# Knowledge representation

Tutorial 2

4 October 2013

## Operations on Lists

**1.** Define a predicate `rep(+Xs, -Ys)` that succeeds if the list `Ys` is the list `Xs` in which consecutive duplicates of elements have been eliminated.

```
?- rep([1, 1, 1, 2, 2, 2, 2, 4, 4, 1, 7], X).

    X = [1, 2, 4, 1, 7] ;
    false.
```

**2.** Define a predicate `pack(+Ls, -Zs)` that succeeds if the list `Zs` is the list `Ls` in which consecutive duplicates elements have been replaced by a sublist containing all these elements.

```
?- pack([a, a, a, a, b, c, c, a, a, d, e, e, e, e], X).

    X = [[a, a, a, a], [b], [c, c], [a, a], [d], [e, e, e, e]] ;
    false.
```

**3.** Define a predicate `encode(+Ls, -Zs)` that succeeds if the list `Zs` is the list `Ls` in which consecutive duplicates elements have been replaced by a list of two elements `[N,E]` where `N` is the number of duplicates of the element `E`.

```
?- encode([a, a, a, a, b, c, c, a, a, d, e, e, e, e], X).

    X = [[4, a], [1, b], [2, c], [2, a], [1, d], [4, e]] ;
    false.
```

**4.** Define a predicate `decode(+Ls, -Zs)` that succeeds if the list `Ls` is an encoded version (as specified in the previous problem) of the list `Zs`.

# Arithmetic

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**5.** Define a predicate `gcd(+A, +B, -C)` that succeeds if `C` is the GCD (greatest common divisor) of the two positive integer numbers `A` and `B`.

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**6.** Define a predicate `prime(+A)` that succeeds if `A` is a prime number.

# Proposed exercise

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**7.** Goldbach's conjecture is one of the most famous facts in number theory that has not been proved to be correct in the general case.
It says that : *Every positive even number greater than 2 is the sum of two prime numbers.*

Example: $28 = 5 + 23$.

Define a predicate `goldbach(+X, -Y, -Z)` that succeeds if `X` = `Y` + `Z` where `X` is an even integer greater than 2 and `Y`, `Z` two prime numbers.