

# Binary Numbers (1A)

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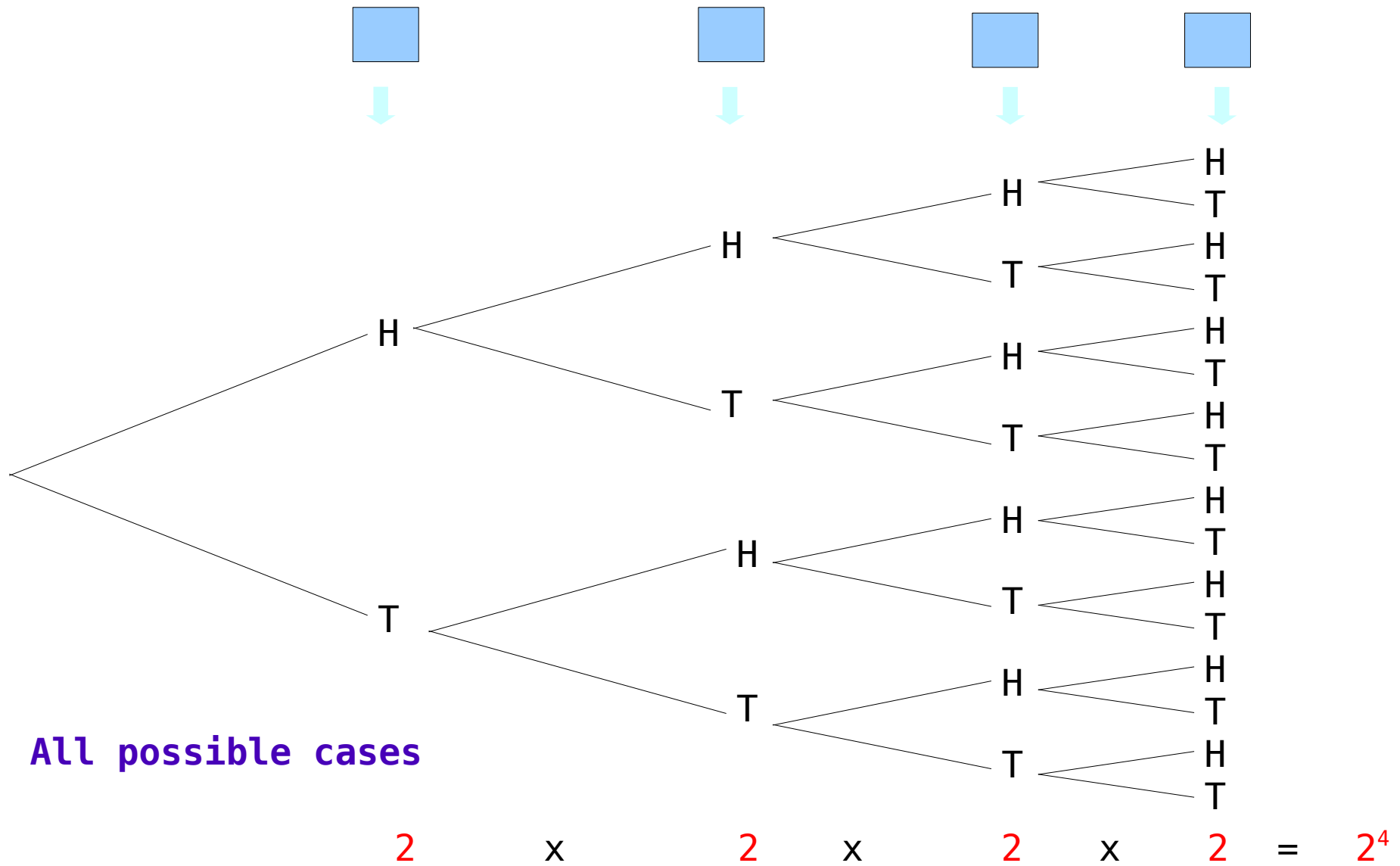
