100 0000_2

• 64 = (1,0)2 × 26 M = 00…02 et e = 6

• E = e + biais = 6 + 1023 = 5 + 1024 E = 100 0000 0101_2

• –64 → 1 10000000101 00……0

3. 12,06640625

• S = 0

• 0,06640625× 2 = 0,1328125 0,1328125 × 2 = 0,265625 0,265625 × 2 = 0,53125 0,53125 × 2 = 1,0625 0,0625 × 2 = 0,125 0,125 × 2 = 0,25 0,25 × 2 = 0,5 0,5 × 2 = 1 |12,06640625| = 12,06640625 = $1100,00010001_2$

• 12,06640625 = (1,10000010001)2 × 23 M = $100000100010…0_2$ et e = 3

• E = e + biais = 3 + 1023 = 2 + 1024 E = 100 0000 0010_2

• 12,06640625 → 0 10000000010 100000100010……0

4. 0,2734375

• S = 0

• 0,2734375 × 2 = 0,546875 0,546875 × 2 = 1,09375 0,09375 × 2 = 0,1875 0,1875 × 2 = 0,375 0,375 × 2 = 0,75 0,75 × 2 = 1,5 0,5 × 2 = 1 |0,2734375| = 0,2734375 = $0,0100011_2$

• 0,2734375 = (1,00011)2 × 2–2 M = 000110…02 et e = –2

• E = e + biais = –2 + 1023 E = 011 1111 1101_2

• 0,2734375 → 0 01111111101 000110……0

Donnez la représentation décimale des nombres codés en simple précision suivants :

1. 1011 1101 0100 0000 0000 0000 0000 0000_2

• S = 1 → négatif

• e = E – biais = 0111 10102 – 127 e = 122 – 127 e = –5

• m = (1,M)2 = (1,1)2 • –m × 2e = $–(1,1)2 \times 2^{-5}$

• = $–(11)2 \times 2^{-6} = –3 \times 2^{-6} = –0,046875$

2. 0101 0101 0110 0000 0000 0000 0000 0000_2

• S = 0 → positif

- e = E – biais = 1010 10102 – 127 e = 170 – 127 e = 43
- m = (1,M)2 = (1,11)2
- $+m \times 2e = +(1,11)2 \times 2^{43}$
- $= +(111)2 \times 241 = +7 \times 241 \approx +1,5393 \times 10^{13}$

3. $1100\ 0001\ 1111\ 0000\ 0000\ 0000\ 0000\ 0000_2$

- S = 1 → négatif
- $e = E – biais = 1000\ 0011_2 – 127$ e = 131 – 127 e = 4
- m = (1,M)2 = (1,111)2
- $–m \times 2^e = –(1,111)2 \times 2^4$
- $= –(11110)2 \times 2^0 = –30$