

XL3B: V0U Excel2013 Model Toolpak Regress2 Binary&Continuous 1

Regress Linear Two Predictor Binary+Continuous Excel 2013

by
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Materials at: www.StatLit.org/pdf/Excel2013-Model-Toolpak-Regress2BC-Slides.pdf
[Excel2013-Model-Toolpak-Regress2BC-Output.pdf](http://www.StatLit.org/pdf/Excel2013-Model-Toolpak-Regress2BC-Output.pdf)

XL3B: V0U Excel2013 Model Toolpak Regress2 Binary&Continuous 2

Weight-Height association before/after control for Gender

Required output: Create and upload your worksheet:

1. Calculate mean height and weight by gender: slide 3
2. Model Weight on Height and Gender: slides 6 & 7.
3. Generate height-weight chart with trendline: slide 8.*
4. Graph output from multiple regression: slide 12.*
Show regress lines for men and women separately.

* Show equation and R-square on both graphs.
Data: www.StatLit.org/xls/Excel2013-Model-Toolpak-Regress2BC-Input.xls
Subjects are college students. Male: 1 for guys; 0 for gals.

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1) Analyze Data: Enter Formula into K4:L5

Row	J	K	L	M	N	O	P
2	Generate Summary Statistics by Gender:						V0E
3	Averages	Male=1	Female=0	=AVERAGEIFS() requires Excel 2007 or newer			
4	Height	70.8	65.4	=AVERAGEIFS(\$C2:\$C93,\$D2:\$D93,"=0")			
5	Weight	158.3	123.8	=AVERAGEIFS(\$E2:\$E93,\$D2:\$D93,"=0")			
6				=AVERAGEIFS(\$E2:\$E93,\$D2:\$D93,"=1")			
7				AVERAGEIFS function allows data to be separate from the criteria.			

Actual male-female differences:

- Average weight: 158.3 - 123.8 = 34.5 pounds
- Average height: 70.75 - 65.40 = 5.35 inches

Question: How much of the male-female weight difference (34.5#) is due to gender (male vs. female) and how much is due to the difference in heights?
Analyzing a whole into parts is called "decomposition".

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2a) Data Toolbar, select Data Analysis. Select Regression

See slide 17 if no Data Analysis on your toolbar.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Pulse1	Pulse2	Height	Male?	Weight	Activity	Run?	Imokes?				
2	58	56	67	0	125	2	0	0				
3	60	66	62	0	120	2						
4	61	70	65.5	0	120	2						
5	62	100	66	0	120	2						
6	62	98	62.75	0	112	2						
7	62	66	65	0	122	3						
8	64	60	66	0	130	3						
9	66	72	66	0	125	2						
10	66	76	65	0	115	2						
11	68	112	70	0	125	2						
12	68	68	69	0	150	2						

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2b) Regress Weight (E1:E93) on Height and Sex (C1:D93)

Input Y Range: \$E\$1:\$E\$93
Input X Range: \$C\$1:\$D\$93
Labels: Labels
Confidence Level: 95%
Output Range: \$J\$9
New Worksheet Ply:

Obtain R-sq here

Obtain best-fit coefficients here

Formatting and formula are optional

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2c) Results: Regress Weight on Height and Sex (Male?)

	J	K	L	M	N	O	P
9	SUMMARY OUTPUT						
11	Regression Statistics						
12	Multiple R	0.81					
13	R Square	0.66					
14	Adjusted R	0.65					
15	Standard Error	13.98					
16	Observations	92					
18	ANOVA						
19		df	SS	MS	F	Significance F	
20	Regression	2	33886.66	16943.33	86.68	1.26E-21	
21	Residual	89	17397.21	195.47			
22	Total	91	51283.87				
24	Coefficients						
25	Intercept	-117.60	Standard Error	3.14	t-Statistic	P-value	Lower 95% Upper 95%
26	Height	3.69	0.57	6.45	0.00	2.55	4.83
27	Male?	14.70	4.29	3.43	0.00	6.18	23.22

Weight = -117.6 + (3.69*Height) + (14.7*Male)

2d) Calculate Expected Weight at High+Low Heights for Guys+Gals

Create formula in L33 predicting weight:

