

# Arithmétique de l'ordi ( $\mathbb{Z}$ )

1. a)  $34 \mid 2$   $\boxed{00100010}$

17	0
8	1
4	0
2	0
1	0
0	1

↑ on ne le modifie pas

b)  $97 \mid 2$   $\boxed{01100001}$

48	1
24	0
12	0
6	0
3	0
1	1
0	1

↑ on ne le modifie pas

c)  $24 \mid 2$   $00011000 = 24$

12	0
6	0
3	0
1	1
0	1

↑ négatif donc

$\boxed{11101000 = -24}$

d)  $2 \mid 2$   $\boxed{00000010} = 2$

1	0
0	1

↑ négatif donc

$\boxed{11111110 = -2}$

2. a)  $34 + 128 = 162$

162	12
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81	0
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40	1
----	---

20	0
----	---

10	0	↑
----	---	---

5	0
---	---

2	1
---	---

1	0
---	---

0	1
---	---

$10100010$

b)  $97 + 128 = 225$

225	12
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112	1
-----	---

56	0
----	---

28	0
----	---

14	0	↑
----	---	---

7	0
---	---

3	1
---	---

1	1
---	---

0	1
---	---

$11100001$

2. c)  $-24 + 128 = 104$

104	2	
52	0	
26	0	
13	0	↑
6	1	
3	0	
1	1	
0	1	

d)  $-2 + 128 = 126$

126	2	
63	0	
31	1	
15	1	↑
7	1	
3	1	
1	1	
0	1	

3. a)  $1100110011$

↑ négatif donc on convertit vers du positif

$01101101$   $2^0 + 2^2 + 2^3 + 2^5 + 2^6 = 109$   
 $1-109$

b)  $10010011$   $2^0 + 2^1 + 2^4 + 2^7 = 147$   
 $147 - 128 = 19$

4. a)  $0011101101$   $2^0 + 2^2 + 2^4 + 2^5 = 53$   
 $+53$

b)  $+53 - 128 = -75$

5. a)  $1110011100$

↑ indique un négatif donc on convertit en positif:  $00110100 = 2^2 + 2^4 + 2^5 = -52$

b)  $11001100 = 2^2 + 2^3 + 2^6 + 2^7 = 204$   
 $204 - 128 = 76$

6. a)  $15 + 26$

15	2	26	2
7	1	13	0
3	1	6	1
1	1	3	0
0	1	1	1
		0	1

$+ 00001111$   
 $00011010$   
 $00101001$   
 $2^0 + 2^3 + 2^5 = 41$

b)  $92 + 44$

92	2	44	2
46	0	22	0
23	0	11	0
11	1	5	1
5	1	2	1
2	1	1	0
1	0	0	1
0	1		

$01011100$   
 $+ 101100$   
 $10001000$   
Débordement!

c)  $77 - 23$

77	2	23	2
38	1	11	1
19	0	5	1
9	1	2	1
4	1	1	0
2	0	0	1
1	0		
0	1		

$01001101$   
 $+ 11101001$   
 $00110110$   
 $2^1 + 2^2 + 2^4 + 2^5 = 54$

d)  $-57 - 125$

57	2	125	2
28	1	62	1
14	0	31	0
7	0	15	1
3	1	7	1
1	1	3	1
0	1	1	1

$0111001$   
 $1000111 \rightarrow -57$   
 $0111101$   
 $1000011 \rightarrow -125$   
 $11000111$   
 $+ 10000011$   
 $01001010$   
Débordement!