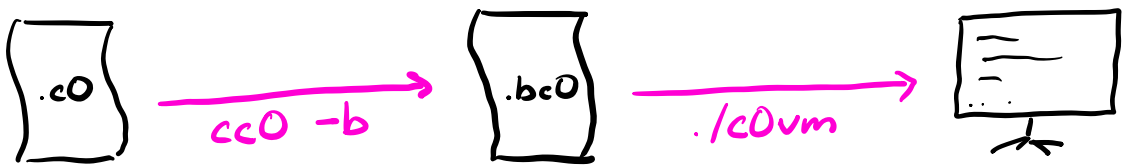
COVM



overview

- stack machine (like Clac) ← most operations happen on the stack
  - supplemented with local variable array
- compiler turns code into **bytecode** represented in an array
  - can move forwards and backwards on it
- COVM reads the bytecode instructions and does stuff
  - instruction opcodes take 1 byte, but some come with additional bytes of operands
    - bipush = 0x10, next byte tells what to push
    - ildc = 0x13, next 2 bytes tell what int_pool index to get
- for control flow (goto, if_*), the offset is from the index of the actual instruction!
- function arguments are pre-loaded into its variable array at runtime, starting at index 0 and in order of how they appear

ex) translate this C0 code into byte code

```
int fun(int a, int b) {
    int games = a+b;
    return games*games;
}
```

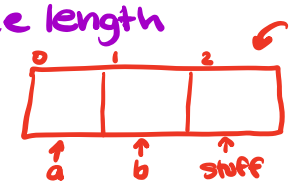
Arithmetic

0x60	iadd	S, x:w32, y:w32 -> S, x+y:w32
0x64	isub	S, x:w32, y:w32 -> S, x-y:w32
0x68	imul	S, x:w32, y:w32 -> S, x*y:w32
0x6C	idiv	S, x:w32, y:w32 -> S, x/y:w32
0x70	irem	S, x:w32, y:w32 -> S, x%y:w32
0x7E	iand	S, x:w32, y:w32 -> S, x&y:w32
0x80	ior	S, x:w32, y:w32 -> S, x|y:w32
0x82	ixor	S, x:w32, y:w32 -> S, x^y:w32
0x78	ishl	S, x:w32, y:w32 -> S, x<<y:w32
0x7A	ishr	S, x:w32, y:w32 -> S, x>>y:w32

Local Variables

0x15 vload <i>	S -> S, v	(v = V[i])
0x36 vstore <i>	S, v -> S	(V[i] = v)

```
#<fun>
02          # of arguments
03          # of local variables
00 0D       code length
15 00
15 01
60
36 02
15 02
15 02
68
B0          return
```



functions n things

- **native** functions are CO library functions (printint, string-join, etc.)
- **static** functions are user defined functions
- call stack + frames are how we keep track of previous function states so we can pick up where we left off