31	J	K	L	M	N	O
32	Height	Male	Weight			
33	60	0	104	=K\$25+K\$26*J33+K\$27*K33		
34	76	0		Pull down L33 to L36.		
35	60	1				
36	76	1				

Pull L33 down to L36

Height	Male	Weight
60	0	104
76	0	163
60	1	119
76	1	178

3) Create Chart #1

Edit Series

Series name: = Weight

Series X values: = 'S1'!\$C\$2:\$C\$93

Series Y values: = 'S1'!\$E\$2:\$E\$93

4a) Copy & Paste Chart 1. Delete Trend, Equation & R²

4b) Select Data. Add two series: One for Gals and one for Guys

31	J	K	L
32	Height	Male	Weight
33	60	0	104
34	76	0	163

Series X values: = 'S1'!\$J\$35:\$J\$36

Series Y values: = 'S1'!\$L\$35:\$L\$36

35	60	1	119
36	76	1	178

Series X values: = 'S1'!\$J\$33:\$J\$34

Series Y values: = 'S1'!\$L\$33:\$L\$34

4c) Select top/guys data point. Format data series/Paint/Line/Solid Repeat for bottom/gals data point.

To select: Point and right mouse

4d) Insert text boxes for Male, Female and Equation with R²

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Appendix


Slide 16: What to do if the plus sign doesn't appear on the upper-right side of the graph

Slides 17 & 18: What to do if the Data Analysis object doesn't appear on the right side of the Data toolbar.

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If + Sign doesn't appear on upper-right side of graph...

Select the graph. Select the Chart-Tools Design tab.



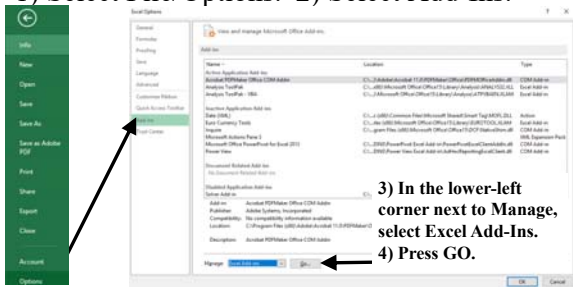
At the far-left, select "Add Chart Element". Select "Axis Titles" and "Chart Title".

To add a Trendline, either select "Trendline" under "Add Chart Element" or right-mouse on a data point and select Trendline from menu.

XL3B: V0U Excel2013 Model Toolpak Regress2 Binary&Continuous 15

If Data Analysis doesn't appear on Data Toolbar

1) Select File/Options. 2) Select Add-Ins.

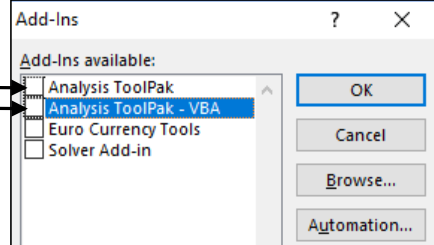


3) In the lower-left corner next to Manage, select Excel Add-Ins. 4) Press GO.

XL3B: V0U Excel2013 Model Toolpak Regress2 Binary&Continuous 16

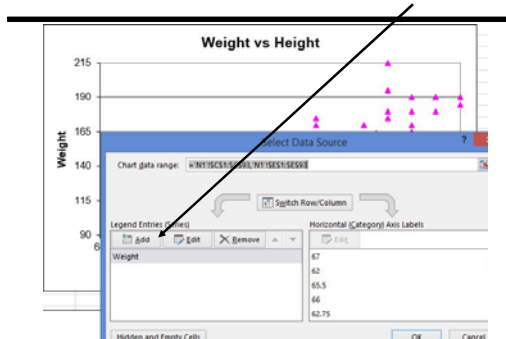
Add Data Analysis to the Data Toolbar

1) Checks the boxes involving Analysis ToolPak.
2) Press OK



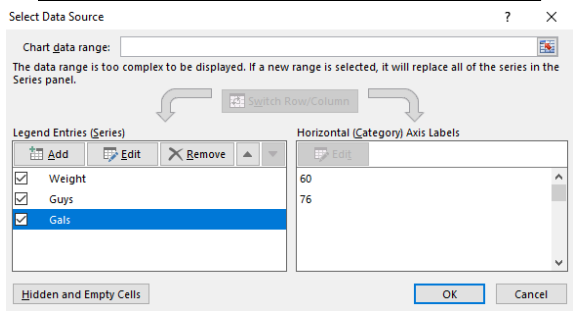
XL3B: V0U Excel2013 Model Toolpak Regress2 Binary&Continuous 17