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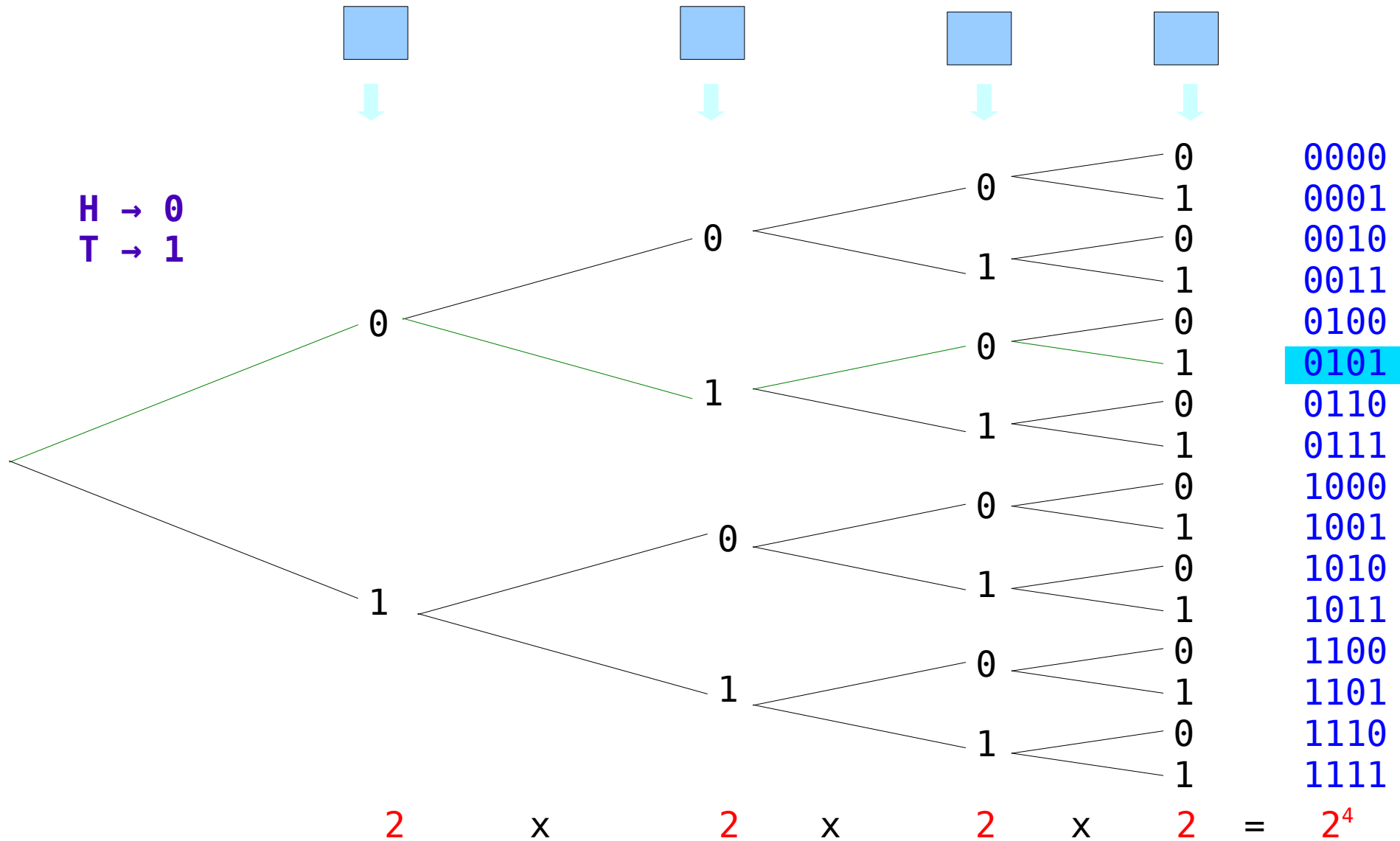
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# Coin Toss



