

# User's Guide

For the Buckling Load Calculator

## Basic Information

The software is written in Tkinter python3. In order to use the program, please preinstall the python3 and remember to download the file "Load1.png" with the software in the device used. The software needs all the files downloaded in the same location. Apart from that, there are some limitations in this calculator that are listed below:

1. The calculator could only be able to use on an object with a cross-section area as circle.
2. The connection types should be within options:
  - a. Pinned ends
  - b. Fixed ends
  - c. Pined and fixed ends
  - d. Fixed and free ends
  - e. Fixed and guided ends
3. The property of the object should be either brick or wood.

## Introduction

The software would need users to provide the below data:

1. The radius of the cross-area.
2. The length of the object.
3. The connection type of the object.
4. The property of the object.

The below picture is how the software looks like:

The screenshot shows a window titled "Buckling Load Calculator". Inside, there is a subtitle "This is only for the object with cross-section area as circle." Below this, there are input fields for "The radius of the cross-section area (r)" and "The length of the object (L)", both currently set to "0" and followed by "m". Underneath, there is a section for "Type of connection:" with five buttons: "Pinned ends", "Fixed ends", "Pinned and fixed ends", "Fixed and free ends", and "Fixed and guided ends". Below these buttons is a "Property:" dropdown menu currently showing "Wood". A "Calculate" button is positioned below the dropdown. At the bottom of the window, there is a display area showing "P = 0 N".

First, for the radius and length, the data should be entered in the respectively enter boxes. Radius is to calculate the  $I$ , and the length is to calculate the real length.

$$I = \frac{\pi \cdot r^4}{4} \quad \text{Eq.1}$$

This image is a close-up of the input fields from the software interface. It shows two rows: "The radius of the cross-section area (r)" with a text input containing "0" and a unit label "m", and "The length of the object (L)" with a text input containing "0" and a unit label "m".

Then, the next section is the button. There are five buttons, and each button represents one connection type shown by the text on them. This is to calculate the real length.

$$\text{Real length} = K \cdot L \quad \text{Eq.2}$$

Where  $K_{\text{pinned\_ends}} = 1$   
 $K_{\text{fixed\_ends}} = 0.5$   
 $K_{\text{pinned\_fixed\_ends}} = 0.699$   
 $K_{\text{fixed\_free}} = 2$   
 $K_{\text{fixed\_guided}} = 1$

Type of connection:

Pinned ends	Fixed ends	Pinned and fixed ends	Fixed and free ends	Fixed and guided ends
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Following is a dropdown menu with two options. This is to set the young's module. One is wood ( $E = 1.43$ ), the other is brick ( $E = 14$ ).

Property:

In the end, click the button “calculate” and all data will be fill in the function below.

$$P = \pi^2 \cdot \frac{EI}{(KL)^2} \quad Eq.3$$

Then, the result will be shown beneath the button.

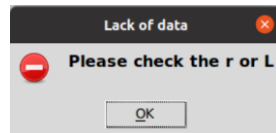
Calculate		
P =	0	N

## Step by Step

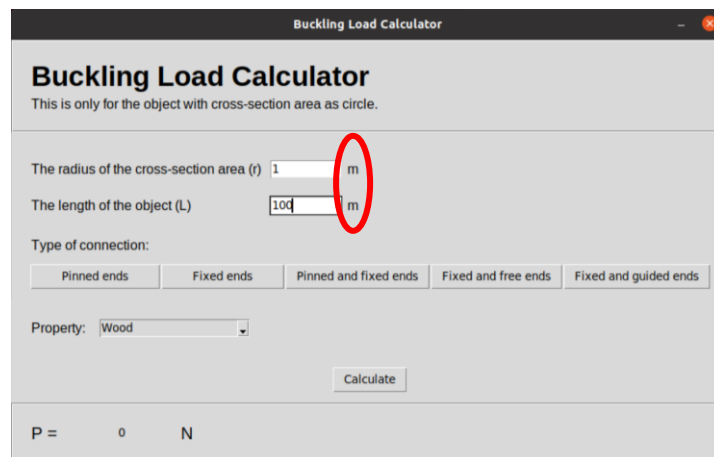
The software will be demonstrated by the example mentioned:

- $r = 1\text{ m}$
- $L = 100\text{ m}$
- Connection typed: Pinned ends
- Property: wood

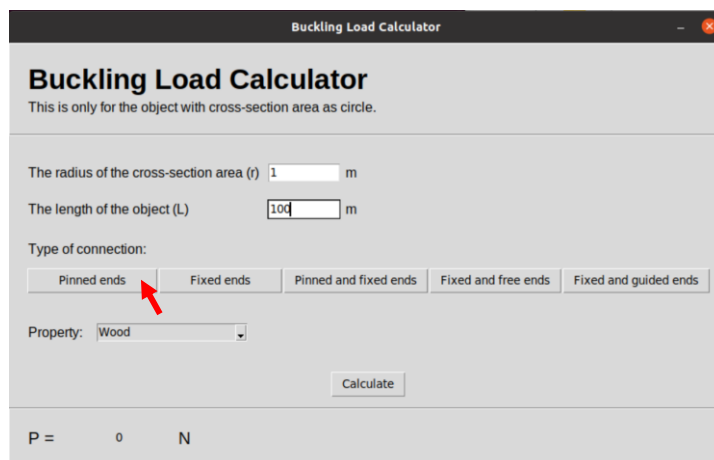
Notice, if an error message jumps out, please check the data entered.