4b2) Select Data; Select "Add"



XL3B: V0U Excel2013 Model Toolpak Regress2 Binary&Continuous 18

4c2) After Adding Two New Series, Press "OK"



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1) Analyze Data: Enter Formula into K4:L5

Row	J	K	L	M	N	O	P
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3	Averages	Male=1	Female=0	AVERAGEIFS() requires Excel 2007 or newer			
4	Height	70.8	65.4	=AVERAGEIFS(\$C2:\$C93,\$D2:\$D93,"=0")			
5	Weight	158.3	123.8	=AVERAGEIFS(\$E2:\$E93,\$D2:\$D93,"=0")			
6		=AVERAGEIFS(\$E2:\$E93,\$D2:\$D93,"=1")					
7		AVERAGEIFS function allows data to be separate from the criteria.					

Actual male-female differences:

- Average weight: $158.3 - 123.8 = 34.5$ pounds
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Question: How much of the male-female weight difference (34.5#) is due to gender (male vs. female) and how much is due to the difference in heights?

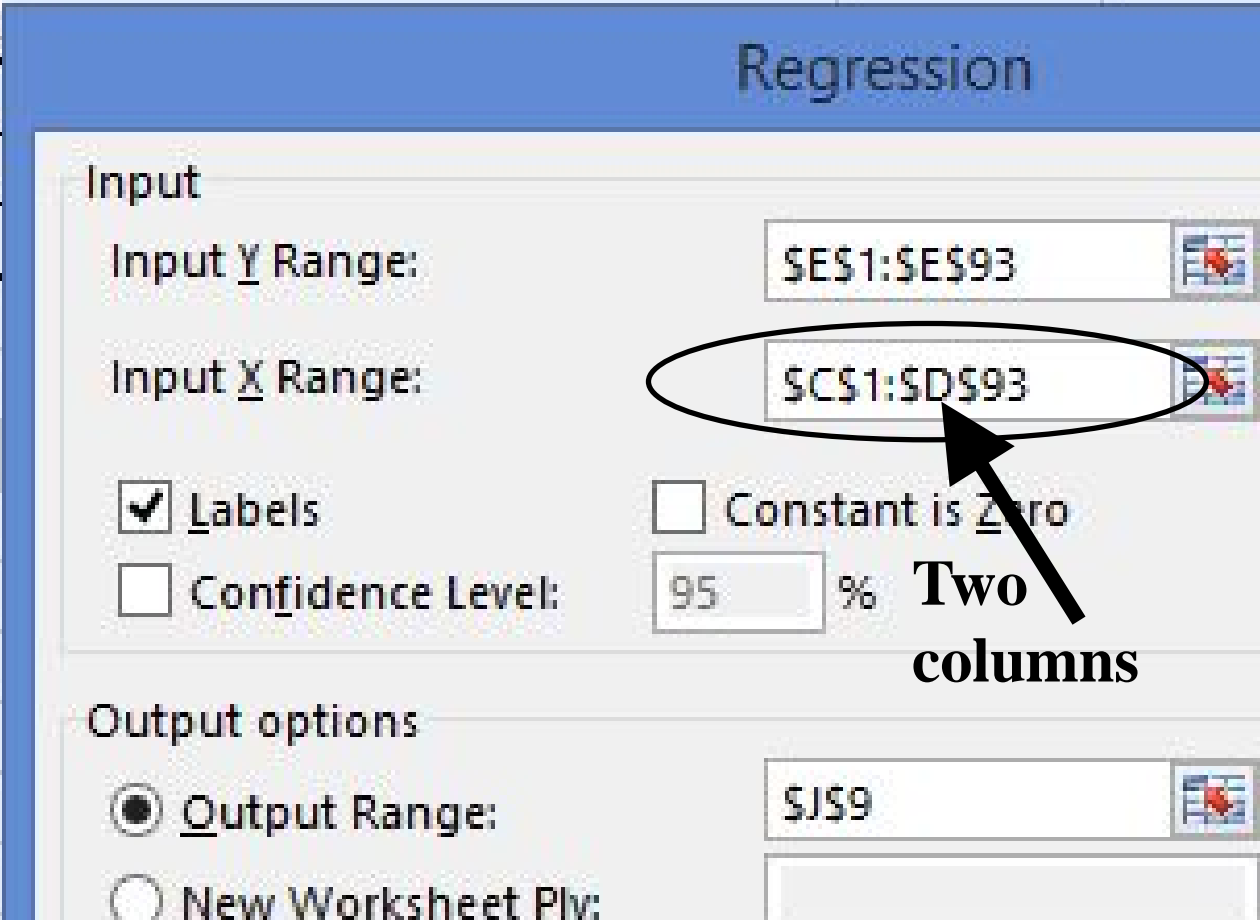
Analyzing a whole into parts is called “decomposition”.

