Lab 1

Value of functions

Aim:

- To construct an applet to establish geometrically the correspondence of a number and its image under a function.
- To use this applet to find the images of numbers under various functions
- To use an applet to visualise the comparison of a function with an input-output machine.

Concepts:

- Image of a number a under a function f is denoted by $f(a)$
- Graph of a function is a collection of points $(a, f(a))$

Discussion :
For any number a,the ordered pair $(a, f(a))$ are the coordinates of a point on the graph of the function $f(x)$, so its y coordinate gives the value of $f(a)$. We use this idea for constructing our applet. Once such an applet is constructed, we can simply change the function and use it for different functions.
Sometimes we compare a function with a machine which gives an output, according to the definition of the function, for a given input. In Activity 1.3 we use an Applet which helps us to visualise this comparison. By this activity we get a clear idea about the domain of the function.

Activity 1.1 Functions

Procedure:

- Draw the graph of $f(x) = x^2$.
- Create a number slider **a** with increment 0.01
- Plot the points $A(a, 0)$, $B(a, f(a))$, $C(0, f(a))$. (give inputs like `A=(a,0)`).
- Draw the line segments AB and BC using `line segment` tool.
- Show the coordinates of A, B, and C.
- Now drag the point A along the x axis (either click and drag the point or using slider - click and drag the slider point to change the value of**a**) and observe the movement of C on the y axis.

To show the coordinates of a point, right click on the point. Go to Object Properties → Basic → Show Label and select the Name and Value option

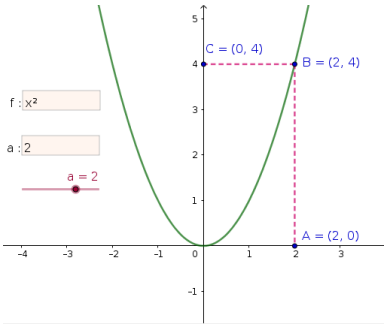
Using this, find the values of $(2.3)^2$,$(-1.8)^2$,$(0.9)^2$,$(2.9)^2$...

Save the file as Activity 1.1

Activity 1.2 Values of Functions

Procedure:

- Open the file Activity 1.1 and save as Activity 1.2
- Create an input box for f and change the function using it.
  (Select *input box* tool, → Click on `Graphics view` → give a suitable caption (say function) → `linked object` → $f(x) = x^2$ → OK)
- Similarly create an input box for the slider.



Change the functions accordingly and find the approximate values corrected to 3 decimal places of the following

	$3^{\frac{1}{3}}$	$\sqrt{1.8}$	$2^{\frac{2}{3}}$	$\sqrt{\sqrt{5}}$	$(3.46)^{\frac{-3}{2}}$
Function	$x^{\frac{1}{3}}$				
Input(x)	3				
Value($f(x)$)					

We can set the number of decimal places as follows;
Options → Rounding → Select number of decimal places.

Change the function to $f(x) = \frac{1}{x}$, and observe how the point C moves as the point A approaches the origin from either side.

Change the function to $f(x) = [x]$ and observe the movement of C according to A

Activity 1.3 Function Machine

Procedure :

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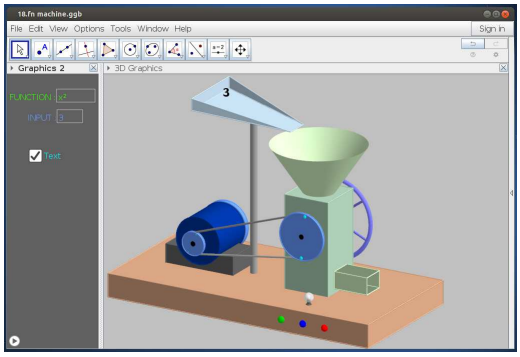
Use Applet ML 1.3



About the Applet

Three switches are provided on the machine

- GREEN :- Click to start the machine.
- RED :- Click to stop the machine.
- BLUE :- Click to reset.

Using input boxes we can change the function and the input number.
The warning light provided on the machine turns red if the input number is out of the domain of the function.

Change the function to $f(x) = \sqrt{x}$ and find the values of the following.

i) $\sqrt{2}$ ii) $\sqrt{1.8}$ iii) $\sqrt{\frac{2}{3}}$

What happens if we give a negative number as the input ?

Change the function to $f(x) = \frac{1}{x}$ and find the values of the following.

i) $\frac{2}{3}$ ii) $\frac{-3}{7}$ iii) $\sqrt{\frac{2}{3}}$

What happens if the input is 0 ?

Additional Activities

Activity 1.A Temperature Scales

Discussion

There are various scales to measure temperature. Perhaps the most popular ones are the Fahrenheit and the Celsius scales.
$F(C)$ is the Fahrenheit temperature corresponding to the Celsius temperature C and they related to each other as

$$F(C) = \frac{9}{5}C + 32$$

- Plot the graph of the above function (Consider C as the variable x)

- From the graph identify the Celsius temperature at which the Fahrenheit temperature become zero
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While plotting the graph of $F(C)$ we have to use x instead of C. So in order to get the graph input **9x/5+32**