

Introduction to Efofex Statistics

Interact With Your Data

Introduction to Efofex Statistics

User's Guide

by Efofex Software

Efofex Software

PO Box 7 Waroona WA 6215 Australia

Fax: +61 8 9733 2460

Email: info@efofex.com

Web: www.efofex.com

Introduction to Efofex Statistics

© 2014 Efofex Software

All rights reserved. No parts of this work may be reproduced in any form or by any means - graphic, electronic, or mechanical, including photocopying, recording, taping, or information storage and retrieval systems - without the written permission of the publisher.

Products that are referred to in this document may be either trademarks and/or registered trademarks of the respective owners. The publisher and the author make no claim to these trademarks.

While every precaution has been taken in the preparation of this document, the publisher and the author assume no responsibility for errors or omissions, or for damages resulting from the use of information contained in this document or from the use of programs and source code that may accompany it. In no event shall the publisher and the author be liable for any loss of profit or any other commercial damage caused or alleged to have been caused directly or indirectly by this document.

Table of Contents

Part I The Basic Idea	2
Part II The Data Generators	3
Part III Controlling Your Graph - Part A	4
Part IV Controlling Your Graph - Part B	5
Part V Controlling Your Graph - Part C	7
Part VI Column Types	8
Part VII Using Frequency Tables	10
Part VIII Using Grouped Data	11
Part IX Multiple Data Sets for Groups	13
Part X Highlighting and Masking Data	14
Part XI Reusing Formulas	16
Part XII Using the Statistics View	17
Part XIII Quick Statistics	18
Part XIV Intelligent Fill Down	19
Part XV Using Labels on Graphs	21
Part XVI Dynamic Interaction with Graphs	22
Part XVII Multiple Graph Types on One Set of Axes	24
Part XVIII Localisation	27
Part XIX Formulas	27
Index	0

1 The Basic Idea

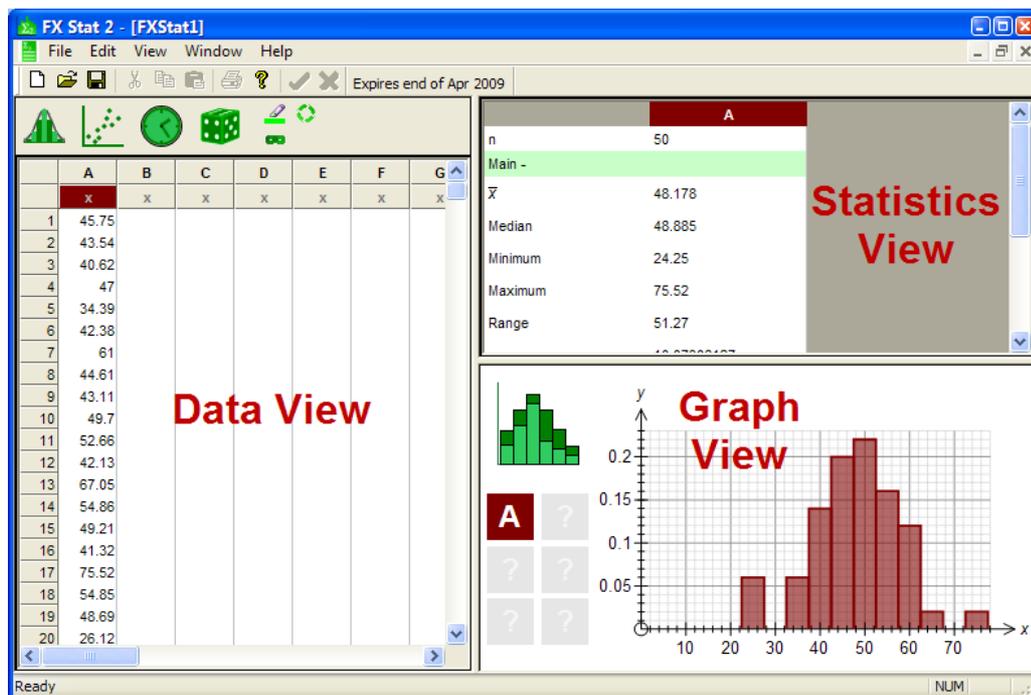
Efofex's Statistics technology is present in FX Stat and FX Draw. This lesson set is written from the viewpoint of FX Stat but all of the concepts are transferable to statistics graphs in FX Draw.

This lesson set is useful for many different products and versions. Some images may not perfectly align with what you are seeing on screen but this will not limit the lesson's usefulness.

So. To the lesson...

FX Stat is designed to be a complete statistic environment for **secondary school teachers and students**. If your school system needs a particular type of graph or statistic, FX Stat will be changed to suit **your** needs - rather than the needs of university lecturers or business owners.

FX Stat has three views of your data:



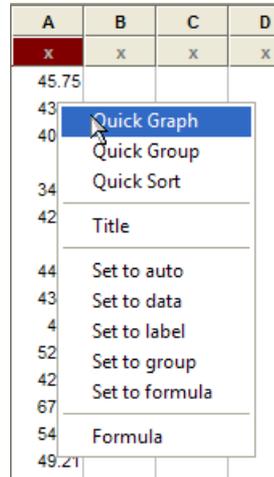
Enter your data in the data view, see it graphed in the graph view and obtain summary statistics in the statistics view.

Think Columns

FX Stat "thinks" in columns. You need to enter your data in **columns**. You graph **columns** of data. FX Stat calculates summary statistics on whole **columns**. You can use formulas on whole **columns**. Think **columns**.

Draw Your First Graph

To draw your first graph, enter some data in one of the columns (remember, FX Stat "thinks" in columns) of the data view. Right click anywhere in the column and select Quick Graph.



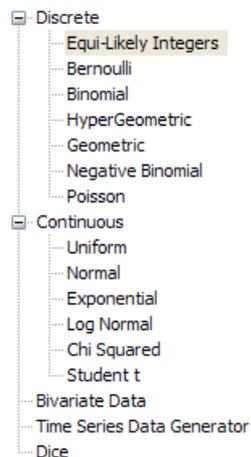
The quick graph option will automatically add your column to the graph and display the graph using the current settings. You should also notice that your column has also be automatically added to the statistics view - making summary statistics instantly available.

2 The Data Generators

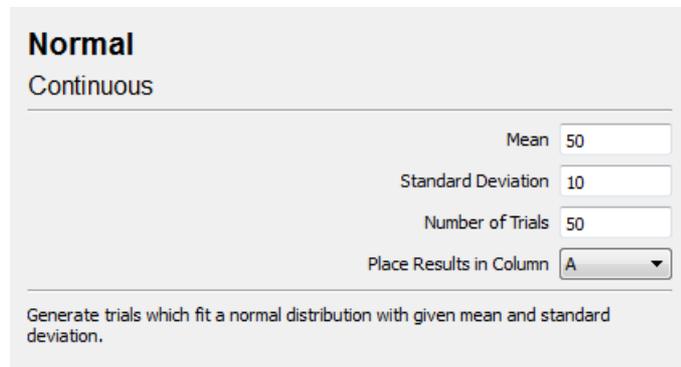
FX Stat includes a large number of data generators that can quickly generate a wide variety of data. The data generators are accessed using this toolbar.