2a) Data Toolbar, select Data Analysis. Select Regression

The screenshot shows the Microsoft Excel 2013 interface. The ribbon is set to 'DATA'. The 'Data Analysis' button is highlighted in the 'Analysis' group. A text box with a black border and white background contains the text: 'See slide 17 if no Data Analysis on your toolbar.' The 'Data Analysis' dialog box is open, showing a list of analysis tools. 'Regression' is selected in the list. The spreadsheet data is as follows:

	A	B	C	D	E	F	G	H	I	J	K	L
1	Pulse1	Pulse2	Height	Male?	Weight	Activity	Run?	smokes?				
2	58	56	67	0	125	2	0	0				
3	60	66	62	0	120	2						
4	61	70	65.5	0	120	2						
5	62	100	66	0	120	2						
6	62	98	62.75	0	112	2						
7	62	66	65	0	122	3						
8	64	60	66	0	130	3						
9	66	72	66	0	125	2						
10	66	76	65	0	115	2						
11	68	112	70	0	125	2						
12	68	68	69	0	150	2						

2b) Regress Weight (E1:E93) on Height and Sex (C1:D93)

Row	J	K	L	M	N	O
2	Generate	 <p>The image shows the Excel Regression dialog box. The 'Input Y Range' is set to '\$E\$1:\$E\$93'. The 'Input X Range' is set to '\$C\$1:\$D\$93', which is circled in black with an arrow pointing to it from the text 'Two columns'. The 'Labels' checkbox is checked. The 'Confidence Level' is set to 95%. The 'Output Range' is set to '\$J\$9'. The 'Constant is Zero' checkbox is unchecked.</p>				
3	Averages					
4	Height					
5	Weight					
6						
7						
8	J					
9						
10						
11						
12						
13						
14						

2c) Results: Regress Weight on Height and Sex (Male?)

8	J	K	L	M	N	O	P		
9	SUMMARY OUTPUT								
10									
11	<i>Regression Statistics</i>								
12	Multiple R	0.81							
13	R Square	0.66							
14	Adjusted R Square	0.65							
15	Standard Error	13.98							
16	Observations	92							
17									
18	ANOVA								
19		<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
20	Regression	2	33886.66	16943.33	86.68	1.28E-21			
21	Residual	89	17397.21	195.47					
22	Total	91	51283.87						
23									
24		<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
25	Intercept	-117.60	37.50	-3.14	0.00	-192.11	-43.08	-192.11	-43.08
26	Height	3.69	0.57	6.45	0.00	2.55	4.83	2.55	4.83
27	Male?	14.70	4.29	3.43	0.00	6.18	23.22	6.18	23.22

Obtain R-sq here

Formatting and formula are optional

Obtain best-fit coefficients here

$$\text{Weight} = -117.6 + (3.69 * \text{Height}) + (14.7 * \text{Male}).$$

2d) Calculate Expected Weight at High+Low Heights for Guys+Gals

Create formula in L33 predicting weight:

31	J	K	L	M	N	O
32	Height	Male	Weight			
33	60	0	104	=K\$25+K\$26*J33+K\$27*K33		
34	76	0		Pull down L33 to L36.		
35	60	1		Height	Male	Weight
36	76	1		60	0	104
				76	0	163
				60	1	119
				76	1	178

