

Is this integer a perfect square? (numbers represented as strings in binary)

```
bool is_this_the_square_root_of_this(string root, string num)
{ if (multiply(root, root)==num)
  return true;
  else
  return false; }
```

```
bool has_this_number_got_a_square_root_beginning_with(string num, string start)
{ if (start.length()>num.length())
  return false;
  if (is_this_the_square_root_of_this(start, num))
  return true;
  else
  { return has_this_number_got_a_square_root_beginning_with(num, start+"0")
    || has_this_number_got_a_square_root_beginning_with(num, start+"1"); } }
```

```
bool is_this_number_a_perfect_square(string num)
{ return has_this_number_got_a_square_root_beginning_with(num, ""); }
```

Non-deterministic version

```
has_this_number_got_a_square_root_beginning_with(string num, string start)
{ if (start.length()>num.length())
  fail;
  else if (is_this_the_square_root_of_this(start, num))
  succeed;
  else
  { either
    has_this_number_got_a_square_root_beginning_with(num, start+"0");
    or
    has_this_number_got_a_square_root_beginning_with(num, start+"1"); } }
```

## Non-deterministic loop version

```
is_this_number_a_perfect_square(string num)
{ string root= "";
  for (int i=0; i<num.length(); i+=1)
  { either
    root += "0";
    or
    root += "1"; }
  if (is_this_the_square_root_of_this(root, num))
    succeed;
  else
    fail; }
```

## Magic Bean version

```
bool is_this_number_a_perfect_square(string num)
{ string root= "";
  for (int i=0; i<num.length(); i+=1)
  { if (magic_bean_says_yes())
    root += "0";
    or
    root += "1"; }
  if (is_this_the_square_root_of_this(root, num))
    return true;
  else
    return false; }
```