

## Understanding the Window

Many graphs that you look at in algebra are appropriate to view on what the calculator calls the “standard” window. The standard window looks only at ordered pairs in which both the  $x$ -coordinates and the  $y$ -coordinates are between -10 and 10. The window variables, their meaning, and their values when using a standard window are given in the table below:

Window Variable	Meaning	Value when using a Standard Window
$X_{\min}$	$x$ -value on the far left of the screen	$X_{\min} = -10$
$X_{\max}$	$x$ -value on the far right of the screen	$X_{\max} = 10$
$X_{\text{scl}}$	distance between marks on the $x$ -axis	$X_{\text{scl}} = 1$
$Y_{\min}$	$y$ -value on the far bottom of the screen	$Y_{\min} = -10$
$Y_{\max}$	$y$ -value on the far top of the screen	$Y_{\max} = 10$
$Y_{\text{scl}}$	distance between marks on the $y$ -axis	$Y_{\text{scl}} = 1$

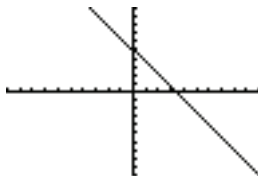
Most of the time you want to see the  $y$ -intercept (when  $x = 0$ ) and points nearby (with  $x$ -values between  $-10$  and  $10$ ). Also, with the equations that we use to learn the ideas, the  $y$ -values that come out when you put in  $x$ -values between  $-10$  and  $10$  are also “relatively close” to the  $x$ -axis (where  $y = 0$ ).

For example, let’s say we are trying to look at a graph of  $y = -\frac{3}{2}x + 5$ . Keeping things “nice”, let’s input  $x$ -values between  $-10$  and  $10$  that are multiples of 2 so that they come out “nice” when we multiply them by  $-\frac{3}{2}$ . Whether we calculate the  $y$ s by hand, or use the table on the calculator, we come up with a table like the following:

$x$	-10	-8	-6	-4	-2	0	2	4	6	8	10
$y$	20	17	14	11	8	5	2	-1	-4	-7	-10

(Notice: The  $y$ -values change by going down 3 each time while the  $x$ -values change by going up 2 each time, just like the slope predicts!)

If we look at this graph using the “standard” window, we can see the main features of the graph without trouble. We miss seeing a few of the ordered pairs from the table because the window only goes as high as  $y = 10$ , but we get a sense of where it starts and how it’s going. If we enter the equation into the  $\boxed{Y=}$  screen and press  $\boxed{\text{ZOOM}}\boxed{6}$ , the graph looks like:



If only all of the numbers in the world were this “nice”...unfortunately real life isn’t as convenient!

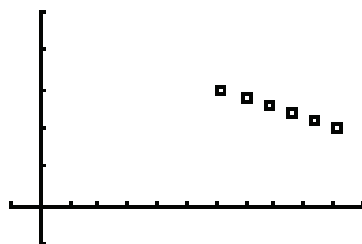
Let's say we are trying to graph a scattergram of the following data:

$s$	$G$
620	3.0
700	2.8
780	2.6
860	2.4
940	2.2
1010	2.0

If we enter this table into  $L_1$  and  $L_2$  and use the standard window, we won't see anything at all! If instead, we think about how we would make a scattergram by hand, and think about what values we would put on the axis, we can design a good window. A couple of example windows and the corresponding graphs are shown below:

WINDOW

```
Xmin=-100
Xmax=1100
Xscl=100
Ymin=-1
Ymax=5
Yscl=1
Xres=1
```



WINDOW

```
Xmin=500
Xmax=1100
Xscl=100
Ymin=1
Ymax=4
Yscl=1
Xres=1
```

