Problem 1—Spheres

As part of a routine investigation, detective John Jones has to dust a manhole cover for fingerprints. While scrutinizing the round metal disc, some thoughts come to his mind: the area of a circle is πr^2; the perimeter is $2\pi r$. Spheres are round, too, and John knows the formulae for them as well: the volume is $^4/_3\pi r^3$; the surface area is $4\pi r^2$.

Now, no one knows better than John that there are worlds upon worlds and dimensions upon dimensions. He knows that when you are speaking of many-dimensional spheres, you use the term "content" to describe its multi-dimensional volume and "surface" to describe its one-dimension-fewer surface area. An *n*-dimensional sphere is simply the collection of all points in *n*-dimensional space the same distance (*r*) from some given point (the center). The amount of the space enclosed by those points is the content, and the amount of space containing these points is the surface.

A zero-dimensional sphere is just a single point. Its content is simply 1; it is a single point. It has no surface, so we say its surface is 0.

A one-dimensional sphere is a line segment. Its content is $2r$, and its surface consists of its two endpoints, so its surface is 2.

The two- and three-dimensional formulae are described above, but why stop there? A four-dimensional sphere, for example, has content $^1/_2\pi^2 r^4$ and surface $2\pi^2 r^3$.

The content of an *n*-dimensional sphere is always of the form $k_n r^n$, and its surface is always of the form $k'_n r^{n-1}$. But what are k_n and k'_n? That is what you must compute.

INPUT SPECIFICATION. Each data case consists of a single unsigned decimal integer no greater than 100 representing the number of dimensions of the sphere. These integers may be preceded, followed, and/or separated by any number of spaces and <**EOLN**>'s.

OUTPUT SPECIFICATION. The output cases should appear in the same order as their respective input cases. The output should be in the format "Case c: Content is k r^n and surface is k' r^s." C is the case number; k is the content; n is the dimension of the sphere; k' is the surface content; s is the dimension of the surface (s=n–1). k and k' should be correct to the nearest thousandth and should be printed with three digits after the decimal point. Each output case should be followed by exactly one <**EOLN**>.

SAMPLE INPUT.

```
0<EOLN>
1<EOLN>
2<EOLN>
3<EOLN>
4<EOLN>
<EOF>
```

SAMPLE OUTPUT.

```
Case·1:·Content·is·1.000·r^0·and·surface·is·0.000·r^-1.<EOLN>
Case·2:·Content·is·2.000·r^1·and·surface·is·2.000·r^0.<EOLN>
Case·3:·Content·is·3.142·r^2·and·surface·is·6.283·r^1.<EOLN>
Case·4:·Content·is·4.189·r^3·and·surface·is·12.566·r^2.<EOLN>
Case·5:·Content·is·4.935·r^4·and·surface·is·19.739·r^3.<EOLN>
<EOF>
```