Problem 52

It can be seen that the number, 125874, and its double, 251748, contain exactly the same digits, but in a different order.

Find the smallest positive integer, x, such that 2x, 3x, 4x, 5x, and 6x, contain the same digits.

Solution

The integer must start with a 1{0,1,2,3,4,5,6}, and must contain at least three digits (the first and last change). It must be a multiple of 3, because 3n is, and contains the same digits.

In[88]:=
```
f[n_] :=
  With[{ans = Select[Range[10^n + 2, 10^n + 7 × 10^(n-1), 3], ReleaseHold@Map[Sort, Hold[
        IntegerDigits[#] === IntegerDigits[2 #] === IntegerDigits[3 #] ===
         IntegerDigits[4 #] === IntegerDigits[5 #] === IntegerDigits[6 #]],
       {2}] &, 1]}, If[ans === {}, $Failed, ans]]
```

I use ParallelTry because it is the easiest way to break as soon as an answer is found, not because evaluation is slow enough to need to be parallelised.

In[89]:=
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ParallelTry[f, Range[7]]
```

Out[89]= {142 857}