Pull L33 down to L36

3) Create Chart #1

Series name:

= 'S1'!\$E\$1

= Weight

Series X values:

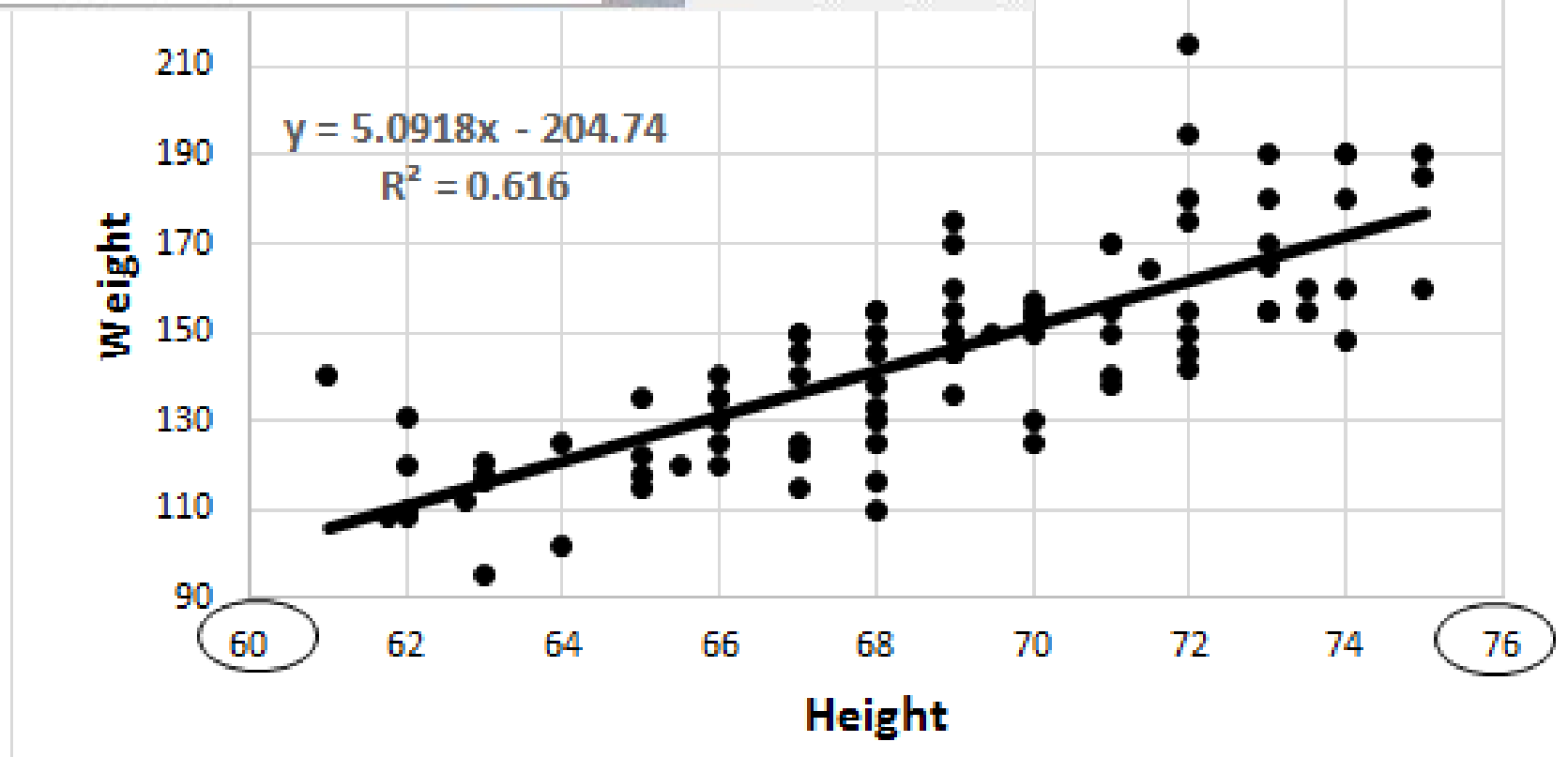
= 'S1'!\$C\$2:\$C\$93

= 67, 62, 65.5, ...