Each of these buttons open the same data generation tool, just starting at different pages.



Each of these pages offer a data entry screen that will allow you to enter the parameters used to create the data. The following screen is for normally distributed continuous data.



The screenshot shows a web interface for generating normal distribution data. It has a title 'Normal' and a subtitle 'Continuous'. Below the title, there are four input fields: 'Mean' with the value 50, 'Standard Deviation' with the value 10, 'Number of Trials' with the value 50, and 'Place Results in Column' with a dropdown menu showing 'A'. At the bottom, there is a small text box that says 'Generate trials which fit a normal distribution with given mean and standard deviation.'

Simply fill in the blanks and FX Stat will quickly generate data for you.

It is well worth your time to investigate the data generators, especially the Bivariate data and Time Series data generators. They can save you a lot of time and, combined with the ability to quickly re-use formulae (see later lesson) allow you to simulate most situations.

3 Controlling Your Graph - Part A

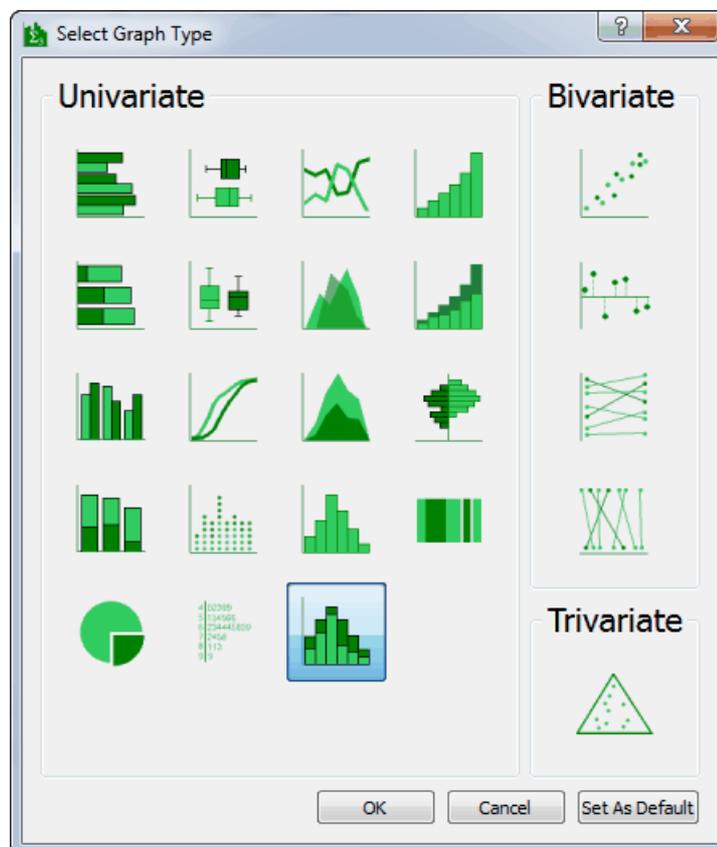
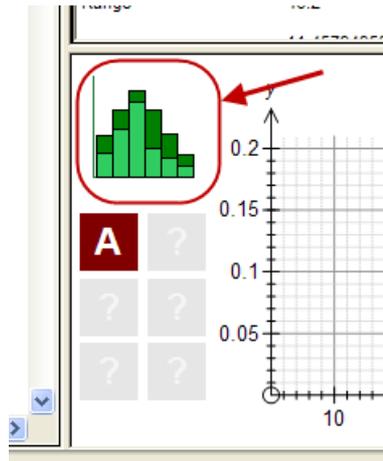
There are three main aspects to controlling your graph:

- Selecting the graph type.
- Setting the data.
- Changing the graph options.

This lesson will look at the first aspect.

Selecting the Graph Type

This is the easy bit. Push the graph type button and select the graph type you wish to use.



4 Controlling Your Graph - Part B

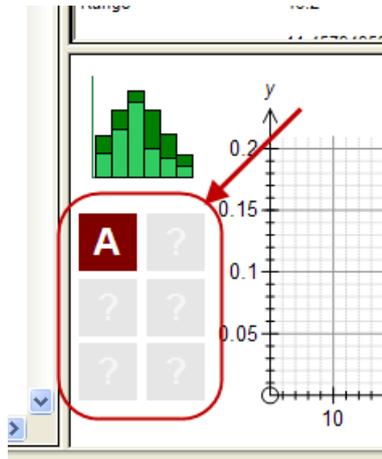
There are three main aspects to controlling your graph:

- Selecting the graph type.
- Setting the data.
- Changing the graph options.

This lesson will look at the second aspect.

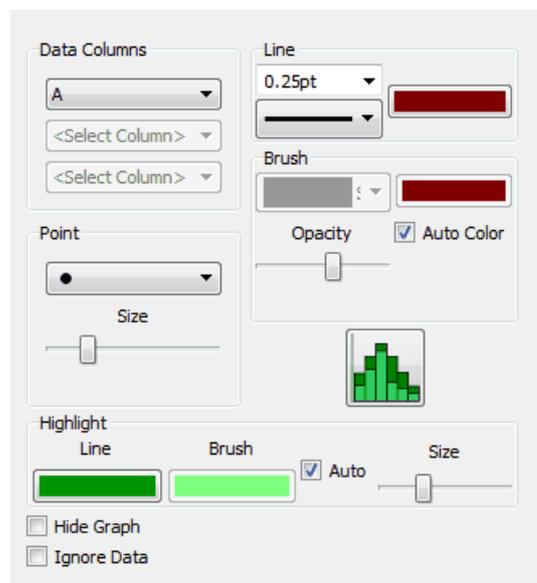
Setting The Data

FX Stat has six "data boxes" available to accept data for your graph (some graph types make less than six available). These are shown as grey squares until you add some data to them. In the example, the first data box is graphing column A and the other five data boxes are empty.



There are a number of ways to add data to a data box but the easiest is to use the Quick Graph entry on the right click menu as shown in the first lesson. Quick Graph will add the column to the first available slot in the data boxes.

The data box buttons allow you to edit the properties for that data box (and other graph options). If I push the A button, I will see this.



On this screen I can change which column is graphed, as well as changing line, brush and point styles for any graph which uses this data box. There are more options available here that we will discuss later.

5 Controlling Your Graph - Part C

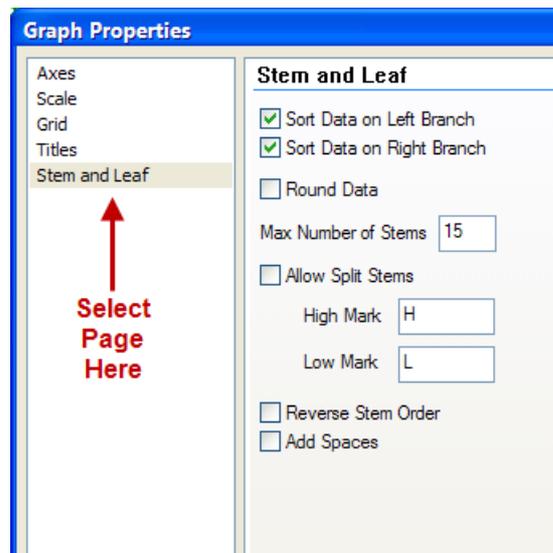
There are three main aspects to controlling your graph:

- Selecting the graph type.
- Setting the data.
- Changing the graph options.

