General Primitives

Boolean:

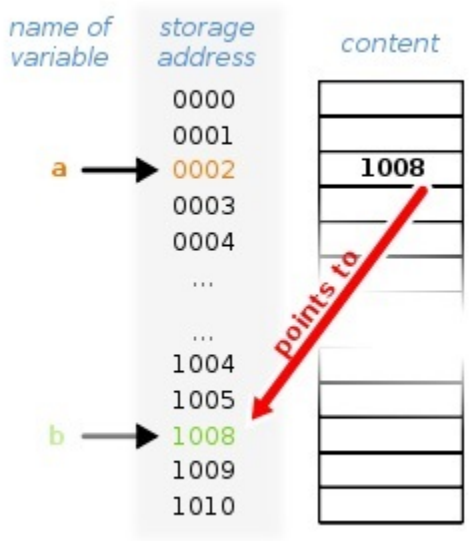
- true or false
- some languages 0 is false
  - C
  - not Java

Floating-Point Number:

- float
  - faster
  - only use to operate on a lot of floating- point numbers (think in the order of thousands or more) and analysis of the algorithm has shown that the reduced range and accuracy don't pose a problem
  - scientific notation in base 2
- double
  - more precise
  - use in default
  - long double can be used if you need more range or accuracy than double
- real

Character:

Pointers



Definition:

- object whose value refers to another value stored elsewhere in the computer memory using its memory address

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Syntax:

- C
  - `int *ptr;`
    - This declares ptr as the identifier pointer that points to an object of type int

```
int a = 5;
   int *ptr = NULL;
   ptr = &a;
```

  -
    - Assigns the value of the address of a to ptr
    - example: if a is stored at memory location of 0x8130 then the value of ptr will be 0x8130 after the assignment
    - To dereference the pointer, an asterisk is used again
  - `*ptr = 8;`
    - This means take the contents of ptr (which is 0x8130), "locate" that address in memory and set its value to 8

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sources:

- https://en.wikipedia.org/wiki/Pointer_(computer_programming)

Ints

Representation:

- Binary
- Two's Complement
- Hexadecimal

Division and Modulus:

- Division is floored

Notes:

- Finite memory for infinitely many integers
- Arithmetic overflow (after max is -, before min is +)
  - when dividing Integer.Min by -1
  - in multiplication, addition, subtraction

Bit Manipulation

Basics:

And (&):	0 & 0 = 0	1 & 0 = 0	0 & 1 = 0	1 & 1 = 1
Or (|):	0 |0 = 0	1 |0 = 1	0 |1 = 1	1 |1 = 1
Xor ($\bigwedge$):	0 ^0 = 0	1 ^0 = 0	0 ^1 = 0	1 ^1 = 1

Shifts:

- Left Shift: If you run out of space the bits drop off
  - Both arith and logical shift in 0

  1. 00011001 <<2 = 01100100
  2. 00011001 <<4 = 10010000

- Right Shift if you run out of space the bits drop off
  - arithmetic shift - shift in sign bit (sticky shift), logical-shift in 0

  1. 00011001 >>2 = 00000110
  2. 00011001 >>4 = 00000001

Notes:

- Windows calculator can do operations in binary, view programmer

Arrays

Big O:

- space O(n)
- time
  - access worst O(1), average O(1)
  - search worst O(n), average O(n)
  - insert worst O(n), average O(n)
  - delete worst O(n), average O(n)

ArrayList (Dynamically Resizing Array):

```
public ArrayList<String> merge(String[] words, String[] more) {
   ArrayList<String> sentence = new ArrayList<String>();
   for (String w : words) sentence.add(w);
   for (String w : more) sentence.add(w);
   return sentence;
 }
```

Notes:

- Index starts with 0