Let's add (+ <expr> <expr>) to the compiler, and (let (x <expr>) <expr>)

```
(*
expr := <number>
    | (add1 <expr>)
    | (+ <expr> <expr>)
    | (let (<name> <expr>) <expr>)
    | <name>
*)
enum Expr {
  Num(i32),
  Add1(Box<Expr>),
  Plus(Box<Expr>, Box<Expr>),



}

fn compile_expr(e : &Expr, si: i32                    ) -> String {
  match e {
       Expr::Num(n) => format!("mov rax, {}", *n),
       Expr::Add1(subexpr) => {
           compile_expr(subexpr, si) + "\nadd rax, 1"
       },
       Expr::Plus(e1, e2) => {
          let e1_instrs = compile_expr(e1, si);
          let e2_instrs = compile_expr(e2, si + 1);
          let stack_offset = si * 8;
          format!("
             {e1_instrs}
             mov [rsp - {stack_offset}], rax
             {e2_instrs}
             add rax, [rsp - {stack_offset}]
          ")
       }
       Expr::Let(x, e, body) => {









     }
}
```

(+ 4 (+ 100 20))

What assembly is produced?

mov rax, 4
mov [rsp – 16], rax
mov rax, 100
mov [rsp – 24], rax
you fill in the rest as review!

(let (x 10)
  (let (y 10)
    (+ x y)))

What assembly should we produce?

Let's agree on what each of these programs should evaluate to…

(let (x 10)
  (let (y 10)
    (+ x y)))

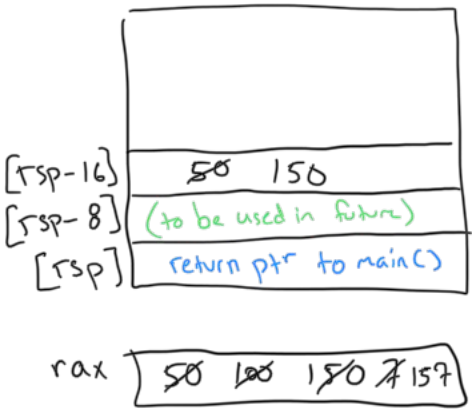
(+ (let (x 10) (add1 x))
  (let (y 7) (+ x y)))

(let (x (let (y 10) (add1 y)))
  (add1 x))

(let (x 10)
  (let (x (add1 x))
    (+ x 10)))

(+ (+ 50 100) 7)

```
mov rax, 50
mov [rsp – 16], rax
mov rax, 100
add rax, [rsp – 16]
mov [rsp – 16], rax
mov rax, 7
add rax, [rsp – 16]
```



mov <reg>, <value> *move <value> into reg, <value> could be a constant, another reg, or memory location*

mov [<reg> + <offset>], <value> *move <value> into memory at address [<reg> + <offset>], value could be const or reg*
*(value **cannot** be another mem location)*

add <reg>, <value> *add <value> to the value in <reg> and store the result in <reg>*
value could be const, register, or a memory location

Rust Immutable Data Structures: https://docs.rs/im/latest/im/

Module im::hashmap

An unordered map.
An immutable hash map using hash array mapped tries.
Most operations on this map are O($\log_x$ n) for a suitably high *x* that it should be nearly O(1) for most maps. Because of this, it's a great choice for a generic map as long as you don't mind that keys will need to implement Hash and Eq.

pub fn update(&self, k: K, v: V) -> Self
Construct a new hash map by inserting a key/value mapping into a map.
If the map already has a mapping for the given key, the previous value is overwritten.
Time: O(log n)
Examples

```
let map = hashmap!{};
assert_eq!(
  map.update(123, "123"),
  hashmap!{123 => "123"} );
```

pub fn get<BK>(&self, key: &BK) -> Option<&V> where
BK: Hash + Eq + ?Sized,
K: Borrow<BK>,
Get the value for a key from a hash map.
Time: O(log n)
Examples

```
let map = hashmap!{123 => "lol"};
assert_eq!( map.get(&123), Some(&"lol") );
```