This lesson will look at the third aspect.

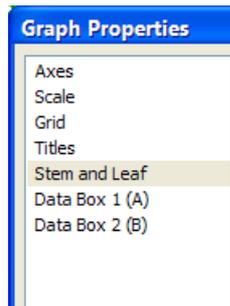
Changing Graph Options

Most graph types have specific options that can be changed. To access the graph options, right click somewhere on the graph.



The left hand side of the screen lets you pick the type of properties you wish to change. Axes, scales, grid and titles are common to all types of graphs. The last option is specific to the graph type you are currently using - in this case Stem & Leaf.

If you have added data to one (or more) or the data boxes, there will be extra entries on the left hand side.



The extra entries give you access to the Data Box properties discussed in the last lesson.

There are many ways of getting to the graph properties screen. You can click on a Data Box button as discussed in the last lesson or you can right click on various parts of the graph. In every case you get to the graph properties, the only difference is what page is displayed at the start.

For example, if you click on one of the numbers making up the scales of the graph, the graph properties screen will appear with the Scale page displayed.

Most graph types have their own unique properties and we recommend that you look at each carefully.

6 Column Types

FX Stat classifies columns based on the information entered into them. FX Stat uses five different column types:

Column Type	Shown As	Use
Data	x	Holds raw numeric data.
Group	10-20	Holds group definitions. 10-20 is a group where $10 \leq x < 20$.
Frequency	f	Frequency columns, when combined with data columns or group columns , contain the frequency of data.
Label	ABC	Holds labels used for some graph types
Formula	=	Holds numeric data that is the result of a formula. Data in formula columns is dynamically updated as the source data changes.

FX Stat will automatically classify columns in most cases - based on the information you have entered into the column. Sometimes you will need to override FX Stat's automatic classification.

	A	B	C	D	E	F
	ABC	x	10-20	f	x	f
1	Jan 08	12.3	15-25	6	9	9
2	Feb 08	12.1	25-35	8	10	1
3	Mar 08	14.2	35-45	1	11	6
4	Apr 08	4.3	45-55	4	12	4
5	May 08	11.8	55-65	2	13	3
6	Jun 08	12	65-75	5	14	7
7	Jul 08	15	75-85	5	15	8
8						

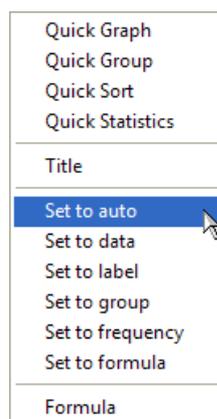
In this example, FX Stat has automatically classified the first five columns. You can see the classifications just below the column headers - ABC, x, 10-20, f, x and f. The first five classifications are **grey**, which indicates that FX Stat has automatically classified the column. The last f is black because in this column, the user has over-ridden FX Stat's automatic classification and forced the column to be a frequency column.

Remember. **Black** means you have set the column type. **Grey** means FX Stat has picked the column type automatically.

Changing Column Types

There are two ways of setting the column type. Depending on where the column is, the frequency column type may or may not be available.

Right Click in the Column



Just select the column type you want.

Click in the Column Type

B	
x	1
12.3	
12.1	
14.2	
4.3	
11.8	
12	
15	

FX Stat will cycle through the available column types.

7 Using Frequency Tables

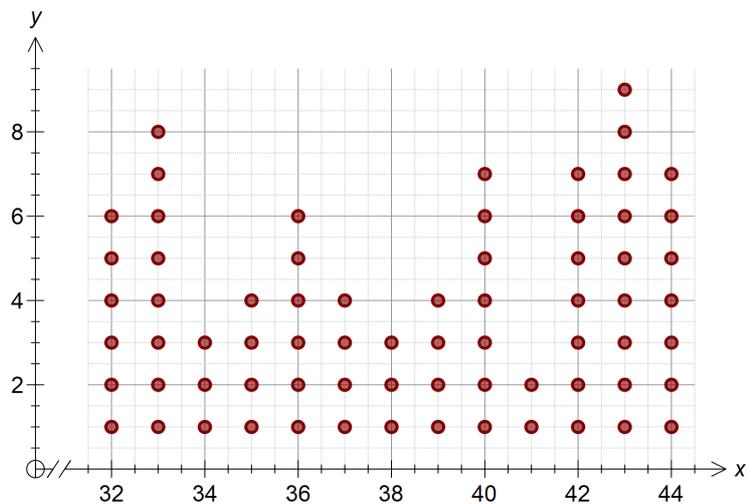
FX Stat has the ability to graph and find summary statistics for frequency tables. Using frequency tables is easy - just add a frequency column (f) next to a normal data column (x).

	A	B	C
	x	f	
1	32	6	
2	33	8	
3	34	3	
4	35	4	
5	36	6	
6	37	4	
7	38	3	
8	39	4	
9	40	7	
10	41	2	
11	42	7	
12	43	9	
13	44	7	
14			

Notice that the frequency column type is **black** (rather than **grey**). This means that the user has had to manually tell FX Stat that the column is a frequency column. Unlike most columns, there is no way for FX Stat to automatically determine if the information in column B represents frequencies or more raw data.

If you quick graph column B, the frequency column, FX Stat will interpret your information as a frequency table.

	A	B
	x	f
1	32	6
2	33	8
3	34	3
4	35	4
5	36	6
6	37	4
7	38	3
8	39	4
9	40	7
10	41	2
11	42	7
12	43	9
13	44	7
14		



8 Using Grouped Data

FX Stat can group data into automatic groups or groups you define yourself. It can graph grouped data and correctly calculate summary statistics for grouped data. It is most important that you learn how to use grouped data in FX Stat.

Quick Group Existing Data

FX Stat can quickly group data for you using its current defaults. Just right click in a column and select Quick Group.

	A	B	C	D
	x	x	x	x
1	45.99			
2	47.13			
3	49.65			
4	56			
5	33			
6	43			
7	56			
8	51			
9	4			
10	38			
11	22			
12	4			
13	38			
14	48			
15	51			
16	46			
17	31			
18	66.35			

	A	B	C
	x	10-20	f
1	45.99	17.5-22.5	0
2	47.13	22.5-27.5	1
3	49.65	27.5-32.5	1
4	56.51	32.5-37.5	4
5	33.55	37.5-42.5	5
6	43.45	42.5-47.5	11
7	56.39	47.5-52.5	10
8	51.76	52.5-57.5	8
9	48.1	57.5-62.5	4
10	38.85	62.5-67.5	5
11	22.79	67.5-72.5	1
12	42.6		
13	38.32		
14	48.84		
15	51.27		
16	46.38		
17	31.81		
18	66.35		

FX Stat has automatically created the groups and allocated all the data in column A into the available groups. FX Stat has other grouping functions that can provide more flexibility and customisation and these will be discussed in later lessons.