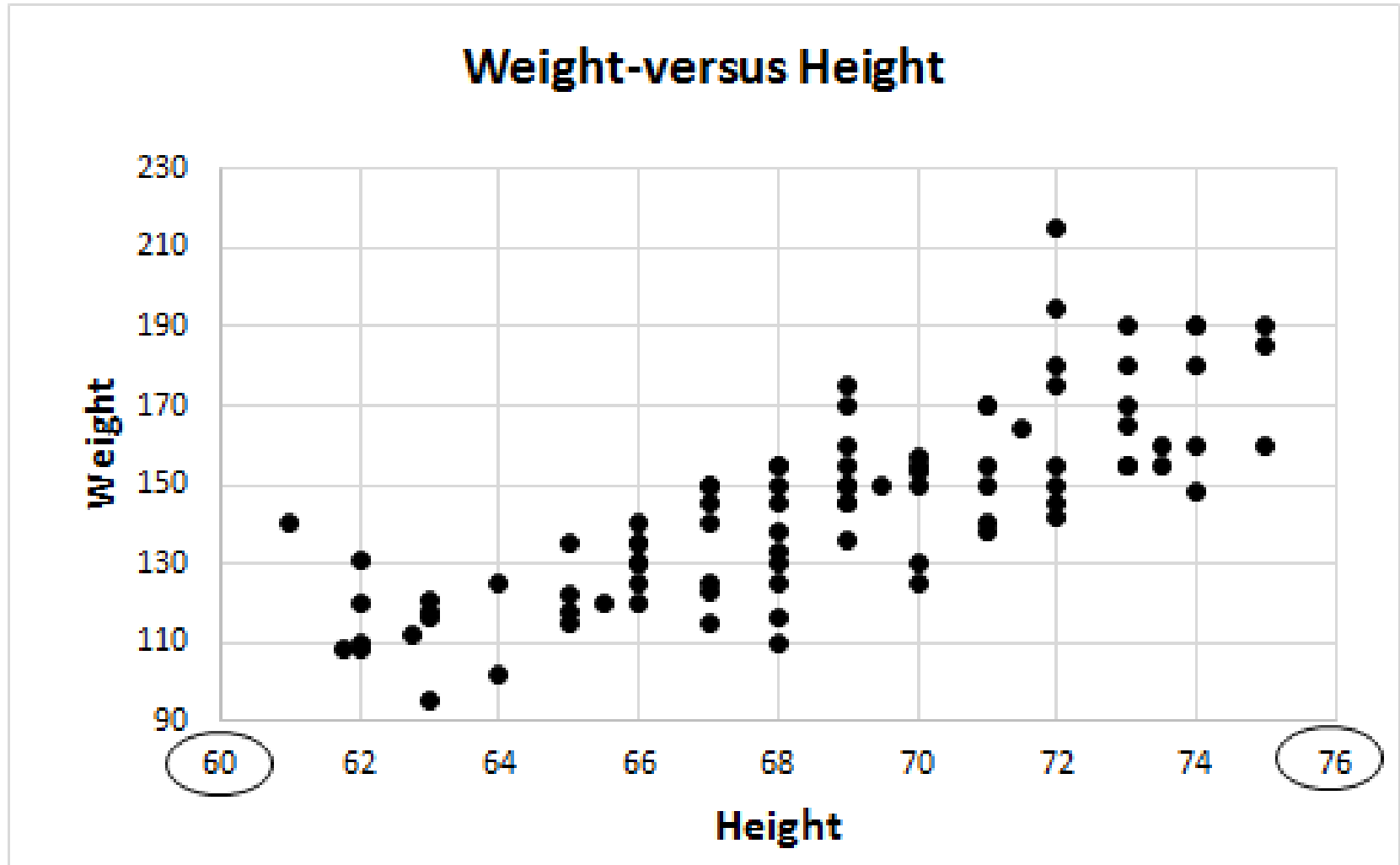
Series Y values:

= 'S1'!\$E\$2:\$E\$93

= 125, 120, 120, ...



