Factorials, Combinations, and Histograms in VPython

To get the `factorial` and `combin` functions you must import them. Insert this line at the beginning of your program:

```
from visual.factorial import *
```

Since you will also want to make graphs, don't forget:

```
from visual.graph import *
```

1 factorial

The factorial function takes one argument:

```
b = factorial(13)
```

will set b to 13!

There is a limit on how big a number can be used in the `factorial` function, so if you want to calculate combinations of numbers larger than about 160, use the `combin` function, which takes advantage of cancellations within the formula:

2 combin

The `combin` function takes two arguments:

```
c = combin(a,b)
```

The definition of the function is this:

$$\texttt{combin(a,b)} \;=\; \frac{a!}{b!\,(a-b)!}$$

3 Histograms

To make a histogram, create an object of type gvbars. The parameter delta determines the width of a single bar.

```
myhistogram = gvbars(color=color.red, delta=0.3)
```

To plot a bar, use the usual syntax:

```
myhistogram.plot(pos=(x,height))
```

4 Natural log

In Python, ln(x) is written `log(x)`:

5 Looping

Remember that one way to do a calculation using values of a variable from 0 to a maximum is:

```
amax = 137
a = 0
while a < amax+1:
    ...<calculations>...
    a = a +1
```