Entering Your Own Grouped Data

You can enter your own grouped data manually if you wish. Just type the group definitions into one column and the frequencies into the column immediately to the right of your column. Manually entering your own grouped data allows you to create whatever groups you want - however bizarre they might be.

	A	B	C
	10-20	f	x
1	5-6	2	
2	6-12	3	
3	12-20	4	
4	20-22	6	
5	22-25	2	
6			

Interpreting Grouped Data

In FX Stat, groups are entered using two numbers separated by a dash, 25-30 for example. Internally, FX Stat interprets such groups as.

$$25-30 \quad \rightarrow \quad 25 \leq x < 30$$

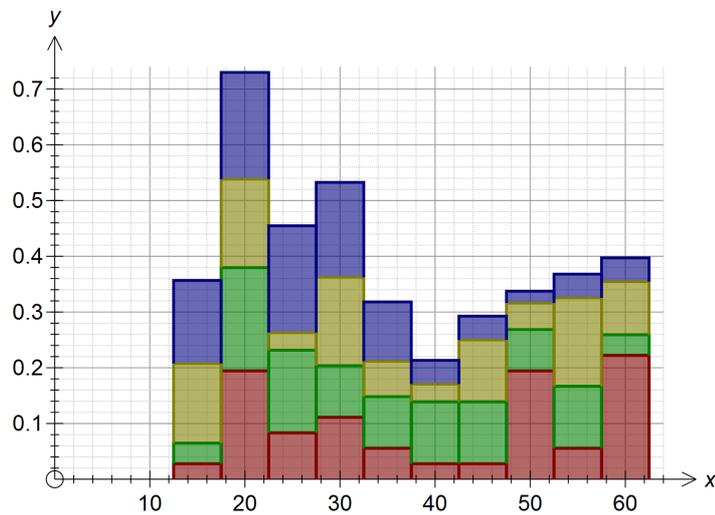
Graphing Grouped Data

To graph grouped data, use Quick Graph (right click) on the **frequency** column. If you right click on the group definition column, Quick Graph will not be available.

9 Multiple Data Sets for Groups

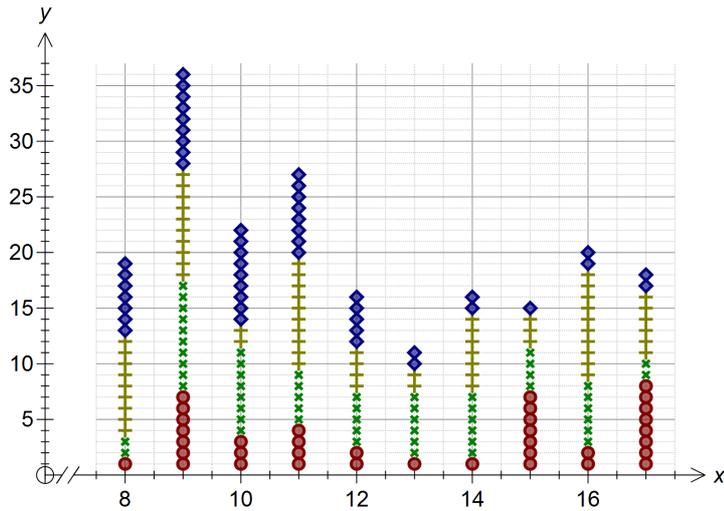
A group column can have multiple frequency columns attached to it. Just keep adding frequency columns to the right of the group definition column. Providing that there are no gaps, each frequency column will use the same group definitions.

	A	B	C	D	E
	10-20	f	f	f	f
1	12.5-17.5	1	2	9	7
2	17.5-22.5	7	10	10	9
3	22.5-27.5	3	8	2	9
4	27.5-32.5	4	5	10	8
5	32.5-37.5	2	5	4	5
6	37.5-42.5	1	6	2	2
7	42.5-47.5	1	6	7	2
8	47.5-52.5	7	4	3	1
9	52.5-57.5	2	6	10	2
10	57.5-62.5	8	2	6	2
11					



Multiple frequency columns can also be used for data columns, creating large frequency tables.

	A	B	C	D	E
	x	f	f	f	f
1	8	1	2	9	7
2	9	7	10	10	9
3	10	3	8	2	9
4	11	4	5	10	8
5	12	2	5	4	5
6	13	1	6	2	2
7	14	1	6	7	2
8	15	7	4	3	1
9	16	2	6	10	2
10	17	8	2	6	2
11					



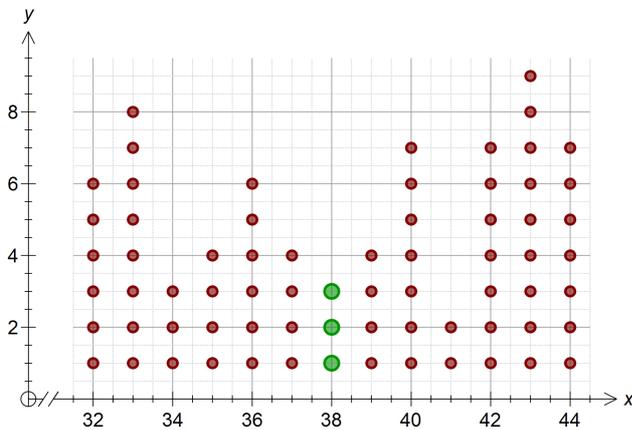
10 Highlighting and Masking Data

FX Stat allows you to highlight and mask data. Highlighted data will usually be highlighted in some way on the graph (depending on the graph type). Masked data is excluded from graphs and from all summary statistics.

Highlighting Data

Select data in the grid. **Any selected data is automatically highlighted on the graph.**

	A	B	C
	x	f	x
1	32	6	
2	33	8	
3	34	3	
4	35	4	
5	36	6	
6	37	4	
7	38	3	
8	39	4	
9	40	7	
10	41	2	
11	42	7	
12	43	9	
13	44	7	
14			



Now push the highlight toolbar button (or type Ctrl + B). This makes the highlighting permanent.



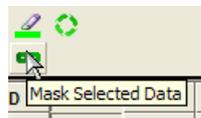
	A	B
	x	f
1	32	6
2	33	8
3	34	3
4	35	4
5	36	6
6	37	4
7	38	3
8	39	4
9	40	7
10	41	2
11	42	7
12	43	9
13	44	7
14		

Highlighting data only affects the way the data is displayed on the graph. There are no implications for the calculation of statistics.