# Coin Toss and Binary Number



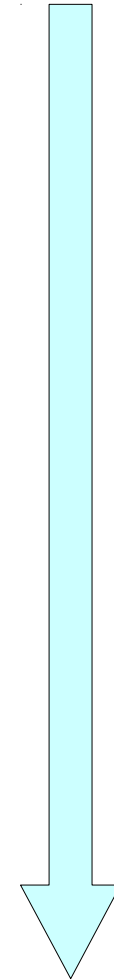
# Hexadecimal and Octal Numbers

|         | DEC | HEX | OCT |
|---------|-----|-----|-----|
| 0 0 0 0 | 0   | 0   | 0   |
| 0 0 0 1 | 1   | 1   | 1   |
| 0 0 1 0 | 2   | 2   | 2   |
| 0 0 1 1 | 3   | 3   | 3   |
| 0 1 0 0 | 4   | 4   | 4   |
| 0 1 0 1 | 5   | 5   | 5   |
| 0 1 1 0 | 6   | 6   | 6   |
| 0 1 1 1 | 7   | 7   | 7   |
| 1 0 0 0 | 8   | 8   | 10  |
| 1 0 0 1 | 9   | 9   | 11  |
| 1 0 1 0 | 10  | A   | 12  |
| 1 0 1 1 | 11  | B   | 13  |
| 1 1 0 0 | 12  | C   | 14  |
| 1 1 0 1 | 13  | D   | 15  |
| 1 1 1 0 | 14  | E   | 16  |
| 1 1 1 1 | 15  | F   | 17  |



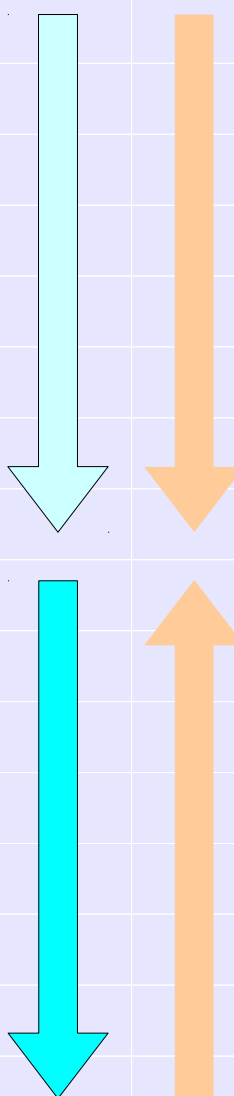
# Unsigned Integer Number

|   |   |   |   |  |    |  |  |
|---|---|---|---|--|----|--|--|
| 0 | 0 | 0 | 0 |  | 0  |  |  |
| 0 | 0 | 0 | 1 |  | 1  |  |  |
| 0 | 0 | 1 | 0 |  | 2  |  |  |
| 0 | 0 | 1 | 1 |  | 3  |  |  |
| 0 | 1 | 0 | 0 |  | 4  |  |  |
| 0 | 1 | 0 | 1 |  | 5  |  |  |
| 0 | 1 | 1 | 0 |  | 6  |  |  |
| 0 | 1 | 1 | 1 |  | 7  |  |  |
| 1 | 0 | 0 | 0 |  | 8  |  |  |
| 1 | 0 | 0 | 1 |  | 9  |  |  |
| 1 | 0 | 1 | 0 |  | 10 |  |  |
| 1 | 0 | 1 | 1 |  | 11 |  |  |
| 1 | 1 | 0 | 0 |  | 12 |  |  |
| 1 | 1 | 0 | 1 |  | 13 |  |  |
| 1 | 1 | 1 | 0 |  | 14 |  |  |
| 1 | 1 | 1 | 1 |  | 15 |  |  |



