Instructions to install Kenzo:

- 1. Download and install LispWorks: <u>http://www.lispworks.com/</u>
- Download the original Kenzo from: <u>https://www-fourier.ujf-grenoble.fr/~sergerar/Kenzo/Kenzo.7z</u> or the complete version with external packages from: <u>https://github.com/miguelmarco/kenzo</u>
- 3. Unzip the Kenzo file.
- 4. Open the folder where you have installed LispWorks.
- 5. Right click on the LispWorks icon and select Properties. In the field "Starts in", provide the folder where you have unzipped Kenzo.

Using Kenzo for the first time:

- 1. Start LispWorks
- 2. In the LispWorks Listener write the instruction: (load "cat-init.cl")
- 3. Now, write in the LispWorks Listener the instruction: (compile-files)

Using Kenzo in the interactive mode

- 1. Start LispWorks
- 2. In the LispWorks Listener write the instruction: (load "cat-init.cl")
- 3. Execute the instruction: (load-cfiles)
- 4. If you use the Kenzo complete version from <u>https://github.com/miguelmarco/kenzo</u>, you must also execute the instruction: (in-package :cat)
- 5. Now, you can use Kenzo:
 - Creating spaces:
 - In order to create the 3-sphere and store it in the variable s3 for further use, we execute the instruction: (setf s3 (sphere 3))
 - In order to create the moore space (2,4) and store it in the variable m24 for further use, we execute the instruction: (setf m24 (moore 2 4))
 - In order to create the cartesian product of s3 and m24, we use the instruction: (setf s3xm24 (crts-prdc s3 m24))
 - In order to create the loop space iterated twice of the 3-sphere, execute the command: (setf l2s3 (loop-space (sphere 3) 2))
 - Computing homology groups. Once that you have created spaces, you can compute their homology groups. For instance,
 - To compute the homology groups of the 3-sphere from dimension 0 to 3, execute the instruction: (homology s3 0 4)
 - To compute the third homology group of s3xm24, execute the command: (homology s3xm24 3)
 - To compute from the first to the fifth homology group of the loop space l2s3, execute the command: (homology l2s3 1 6)

The problem with the interactive approach is that the commands that were executed are not saved.

Using Kenzo with lisp files:

- 1. Start LispWorks.
- 2. Create a new file (File \rightarrow New).
- 3. Save the file (File \rightarrow Save).
- 4. In the editor write the instructions that you want to execute. For instance:

;; Lines that start with a semicolon are comments

; The following two lines are always necessary (load "cat-init.cl") (load-cfiles)

; Creating spaces ; The 3-sphere (setf s3 (sphere 3)) ; The Moore space (2,4) (setf m24 (moore 2 4)) ; The cartesian product of the 3-sphere and the Moore space (2,4) (setf s3xm24 (crts-prdc s3 m24)) ; The loop space iterated twice of the 3-sphere (setf l2s3 (loop-space s3 2)) ; Computing homology groups ; H_0(S^3), H_1(S^3), H_2(S^3), and H_3(S^3) (homology s3 0 4) ; Third homology group of s3xm24 (homology s3xm24 3)

5. Save the file

6. You can execute the file using the "Compile buffer" button.