

HW2

1.

There are many positives to increasing the number of MIPS registers. More registers can improve the speed of the code since they are faster than cache and especially faster than main memory. They are deterministic with no misses, they can replicate with multiple read ports, and reduce memory traffic. They also can reduce code density because they have short identifiers; typically three to eight bits compared to a forty bit main memory address. There are some cons to having an increased number of registers. These cons include needing to save and restore on procedure calls and context switch. You cannot take the address of a register for pointers and they also have a fixed size which effects the ability to store strings and structures efficiently. Although, the main problem is the reliability on the compiler. The more registers, the more powerful the compiler must be. As modern technology continues to advance this because more possible, but it can still be costly and difficult. As a result I believe that the number of MIPS registers is sufficient and should not be changed.

2.1

- 3 two-address instructions = $3 * 2^5 * 2^5 = 3072$
- 30 one-address instructions = $30 * 2^5 = 960$
- 45 zero-address instructions = 45

The total number of bits used by these instructions is $3072 + 960 + 45 = 4077$. The total number of bits available is $2^{12} = 4096$, so yes this is possible.

2.2

- 3 two-address instructions = $3 * 2^5 * 2^5 = 3072$
- 31 one-address instructions = $31 * 2^5 = 992$
- 35 zero-address instructions = 35

The total number of bits used by these instructions is $3072 + 992 + 35 = 4099$. The total number of bits available is $2^{12} = 4096$, so no this is not possible.