# Homework 6

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**Exercise 6.** Let F be the set of real numbers with decimal representation consisting of all fours (and possibly a single decimal point). Examples of numbers contained in F are 4, 44, 4444444, 44.4, 4.444444, 444.44444,... etc.

Let G be the set of real numbers with decimal representation consisting of all fours or sixes (and possibly a single decimal point). Examples of numbers contained in G are 4, 6, 44, 66, 46, 64, 4464464, 46.46, 6.644464, 646.64646464, 446.6666666, . . . etc.

- [x] The set F is countable and the set G is not countable.
- [ ] The sets F and G are both countable.
- [ ] The set G is countable and the set F is not countable.
- [ ] The sets F and G are both not countable.

(1) We can count them. There is a bijection between this set and the set of rational nb.

p => position of the dot
q => number of 4

(2) We can use Canthor. Alphabet of more than 1 caracther of infinite length.

**Exercise 7.** Which of the following statements is incorrect?

- ○ The Cartesian product of finitely many countable sets is countable.
- ○ Any subset of infinite cardinality of an uncountable set is uncountable.
- ○ $N \cup \{x \in \mathbf{R}, 0 < x < 1\}$ is uncountable.
- ○ The intersection of two uncountable sets can be countably infinite.

$\mathbb{Q} \subseteq \mathbb{R}$.

**Exercise 8.**

```
function f1() {
  x=0
  i=1
  while (i ≤ n) {
    x=x+1
    i=x+x
  }
  a=x
}
```

```
function f2() {
  y=0
  j=1
  while (j ≤ n) {
    y=y+1
    j=y*y
  }
  b=y
}
```

After execution of the two program fragments `f1` and `f2`, it is the case that

- ○ $a \approx \frac{n}{2}$, $b \approx \sqrt{n}$.
- ○ $a \approx n$, $b \approx \log_2(n)$.
- ○ $a \approx \frac{n}{2}$, $b \approx \log_2(n)$.
- ○ $a \approx n$, $b \approx \sqrt{n}$.

$i = 2x$

$j = y^2$