Computer Architecture and Microprocessors

Problem:

Write a SimpleRisc assembly program to find the Ramanujan number, the smallest number that is a sum of two cubes in two different ways.

Example: 1729 (= 10^3 +9^3 and 12^3 + 1^3)

Solution:

```
mov    r0, 1        #variable  i

.loop1:
        mov    r1,  1          #variable j
        mov    r2,  0          #counter
         .loop2:
                add    r3,  r2,  1          #variable k

                .loop3:
                        mul    r4, r1, r1
                        mul    r4, r4, r1
                        mul    r5, r3, r3
                        mul    r5, r5, r3
                        add    r6, r4, r5
                        cmp    r6, r0
                        add    r3, r3, 1
                        beq    .counter
                        cmp    1, 1
                        beq    .loop4

                        .counter:
                                        add    r2, r2, 1
                        .loop4:
                                        mul    r7, r3, r3
                                        mul    r7, r7, r3
                                        cmp    r7, r0
                                        bgt    .loop2
                mul    r8, r2, r2
                mul    r8, r8, r2
                add    r2, r2, 1
                cmp    r8, r0
                bgt    .loop1
```

```
        cmp    r2, 2
        beq    .endprogram
        add    r0, r0, 1

.endprogram:   mov     r9,  r0
```

Final Output i.e. the Ramanujan Number is stored in the register *r9*.