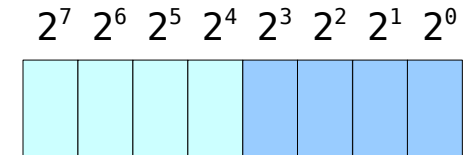
# Signed Integer Number

|   |   |   |   |    |
|---|---|---|---|----|
| 0 | 0 | 0 | 0 | 0  |
| 0 | 0 | 0 | 1 | +1 |
| 0 | 0 | 1 | 0 | +2 |
| 0 | 0 | 1 | 1 | +3 |
| 0 | 1 | 0 | 0 | +4 |
| 0 | 1 | 0 | 1 | +5 |
| 0 | 1 | 1 | 0 | +6 |
| 0 | 1 | 1 | 1 | +7 |
| 1 | 0 | 0 | 0 | -8 |
| 1 | 0 | 0 | 1 | -7 |
| 1 | 0 | 1 | 0 | -6 |
| 1 | 0 | 1 | 1 | -5 |
| 1 | 1 | 0 | 0 | -4 |
| 1 | 1 | 0 | 1 | -3 |
| 1 | 1 | 1 | 0 | -2 |
| 1 | 1 | 1 | 1 | -1 |

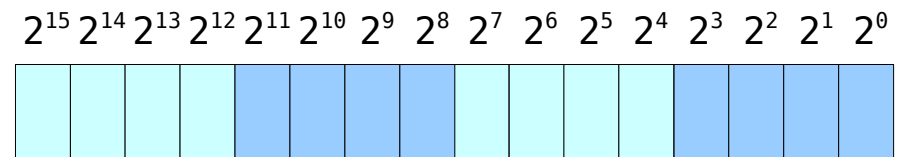


# Unsigned Integer Numbers in 1, 2, 4 Bytes

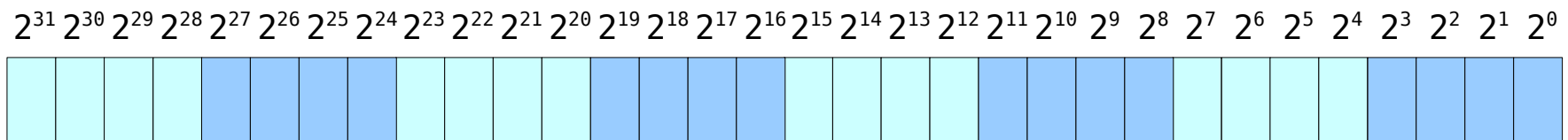
1 Byte : unsigned char



2 Bytes: unsigned short



4 Bytes: unsigned int  
unsigned long

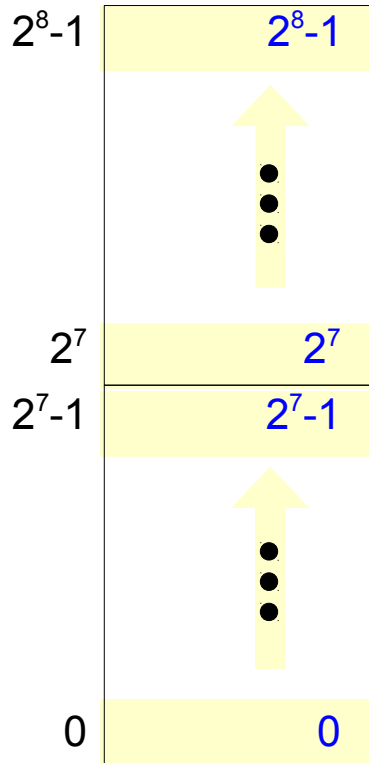




# Unsigned Integer Ranges

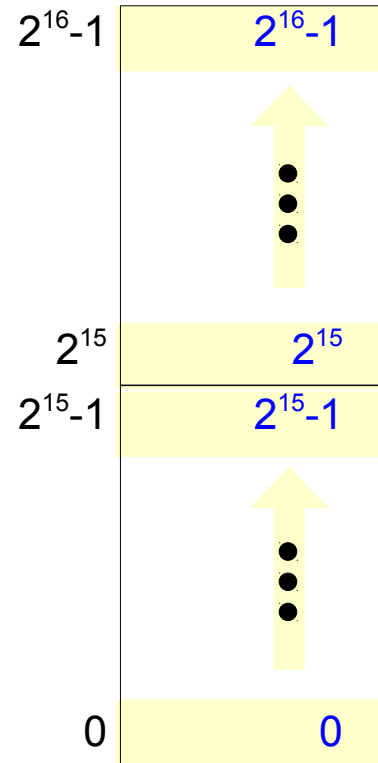
1 Byte

|       |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|
| $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