Masking Data

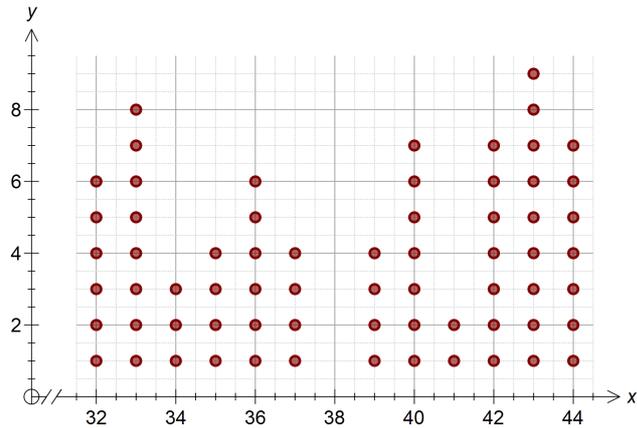
Select data in the grid. **Any selected data is automatically highlighted on the graph.**

Now push the mask toolbar button (or type Ctrl + M). The data will be immediately removed from any summary statistics and graph.



	B
n	70
Main -	
\bar{x}	38.32857143
Median	39
Minimum	32
Maximum	44
Range	12

	B
n	67
Main -	
\bar{x}	38.34328358
Median	39
Minimum	32
Maximum	44
Range	12

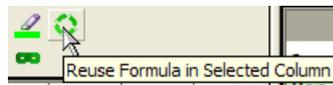


11 Reusing Formulas

FX Stat provides the ability to re-use a formula. There are two main uses for this feature.

Reuse Formulas

Select a cell in the column you want the results to go into and press the re-use button.



Using Reuse to Create Data in Multiple Columns

Most users will use the data generators to quickly create data. Once you have selected all of the parameters you require and created data in one column, just point to another column and reuse the formula. FX Stat will use exactly the same parameters and data generator and create another set of data. This allows you to quickly create large amounts of similar data.

Normal
Continuous

Mean

Standard Deviation

Number of Trials

Place Results in Column

Generate trials which fit a normal distribution with given mean and standard deviation.

	A	B	C	D
	x	x	x	x
1	63.84			
2	58.82			
3	45.49			
4	77.51			
5	55.26			
6	50.43			
7	36.19			
8	49.37			
9	12.43			
10	42.29			
11				

Original

	A	B	C	D
	x	x	x	x
1	63.84	36.14		
2	58.82	43.08		
3	45.49	37.62		
4	77.51	69.38		
5	55.26	32.49		
6	50.43	47.68		
7	36.19	37.46		
8	49.37	4.62		
9	12.43	43.05		
10	42.29	44.4		
11				

Reuse

	A	B	C	D
	x	x	x	x
1	63.84	36.14	79.06	
2	58.82	43.08	54.56	
3	45.49	37.62	41.79	
4	77.51	69.38	59.51	
5	55.26	32.49	29.1	
6	50.43	47.68	36.19	
7	36.19	37.46	46.58	
8	49.37	4.62	46.22	
9	12.43	43.05	83.66	
10	42.29	44.4	55.03	
11				

Reuse

Using Reuse to Simulate Trials

You can use a data generator to simulate a number of trials - rolling 2 six sided dice for example. If you leave the cursor in the original column and keep pressing the reuse button, you can repeat the simulation a large number of times.

12 Using the Statistics View

FX Stat's statistics view automatically generates summary statistics for any graphed columns. The main statistics (such as mean, median and range) are displayed by default. Less commonly used statistics (such as mean absolute deviation, deciles and stanines) are available by scrolling down to the header and expanding the section.

	A
σ_x	8.34980913
S_x	8.26588932
Inter-quartile range	13.56
Other +	
Deciles +	
Stanines +	
Percentiles +	

	A
σ_x	8.34980913
S_x	8.26588932
Inter-quartile range	13.56
Other +	
Deciles +	
Stanines -	
1	31.56 <= x < 38.7576
2	38.7576 <= x < 41.0777

	A
Stanines -	
1	$31.56 \leq x < 38.7576$
2	$38.7576 \leq x < 41.0777$
3	$41.0777 \leq x < 42.7235$
4	$42.7235 \leq x < 45.568$
5	$45.568 \leq x < 51.534$
6	$51.534 \leq x < 56.4222$

Two variable statistics (including regression equations) are automatically displayed when two variable graphs are used - eg scatter graphs.

Copying Statistics

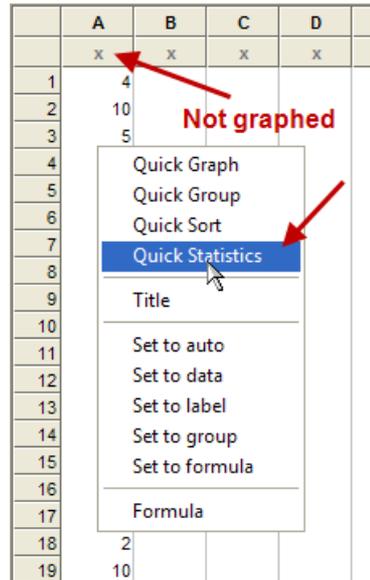
You can copy statistics out of the statistics view by right-clicking on the view.

	A
n	30
Main -	
\bar{x}	5.31666667
Median	
Minimum	
Maximum	10.8
Range	10.8
σ_x	2.93986668

Copy Selected Statistics
Copy All Statistics

13 Quick Statistics

When you right-click on a column that includes data that is not currently being graphed, FX Stat will offer you a Quick Statistics option.



Columns which have been graphed are automatically added to the statistics view. Quick Statistics lets you add a column that you have **not graphed** to the statistics view.

	A
n	50
Main -	
\bar{x}	5.82
Median	6
Minimum	1
Maximum	10
Range	9

This allows you to find summary statistics for any column you want.

14 Intelligent Fill Down

FX Stat 2 includes an intelligent fill down feature that can make the creation of data much easier.

To use the fill down feature enter something into a cell and move the mouse pointer over the little black square so that the cursor changes. Now click the left mouse button and move down. FX Stat will automatically create data to fill the spaces.

Perhaps the most useful application of this is creating group definitions.

Sometimes you will need to select **two** cells so that FX Stat knows how much to increment by.

	A	B
	ABC	x
1	Mon	
2	Wed	
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		

	A	B
	ABC	x
1	Mon	
2	Wed	
3	Fri	
4	Sun	
5	Tue	
6	Thu	
7	Sat	
8	Mon	
9	Wed	
10	Fri	
11	Sun	
12	Tue	
13	Thu	
14		

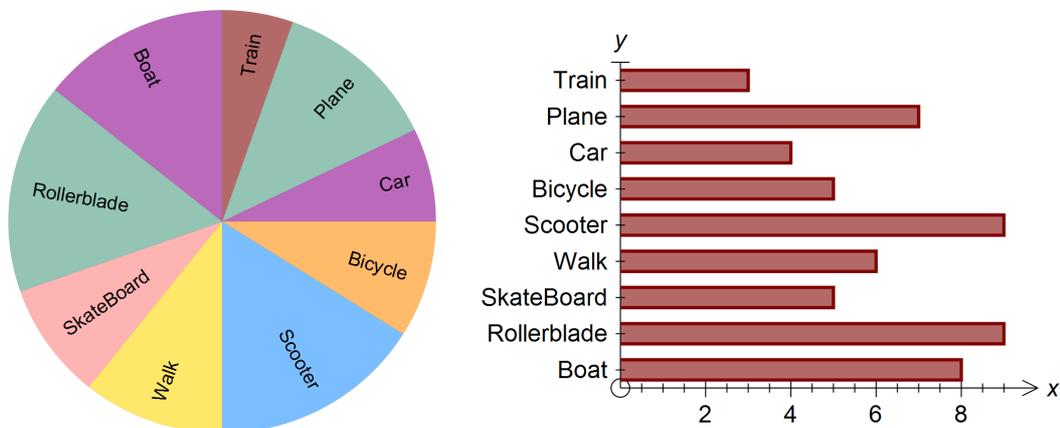
15 Using Labels on Graphs

Using labels on graphs is easy - just enter your labels into a column. FX Stat should automatically detect the labels and mark the column as a label column.

