STARFISH SCHOOL

A Virtual Bootcamp for Astronomy Graduate Students

WEEK 2 EXERCISES

Version 2.0

Exercise 1

1. Write a function (in Python and R) that takes your height as input (L_0) and computes your height L if you were travelling at $v=0.3c$.

You may need to know the following equations for Lorentz contraction:

$$L = L_0 \ / \ \gamma(v)$$

$$\gamma(v) \equiv \frac{1}{\sqrt{1 - v^2/c^2}}$$

Exercise 2

1. Generate 100 random numbers from a Gaussian distribution
2. Generate 100 000 random numbers from a Gaussian distribution and show that they are much better approximated by a Gaussian distribution (i.e., plot a Gaussian curve).
   HINT: In R, look up `?rnorm`

The following equation may be useful to you for a Gaussian distribution:

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$