|-------|-------|-------|-------|-------|-------|-------|-------|



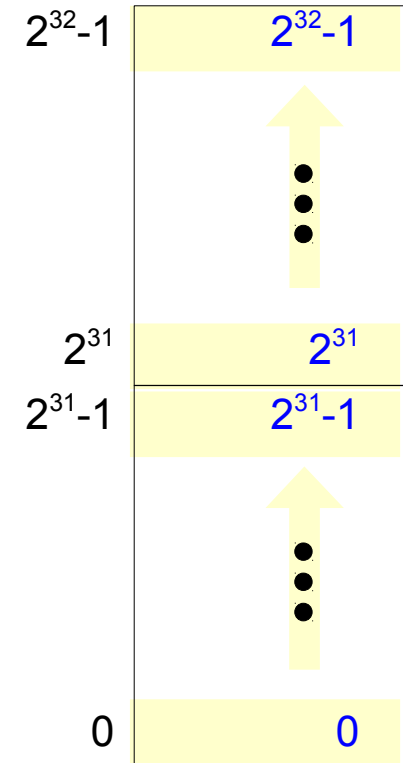
2 Bytes

|          |          |          |          |          |          |       |       |
|----------|----------|----------|----------|----------|----------|-------|-------|
| $2^{15}$ | $2^{14}$ | $2^{13}$ | $2^{12}$ | $2^{11}$ | $2^{10}$ | $2^9$ | $2^8$ |
| $2^7$    | $2^6$    | $2^5$    | $2^4$    | $2^3$    | $2^2$    | $2^1$ | $2^0$ |



4 Bytes

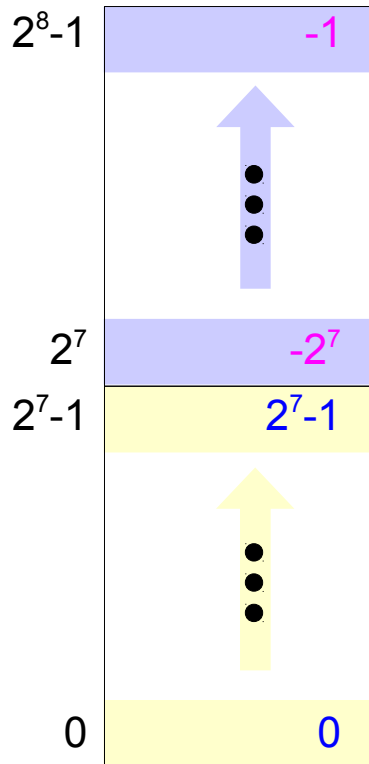
|          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|
| $2^{31}$ | $2^{30}$ | $2^{29}$ | $2^{28}$ | $2^{27}$ | $2^{26}$ | $2^{25}$ | $2^{24}$ |
| $2^{23}$ | $2^{22}$ | $2^{21}$ | $2^{20}$ | $2^{19}$ | $2^{18}$ | $2^{17}$ | $2^{16}$ |
| $2^{15}$ | $2^{14}$ | $2^{13}$ | $2^{12}$ | $2^{11}$ | $2^{10}$ | $2^9$    | $2^8$    |
| $2^7$    | $2^6$    | $2^5$    | $2^4$    | $2^3$    | $2^2$    | $2^1$    | $2^0$    |



