1) Determine if a sentence is pangram.

Pangram

Determine if a sentence is a pangram. A pangram (Greek: παν γράμμα, pan gramma, "every letter") is a sentence using every letter of the alphabet at least once. The best known English pangram is:

The quick brown fox jumps over the lazy dog.

The alphabet used consists of ASCII letters `a` to `z`, inclusive, and is case insensitive. Input will not contain non-ASCII symbols.

2) Number to Roman Numerals Converter and vice-versa.

Roman Numerals

Write a function to convert from normal numbers to Roman Numerals.

The Romans were a clever bunch. They conquered most of Europe and ruled it for hundreds of years. They invented concrete and straight roads and even bikinis. One thing they never discovered though was the number zero. This made writing and dating extensive histories of their exploits slightly more challenging, but the system of numbers they came up with is still in use today. For example the BBC uses Roman numerals to date their programmes.

The Romans wrote numbers using letters - I, V, X, L, C, D, M. (notice these letters have lots of straight lines and are hence easy to hack into stone tablets).

```
1  => I
10  => X
 7  => VII
```

There is no need to be able to convert numbers larger than about 3000. (The Romans themselves didn't tend to go any higher)

Wikipedia says: Modern Roman numerals ... are written by expressing each digit separately starting with the left most digit and skipping any digit with a value of zero.

To see this in practice, consider the example of 1990.

In Roman numerals 1990 is MCMXC:

1000=M 900=CM 90=XC

2008 is written as MMVIII:

2000=MM 8=VIII

See also: http://www.novaroma.org/via_romana/numbers.html

3) RainDrops

Raindrops

Convert a number to a string, the contents of which depend on the number's factors.

- If the number has 3 as a factor, output 'Pling'.
- If the number has 5 as a factor, output 'Plang'.
- If the number has 7 as a factor, output 'Plong'.
- If the number does not have 3, 5, or 7 as a factor, just pass the number's digits straight through.

Examples

- 28's factors are 1, 2, 4, **7**, 14, 28.
    - In raindrop-speak, this would be a simple "Plong".
- 30's factors are 1, 2, **3**, **5**, 6, 10, 15, 30.
    - In raindrop-speak, this would be a "PlingPlang".
- 34 has four factors: 1, 2, 17, and 34.
    - In raindrop-speak, this would be "34".
    -

4) Leap Year Detector

Leap

Given a year, report if it is a leap year.

The tricky thing here is that a leap year in the Gregorian calendar occurs:

```
on every year that is evenly divisible by 4
  except every year that is evenly divisible by 100

```

```
    unless the year is also evenly divisible by 400
```

For example, 1997 is not a leap year, but 1996 is. 1900 is not a leap year, but 2000 is.

If your language provides a method in the standard library that does this look-up, pretend it doesn't exist and implement it yourself.

Notes

Though our exercise adopts some very simple rules, there is more to learn!

For a delightful, four minute explanation of the whole leap year phenomenon, go watch this youtube video.

5) Word Count

Word Count

Given a phrase, count the occurrences of each word in that phrase.

For example for the input `"olly olly in come free"`

```
olly: 2
in: 1
come: 1
free: 1
```

6) Given a word list all anagrams

Anagram

Given a word and a list of possible anagrams, select the correct sublist.

Given `"listen"` and a list of candidates like `"enlists" "google" "inlets" "banana"` the program should return a list containing `"inlets"`.

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7) Binary Tree

Binary Search Tree

Insert and search for numbers in a binary tree.

When we need to represent sorted data, an array does not make a good data structure.

Say we have the array `[1, 3, 4, 5]`, and we add 2 to it so it becomes `[1, 3, 4, 5, 2]` now we must sort the entire array again! We can improve on this by realizing that we only need to make space for the new item `[1, nil, 3, 4, 5]`, and then adding the item in the space we added. But this still requires us to shift many elements down by one.

Binary Search Trees, however, can operate on sorted data much more efficiently.

A binary search tree consists of a series of connected nodes. Each node contains a piece of data (e.g. the number 3), a variable named `left`, and a variable named `right`. The `left` and `right` variables point at `nil`, or other nodes. Since these other nodes in turn have other nodes beneath them, we say that the left and right variables are pointing at subtrees. All data in the left subtree is less than or equal to the current node's data, and all data in the right subtree is greater than the current node's data.

For example, if we had a node containing the data 4, and we added the data 2, our tree would look like this:

```
4
/
2
```

If we then added 6, it would look like this:

```
4
/ \
2   6
```

If we then added 3, it would look like this

```
  4
/   \
2     6
 \
```

```
  3
```

And if we then added 1, 5, and 7, it would look like this

```
      4
    /   \
   /     \
  2       6
 / \     / \
1   3   5   7
```

8) Determine if given word is a isogram

Isogram

Determine if a word or phrase is an isogram.

An isogram (also known as a "nonpattern word") is a word or phrase without a repeating letter.

Examples of isograms:

- lumberjacks
- background
- downstream

The word *isograms*, however, is not an isogram, because the s repeats.

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9) Change calculator.

Change

Correctly determine the fewest number of coins to be given to a customer such that the sum of the coins' value would equal the correct amount of change.

For example

- An input of 15 with [1, 5, 10, 25, 100] should return one nickel (5) and one dime (10) or [0, 1, 1, 0, 0]
- An input of 40 with [1, 5, 10, 25, 100] should return one nickel (5) and one dime (10) and one quarter (25) or [0, 1, 1, 1, 0]

Edge cases

- Does your algorithm work for any given set of coins?
- Can you ask for negative change?
- Can you ask for a change value smaller than the smallest coin value?

10) Pythagorean Triplet

Pythagorean Triplet

A Pythagorean triplet is a set of three natural numbers, {a, b, c}, for which,

```
a**2 + b**2 = c**2
```

For example,

```
3**2 + 4**2 = 9 + 16 = 25 = 5**2.
```

There exists exactly one Pythagorean triplet for which a + b + c = 1000.

Find the product a * b * c.