	A	B	C
	ABC	x	x
1	Train	3	
2	Plane	7	
3	Car	4	
4	Bicycle	5	
5	Scooter	9	
6	Walk	6	
7	SkateBoard	5	
8	Rollerblade	9	
9	Boat	8	
10			

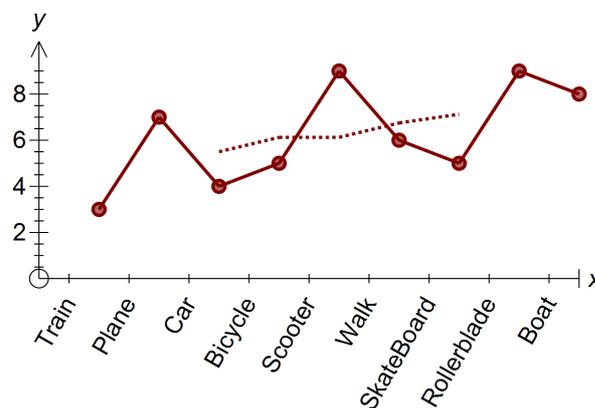
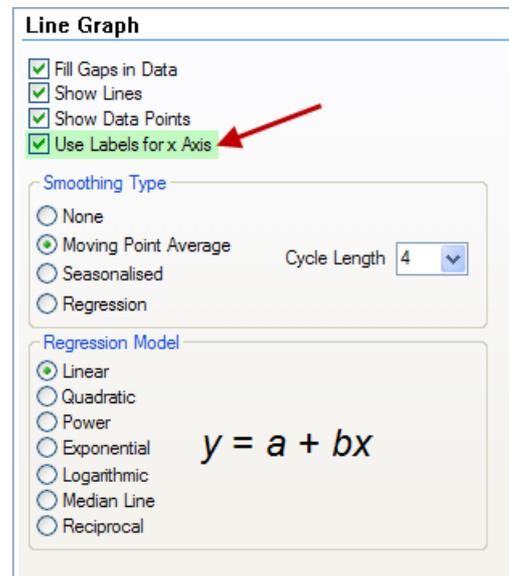
In some situations (particularly if you are using numbers for labels) FX Stat will not automatically detect the label column. If so, you will need to manually tell FX Stat that the column is a label column. This was discussed in the [Column Types](#) lesson.

Most graph types that support labels will now automatically find the labels and use them.



Line graphs can also use labels for the x axis but need to be given permission to

do this. Right click on a line graph and change this option.

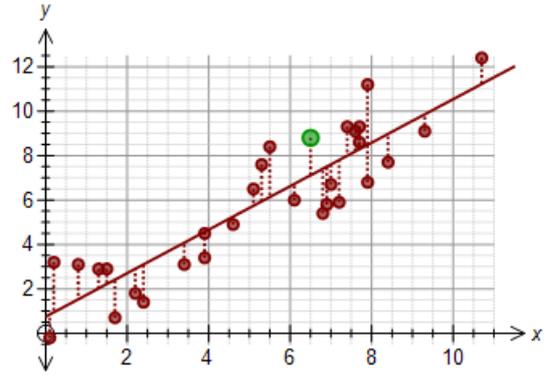
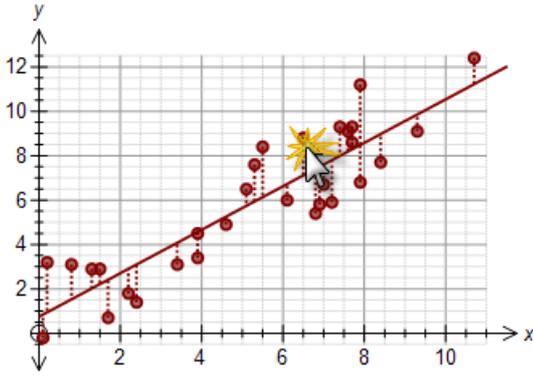


16 Dynamic Interaction with Graphs

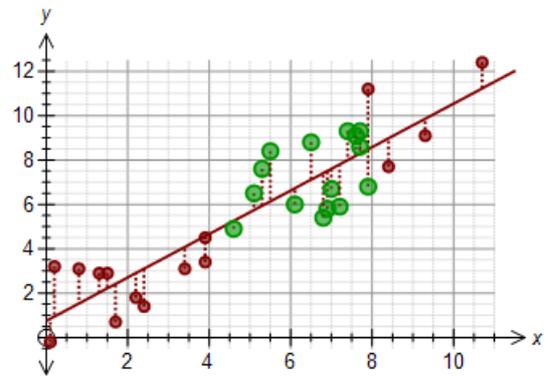
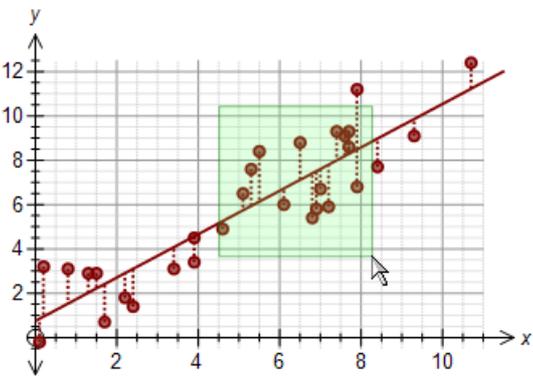
FX Stat lets you interact with data **on the graph**. How you can interact depends on the type of graph. All graphs let you select data, many let you change data.

Selecting Data

Clicking on a data point or bar will select and highlight that point/bar.



You can also sweep out a selection rectangle that will select and highlight all included points.

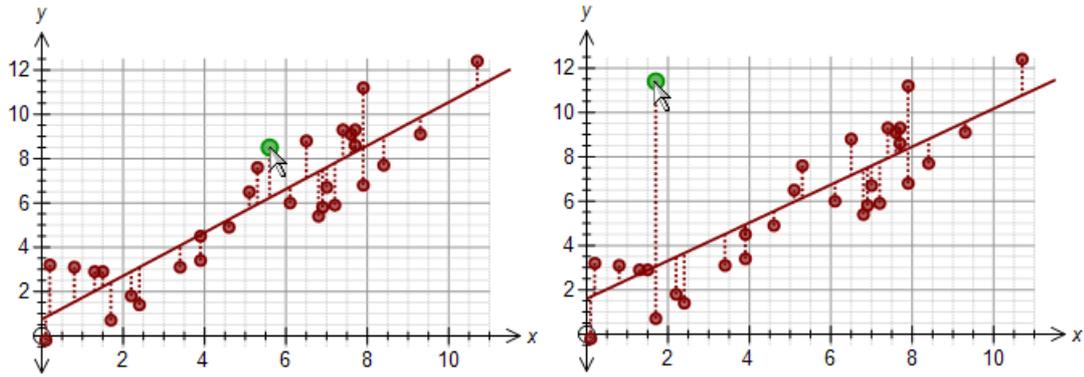


Selected data is selected in the data view at the same time.

