



# Teacher Notes for Number Line

Compatibility: TI-83+/83+SE/84+/84+SE

Run The Program Called: **NL**

## ► Summary

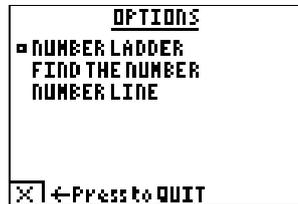
There are 3 distinct modes of use, each of which is described in detail below:

- Number Ladder** place numbers that are randomly generated in order, from lowest to highest, in a ladder of 8 empty cells.
- Find the Number** locate and identify a number to a given degree of accuracy presented on a scale that can be zoomed in upon.
- Number Line.** correctly name the number (either an integer, a decimal or a fraction) that is indicated by the marker on the displayed number scale.

## ► General Features

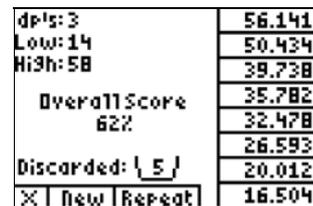
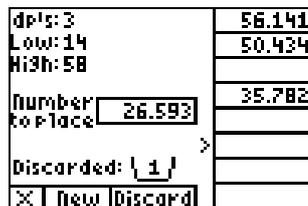
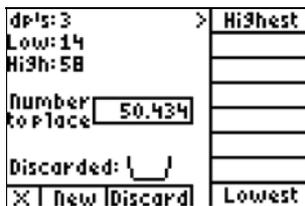
On all screens and in all modes, there are **QUIT** buttons on display in the bottom left hand corner of the screen.

To **QUIT**, press the **Y=** button.



## ► Features of Number Ladder

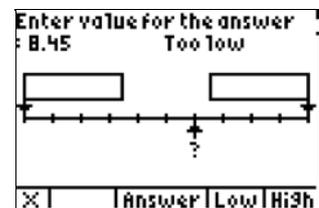
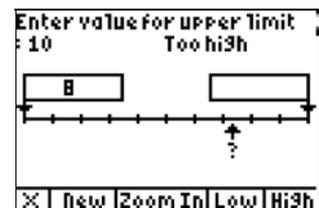
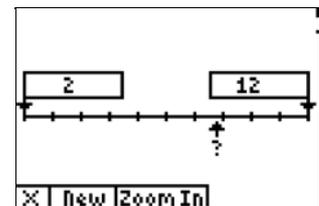
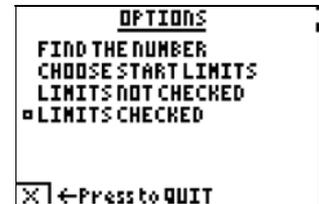
- The objective of Number Ladder is to place the numbers that are randomly generated in order, from lowest to highest, in a ladder of 8 empty cells.
- The user can specify from 0 to 3 decimal places as well as the lower and upper bounds for the number domain. The program checks to see if enough distinct numbers can be generated to fill 8 cells from the inputted number of decimal places and the lower and upper limits.
- Each number to be placed is initially displayed in the central box and the user controls which cell it will be placed in by moving the arrow-head next to the ladder using the **UP** and **DOWN** arrow keys.
- The number is placed in the cell by pressing **ENTER**. Once a number is placed on the ladder, it cannot be moved.



- Alternatively, the number can be discarded by pressing the **ZOOM** key (aligned with the word **Discard** on the screen). Watch for the animation of the number being crushed before being discarded!
- Where a number cannot be placed due to previously placed numbers being in the way, it has to be discarded and the user must press the **Discard** button.
- the user can start a new ladder by pressing **WINDOW** at any time (aligned under the word **New** on the screen)
- at the end an overall % score is displayed. This is calculated from the quantity of numbers placed compared to the total quantity of numbers presented for placing.

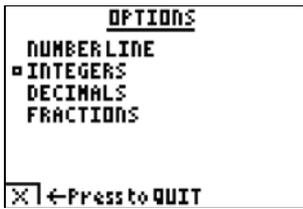
## ► Features of Find the Number

- The objective of Find the Number is to locate and identify a number to a given degree of accuracy presented on a scale that can be zoomed in upon.
- The user can specify from 0 to 3 decimal places as well as the lower and upper bounds for the number domain. The program does check to see if enough distinct numbers can be generated for a number line from the inputted number of decimal places and the lower and upper limits.
- The number line between the limits always has 10 divisions on it, so from the outset it is possible for the notches on the line to equate to “non-standard” numbers.
- At the start, the lower and upper limits are displayed in the boxes at each end of the line and the desired number to be identified is located with an arrow on the underside of the number line.
- The user can **Zoom In** to the section of the number line that the target number is located within - watch for the animation of that section expanding to fill the screen!
- the boxes for the upper and lower limits of the new number line are now blank. Their values can be entered by pressing **TRACE** or **GRAPH** (aligned with **Low** and **High** on the screen) and then typing in the number, pressing **ENTER** when finished. They do not have to be filled if not desired!
- If the user selected **LIMITS NOT CHECKED** from the initial options menu, then any numbers entered by the user in the boxes are only for their reference.
- If the user selected **LIMITS CHECKED** from the initial options menu, then the numbers are checked and guidance on whether the entered value was too high, or too low is given. If the value that is entered is correct, the number is displayed in the cell. This option is useful for weaker students having their every step checked for accuracy and understanding.
- When the user has zoomed in far enough that the target number is aligned exactly with one of the notches, then the **Zoom In** option changes to **Answer**.