# Signed Integer Ranges

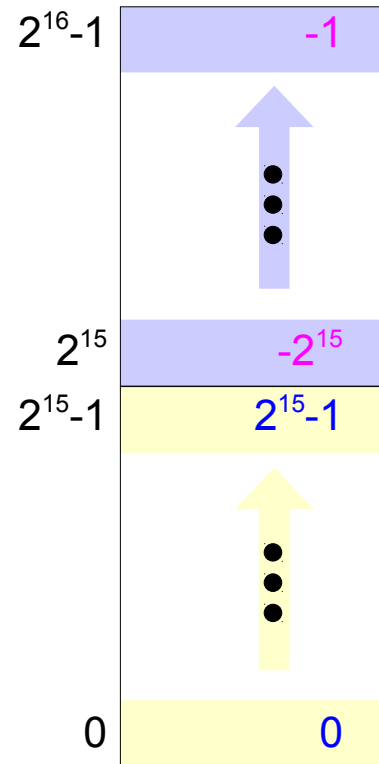
1 Byte

|       |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|-------|
| $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
|-------|-------|-------|-------|-------|-------|-------|-------|



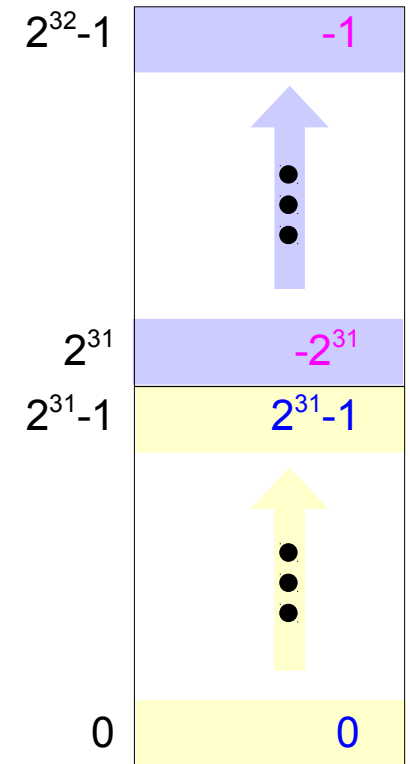
2 Bytes

|          |          |          |          |          |          |       |       |
|----------|----------|----------|----------|----------|----------|-------|-------|
| $2^{15}$ | $2^{14}$ | $2^{13}$ | $2^{12}$ | $2^{11}$ | $2^{10}$ | $2^9$ | $2^8$ |
| $2^7$    | $2^6$    | $2^5$    | $2^4$    | $2^3$    | $2^2$    | $2^1$ | $2^0$ |



4 Bytes

|          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|
| $2^{31}$ | $2^{30}$ | $2^{29}$ | $2^{28}$ | $2^{27}$ | $2^{26}$ | $2^{25}$ | $2^{24}$ |
| $2^{23}$ | $2^{22}$ | $2^{21}$ | $2^{20}$ | $2^{19}$ | $2^{18}$ | $2^{17}$ | $2^{16}$ |
| $2^{15}$ | $2^{14}$ | $2^{13}$ | $2^{12}$ | $2^{11}$ | $2^{10}$ | $2^9$    | $2^8$    |
| $2^7$    | $2^6$    | $2^5$    | $2^4$    | $2^3$    | $2^2$    | $2^1$    | $2^0$    |



## References

- [1] Essential C, Nick Parlante
- [2] Efficient C Programming, Mark A. Weiss
- [3] C A Reference Manual, Samuel P. Harbison & Guy L. Steele Jr.
- [4] C Language Express, I. K. Chun