	A	B
	x	x
1	2.4	1.4
2	3.9	4.5
3	1.7	7.1
4	5.3	7.6
5	7.4	9.3
6	0.2	3.2
7	5.1	6.5
8	6.9	5.8
9	2.2	1.8
10	0.1	-0.2
11	3.9	3.4
12	4.6	4.9
13	1.5	2.9
14	1.3	2.0

Modifying Data

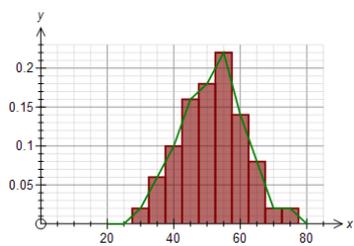
If you click on a data point and move the mouse while clicked, the graph **and** data can be modified. All statistics are automatically updated.



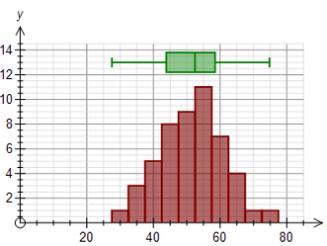
As each graph type is modified differently, we cannot give a full set of examples here. Try it out for yourself.

17 Multiple Graph Types on One Set of Axes

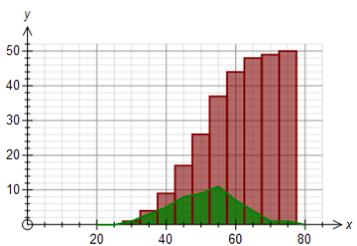
Many users will want to combine graph types on the same set of axes.



Frequency Polygon and Histogram



Histogram and Box Plot
Cumulative Histogram



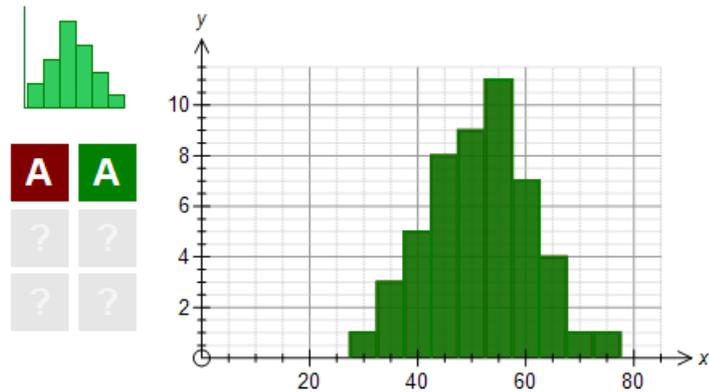
Frequency Polygon and

In all three examples, we have shown the same data in two different ways.

Before we look at how to achieve this, it is important to remember that **not all graph types can be combined**. More about this later.

Add Your Data Column to Two Data Boxes

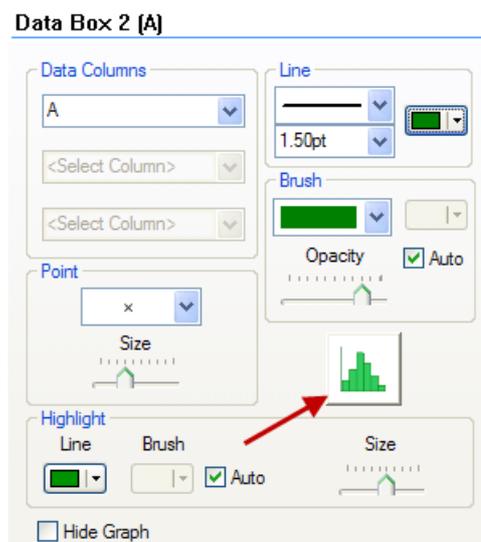
Firstly, we add the data column to two data boxes using the standard commands. Your graph might look like this.



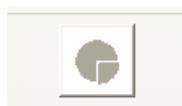
We have graphed column A in two boxes and the graph is two overlaid histograms. Not too useful yet!

Push the Second Data Box Button

Push the second data box button (the green one in this case) and the following screen will appear.



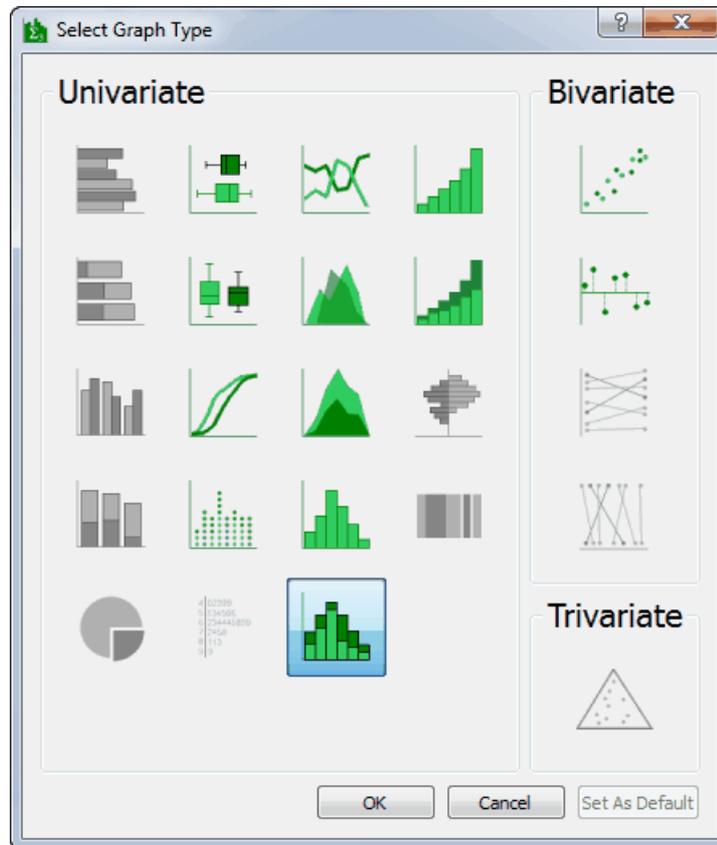
The graph type button is active which means that we can change the graph type for just this data box. For some types, this button will be greyed out which prevents you from overlaying another graph type.



