# 1995 Paper 1 Question 6

**Foundations of Computer Science**

Consider the following ML declarations:

```
datatype bit = one | zero;
datatype cardinal = Cardinal of bit list;
exception Result_would_be_negative;
```

Define functions to add, subtract and multiply `cardinal`s, viewing them as representations of integers stored as in binary with the least significant bit of the value first in the list. Thus for instance the number eleven has the value 1011 in binary and so would be represented (note the ordering of the bits) by the structure

```
Cardinal [one, one, zero, one]
```

Using Big-O notation state the time complexity of your add and multiply functions.

[20 marks]

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