Project_Euler_005

February 4, 2018

1 Project Euler Problem 5

2520 is the smallest number that can be divided by each of the numbers from 1 to 10 without any remainder.

What is the smallest positive number that is evenly divisible by all of the numbers from 1 to 20?

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In [1]: # We can solve this by considering prime factorization.
        # Take the prime factorization of every number from 2 to 20.
        # If a number is divisible by every number from 1 to 20, it will
        # have each of these factorizations as a subset.

        from functools import reduce

        # prime_factors(x) gives us the full list of prime factors of
        # x, including multiples.  For instance, prime_factors(4) returns
        # # [2,2].

        def prime_factors(x):
            i = 2
            factor_list = []
            while i <= x:
                if i == x:
                    factor_list.append(i)
                    return factor_list
                elif x % i == 0:
                    factor_list.append(i)
                    x = x/i
                elif x % i != 0:
                    i += 1

        full_factor_list = []

        # In this for loop, we get the prime factorization of every number
        # from 2 through 20.  If any of those prime factors aren't included
        # in the same quantity as in full_factor_list, we append the factor
        # to full_factor_list.
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```python
        # For example, when j = 9, prime_factors(9) returns [3,3].  Since
        # there is only one element in full_factor_list equal to 3 at that
        # point, we append another 3 to full_factor_list.

        for j in range(2, 21):
            factor_list = prime_factors(j)
            if len(full_factor_list) == 0:
                full_factor_list = full_factor_list + factor_list
            else:
                for k in factor_list:
                    if full_factor_list.count(k) < factor_list.count(k):
                        full_factor_list.append(k)

        print("The full set of factors is {}."
              .format(full_factor_list))
        print("The answer is {}."
              .format(reduce(lambda x, y: x*y, full_factor_list)))
```

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The full set of factors is [2, 3, 2, 5, 7, 2, 3, 11, 13, 2, 17, 19].
The answer is 232792560.
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