Greyed Out - No Combining Available

Push the Graph Type Button

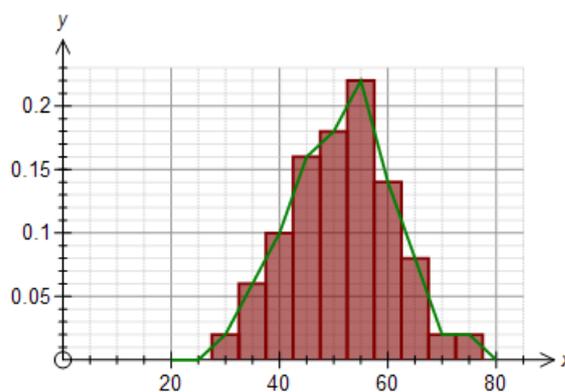
Push the graph type button and a list of available graph types will appear. Not all graph types will be available because not all graph types can be combined.



Change the Graph Type

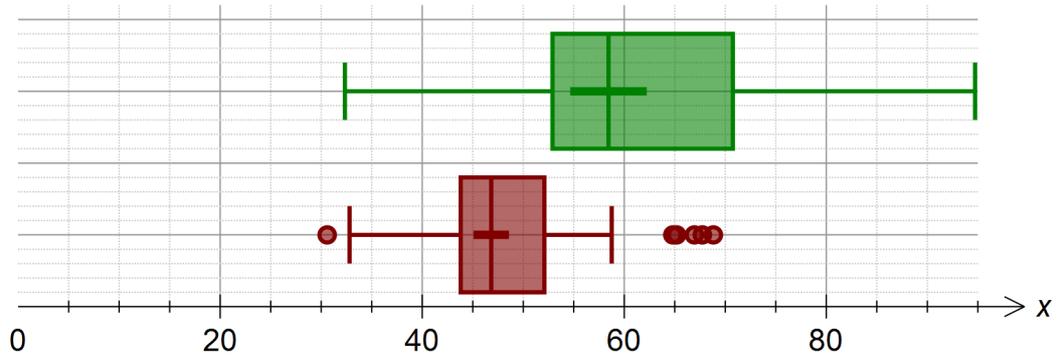
Change the graph type to your desired graph type. In this example, we will choose the frequency polygon. You may also want to decrease the opacity of the brush at this point.

Finished!



18 Localisation

Statistics, especially secondary school level statistics, are remarkably variable between locations. For example, New Zealand has added a bar to box and whisker plots that show a version of the confidence interval for the data.



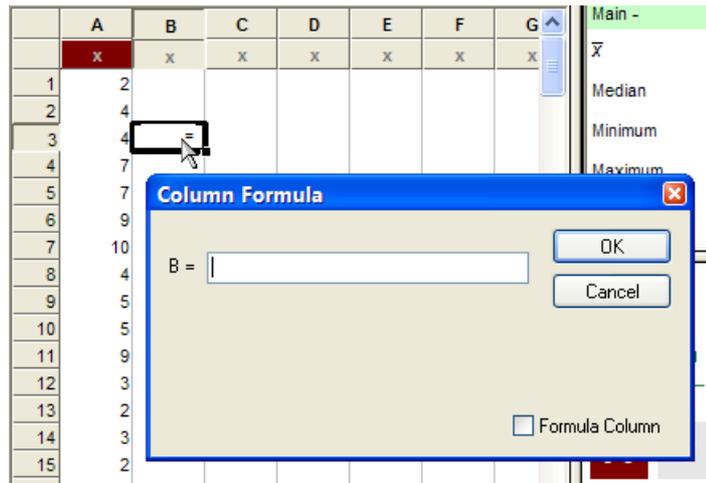
As far as we know, New Zealand is the only location that uses this concept but we have included in our options as part of our commitment to making FX Stat suit as many systems as possible.

If you look at one of the graphs FX Stat produces and say to yourself "that's not right", just remember three things. Firstly, what you are seeing on the screen **is** right **somewhere** and Efofex will not get into arguments about a concept's "correctness". Secondly, take a close look at the various options we provide, both for graphs in general and for the specific graph type you are interested in. **It is highly likely that FX Stat already does what you require.** Finally, if FX Stat does not do what you are after, approach us with a clear specification of what you require and we are very likely to add it.

19 Formulas

FX Stat includes a comprehensive set of statistical commands that can be used on your data - far more than we can discuss here. But we can show you how to access them.

You enter a formula into FX Stat by moving the cursor to a cell in the data view and pressing the "=" sign.



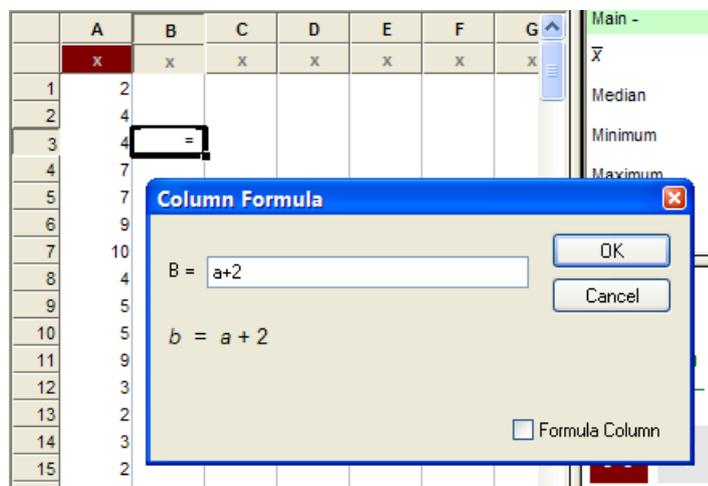
In this example, we are entering a formula into column B.

Now we need to tell you the most important thing about FX Stat formulas...

Formulas Operate On A Whole Column At Once!!!

This is **VERY** different to a spreadsheet.

In our example, we will type a very simple formula



Push OK and FX Stat uses the formula to fill in **ALL** of column B.

	A	B
	x	x
1	2	4
2	4	6
3	4	6
4	7	9
5	7	9
6	9	11
7	10	12
8	4	6
9	5	7
10	5	7
11	9	11
12	3	5
13	2	4
14	3	5

So what commands are available? FX Stat contains many statistics specific commands that can be used in your data analysis and creation tasks. Full details on the meaning, use and syntax of these commands are available in the function reference section of FX Stat's help file. See below for a summary of the available commands.

This is the last lesson in this series - but there is much more to learn!! Much more information is available in FX Stat's help file and we strongly recommend that you take a look around.

Normal Distribution

Normal()	NormP()	NormQ()
NormPDF()	ZScore()	Standardise()

Random Number Generation

Rand()	RandBernoulli()	RandBetween()
RandBinomial()	RandGeometric()	RandHyperGeometric()
RandNegBinomial()	RandNormal()	RandLogNormal()
RandExponential()	RandPoisson()	RandChiSquared()
RandStudent()		

Regression and Time Series Data

MPA() Predict() PredictY()
PredictX() Residual() ResidualY()
ResidualX() Seasonalise()

Sorting

Sort() SortA() SortD()
SortCol() SortColA() SortColD()

Ranking

Rank() RankD() RankA()

Frequency Tables

FreqTable() CumFreqTable()

Grouping Data

Group() GroupN() GroupE()
GroupW()

Deciles / Stanines and Percentiles

Decile() Stanine() Percentile()

Miscellaneous Functions

Inc() Deviation() Round()