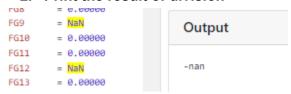
Assignment 3-7 Check out the value of Nan

1. Make an Assembly program that shows the NaN. Divide the 0 by 0.

```
## Program: 0 / 0
       .text
     .globl main
main:
  li $v0, 2
               # print floating service code
  li
               $t0, 0
  mtc1
               $t0, $f2
                            # $t0 = 0;
  cvt.s.w
               $f4, $f2 # Convert the double precision number to single precision
               $f9, $f4, $f4 # Largest Number / 0
  div.s
  li
               $v0, 2
  mfc1
               $t0, $f9
               $f12, $f9
  mov.s
  syscall
## End of file
```

2. Print the result of division



Negative Not a Number

a. Elaborate on the numbers on the register \$f9

\$f9 contains NaN, because \$f9 is the dividend of \$f4 divided by \$f4. Contained in \$f4 is 0, and 0/0 is undefined not only in mathematics but for IEEE 754 floating point arithmetic due to it's undefined ambiguous nature of being.

Also noticed this pathing,

b. And \$t0 based on the IEEE 754 format, Is this NaN? Why?

1 = sign bit = Negative

1111 1111 = Exponent = When the exponent bits are all 1's, it indicates that the value is **either Infinity or NaN**.

100 0000 0000 0000 0000 0000 = Mantissa = When the mantissa bits are non-zero, in this case the leading 1 is making that condition true, when the exponent bits are all 1's, this tells us that the value is **NaN**.

Knowing that the sign bit is negative, we can conclude that this is a **Negative NaN** This is confirmed by the output we got as seen above.

It's NaN because the value being divided is zero to itself, which is undefined/NaN.

Notes: Division by zero is **undefined** in classical arithmetic because there is no number that can satisfy the operation consistently across different contexts.

When both the numerator and denominator are zero, the problem becomes even more ambiguous, as there are **infinitely many potential answers**.

To avoid giving an incorrect or misleading result, the IEEE 754 standard defines such cases as **NaN**, signaling to the system and the user that the result of the computation is not a valid real number.