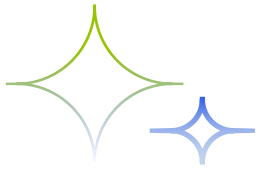

MONTANA
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Programming with C I

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Binary

- Computers represent everything as bits
- Recall: a byte is 8 bits
- Int: 4 bytes (32 bits)
- What's the largest int we can represent?

2^32 - 1

(unsigned)

Hexadecimal (base 16)

- **Binary takes up a lot of space**
- **Hexadecimal takes few digits but can easily be converted to binary (and vice versa)**
  - Hex uses digits 0-9 and a-f
  - 1 hex digit = 4 bits
- **0000 0000 0000 0001 1101 0011 0101 1011**
- **1d35b**

In C

Format ints

- %d for decimal
- %b for binary
- %x for hex

Assign ints

- 0b for binary (ex: 0b11011 is 27)
- 0x for hex (ex: 0x83fa9 is 540585)

Bitwise Operators

- You know logical operators…&&,||,!
- We will now learn &,|,~,^,<<,>>
- These operate at the bit level

Table

&

a	b	a & b
1	1	1
0	0	0
0	1	0
0	0	0

Table

|

a	b	a | b
1	1	1
0	0	1
0	1	1
0	0	0

Table

^

a	b	a ^ b
1	1	0
1	0	1
0	1	1
0	0	0

Table

~

a	~a
1	0
0	1

Operators on multiple bits

AND

```
    0110
&   1100
    ----
    0100
```

OR

```
    0110
|   1100
    ----
    1110
```

XOR

```
    0110
^   1100
    ----
    1010
```

NOT

```
^   1100
    ----
    0011
```

THE END

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