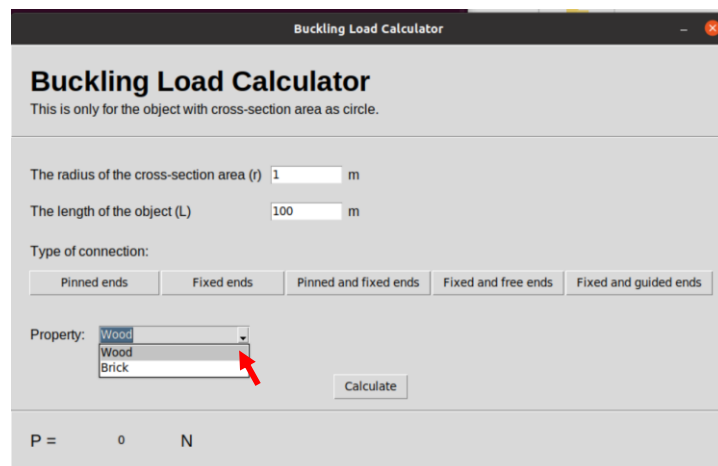
**Step 1.** Enter the  $r$  and  $L$  in relatively text boxes. Notice the unit is meter.



**Step 2.** Click the corresponding type button.

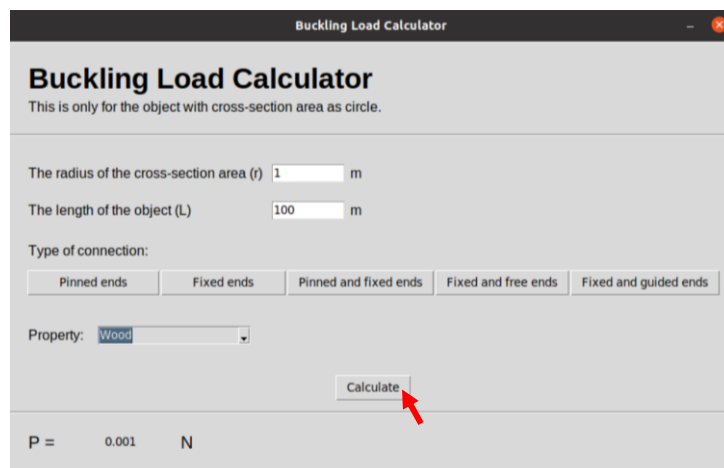


**Step 3.** Chose the property.



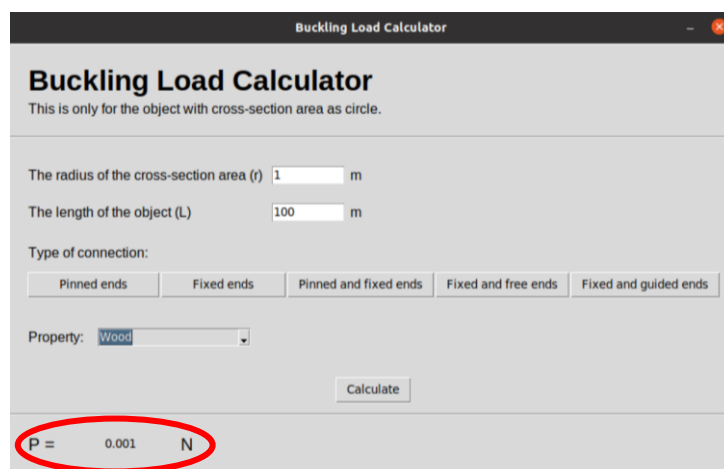
The screenshot shows the 'Buckling Load Calculator' window. The title bar says 'Buckling Load Calculator'. Below the title, it says 'This is only for the object with cross-section area as circle.' The input fields are: 'The radius of the cross-section area (r)' with value '1' and unit 'm', and 'The length of the object (L)' with value '100' and unit 'm'. The 'Type of connection' section has five buttons: 'Pinned ends', 'Fixed ends', 'Pinned and fixed ends', 'Fixed and free ends', and 'Fixed and guided ends'. The 'Property' dropdown menu is open, showing 'Wood' as the selected option, with 'Wood' and 'Brick' as visible options. A red arrow points to the 'Wood' option. The 'Calculate' button is visible. At the bottom, the result is displayed as 'P = 0 N'.

**Step 4.** Click the button 'Calculate'.



The screenshot shows the 'Buckling Load Calculator' window. The title bar says 'Buckling Load Calculator'. Below the title, it says 'This is only for the object with cross-section area as circle.' The input fields are: 'The radius of the cross-section area (r)' with value '1' and unit 'm', and 'The length of the object (L)' with value '100' and unit 'm'. The 'Type of connection' section has five buttons: 'Pinned ends', 'Fixed ends', 'Pinned and fixed ends', 'Fixed and free ends', and 'Fixed and guided ends'. The 'Property' dropdown menu is open, showing 'Wood' as the selected option. The 'Calculate' button is highlighted with a red arrow. At the bottom, the result is displayed as 'P = 0.001 N'.

**Step 5.** Got the result in the text box at the end.



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