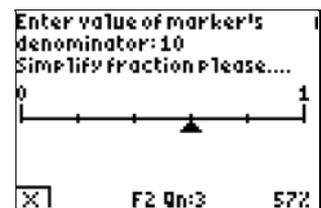
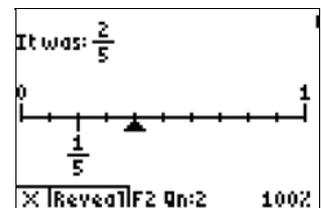
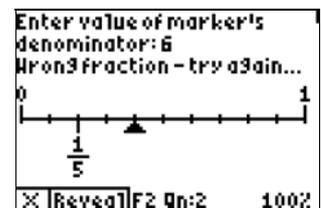
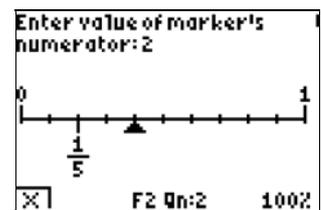
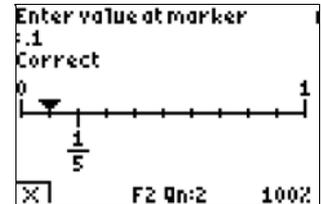
## ► Features of Number Line

The objective of Number Line is to correctly name the number that is indicated by the marker on the displayed number scale.



There are 2 Integer, 3 Decimal and 3 Fraction exercises, each containing 20 questions that present the user with a variety of scales that are labelled and have a single notch marked that is required to be identified.

- If the notch is above the line, then either an integer or decimal is required. If the notch is on the underside of the line, then the value needs to be entered as a fraction (see below)
- For Integer and Decimal exercises, the user is only asked for one notch's value. This notch is randomly chosen from those available that have not already been labelled. This allows the same basic numberline to give several different questions, depending upon which notches are picked by the program. In Decimal mode, this value can be up to 3 decimal places.
- For the Fraction exercise, the user is asked for the value of one notch in decimal and the value of another notch as a fraction. Where the denominators of the fractions are 3, 6, 7, 9, 12 or 16 then the user is not prompted for a decimal value. This is due to decimals of more than 3dp's occurring with these families of fractions.
- entry of integers and decimals are as normal, using the number keys
- entry of fractions is prompted for by the program. It first asks for the whole number part (there are no negative fraction number lines in the exercises), then the numerator, then the denominator. Where a fraction has no integer part (as it's between 0 and 1), the program only asks for numerator and denominator. Where it has no fractional part, it only asks for the whole number part.
- a score is kept of number of questions right out of number of questions attempted. The percentage score is displayed in the bottom right hand corner of the screen. It starts off at 100% (as nothing has yet been answered incorrectly by that stage) and it is continually updated as questions are answered either correctly, or incorrectly. Where a fraction is correctly entered, but not in its simplest form, there is no scoring penalty. If the user elects to **REVEAL** the answer, then they are penalised points equivalent to having answered 2 questions wrong - harsh, but fair!
- details on the question currently being tackled are at the bottom centre of the screen are. There is first a letter - I for Integer, D for Decimal, F for Fraction - then a number for the exercise (either 1, 2 or 3). The question number is also shown - this goes from 1 to 20 in every case.
- at the end of answering the 20 question exercise, the user is presented with their overall % score.



## ► Suggestions

It is recommended that only one of the three modes (Number Ladder, Find the Number and Number Line) is used in any one lesson. They each have different roles to play in a lesson:

**Number Ladder** This is a good end-of-lesson filler before students using it in a subsequent lesson. It requires the teacher to instruct them on appropriate lower and upper limits, as well as the required number of decimal places to use. Allowing students to pick their own, will not be as productive use of time.

Consider using it to order decimals between 0 and 1, or set both lower and upper numbers to be negative integers.

**Find the Number** This program can be used in a similar way to Number Ladder, in that the teacher either leads the activity, or gives students a highly structured environment to work within.

As an added activity, the teacher can inform the class that the limits are, say, 0 and 100 and the target number is 2 dp. They then press **ZOOM** repeatedly (but slowly) without saying anything. The task for the students is to follow which sections are expanded at each stage, and to declare what the final number is at the end - a very telling exercise of who can sustain concentration and memory over 3 “zoom” stages!

**Number Line.** In contrast to the previous two modes of use, **Number Line** is ideal for students to work on exclusively with only minimal teacher direction. Their task is to keep their score as high as possible for as long as possible. It is recommended that students start off on Exercise 1 of each type of problem (Integers, Decimals or Fractions) to help them become acquainted with the techniques and strategies for success at the later questions and exercises.

## ► Acknowledgements

This program was originally created for the publication “Lessons for the Maths Framework using ICT” written by Derek Ball and Barbara Ball and published by Pearson Education Ltd in 2003.