Project Pre-Proposal

1.) Who are the members of your team?
- Sean Harrison
- Sean Donohoe

2.) What basic problem will your project try to solve?

We would like to come up with an integer linear programming solution to the register allocation problem. This should solve:
- A one pass solution to the register allocation problem
- An optimal solution to register allocation
- We do a minimal spilling solution in one pass
- There is potential we could apply this to local allocation problems as well
- Integer linear programming is an NP-complete problem, so it could be extraordinary costly in time, however we know we can do some analysis to see if a greedy approach or ILP is better.

3.) Define the problem that you will solve as concretely as possible. Provide a scope of expected and potential results. Give a few example programs that exhibit the problem that you are trying to solve.
We want to break register allocation into a series of phases and apply ILP to it.
- Phase 1: Global ILP without register spilling
  - Expected result: should be more optimal than greedy, but about the same speed
  - We expect these results cause the greedy could spill on problems not needing spilling, so ILP would be more optimal, and the problem is relatively simple so they should be similar in speed
- Phase 2: Static analysis tool to determine instructions that could spill and add the ability for spill code to ILP formulation
  - Expected result: Could slow down ILP but will still be more optimal than greedy
- Phase 3: Static analysis tool to identify potentially eliminating constraints that are unnecessary, therefor introducing heuristics that make the ILP problem faster.
  - Expected result: ILP speed up

4.) What is the general approach that you intend to use to solve the problem?

Using python Pulp to generate an ILP formulation from the interference graph. For heuristics, writing a function that uses things we've learned from previous labs to calculate spillable likelihood

5.) Why do you think that approach will solve the problem? What resources (papers, book chapters, etc.) do you plan to base your solution on? Is there one in particular

that you plan to follow? What about your solution will be similar? What will be different?

6.) How do you plan to demonstrate your idea? Will you use your course compiler. If so, what specific changes do you plan to make to it (e.g., what passes need to be changed or added)?

7.) How will you evaluate your idea? What will be the measurement for success?