4a) Copy & Paste Chart 1. Delete Trend, Equation & R²



4b) Select Data. Add two series: One for Gals and one for Guys

	J	K	L
31			
32	Height	Male	Weight
33	60	0	104
34	76	0	163

Gals

Series X values:

= 'S1'!\$J\$33:\$J\$34

Series Y values:

= 'S1'!\$L\$33:\$L\$34

Guys

Series X values:

= 'S1'!\$J\$35:\$J\$36

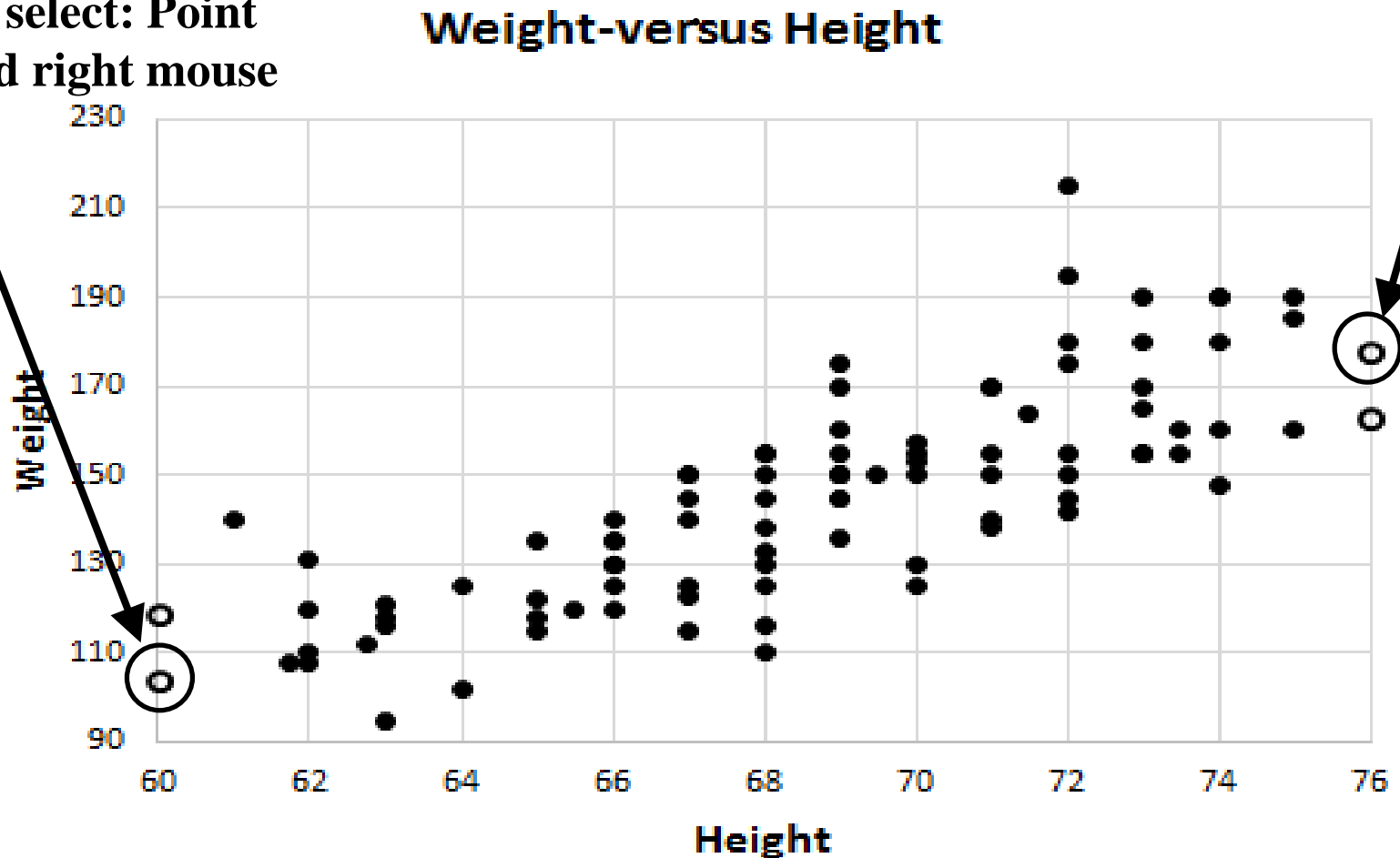
Series Y values:

= 'S1'!\$L\$35:\$L\$36

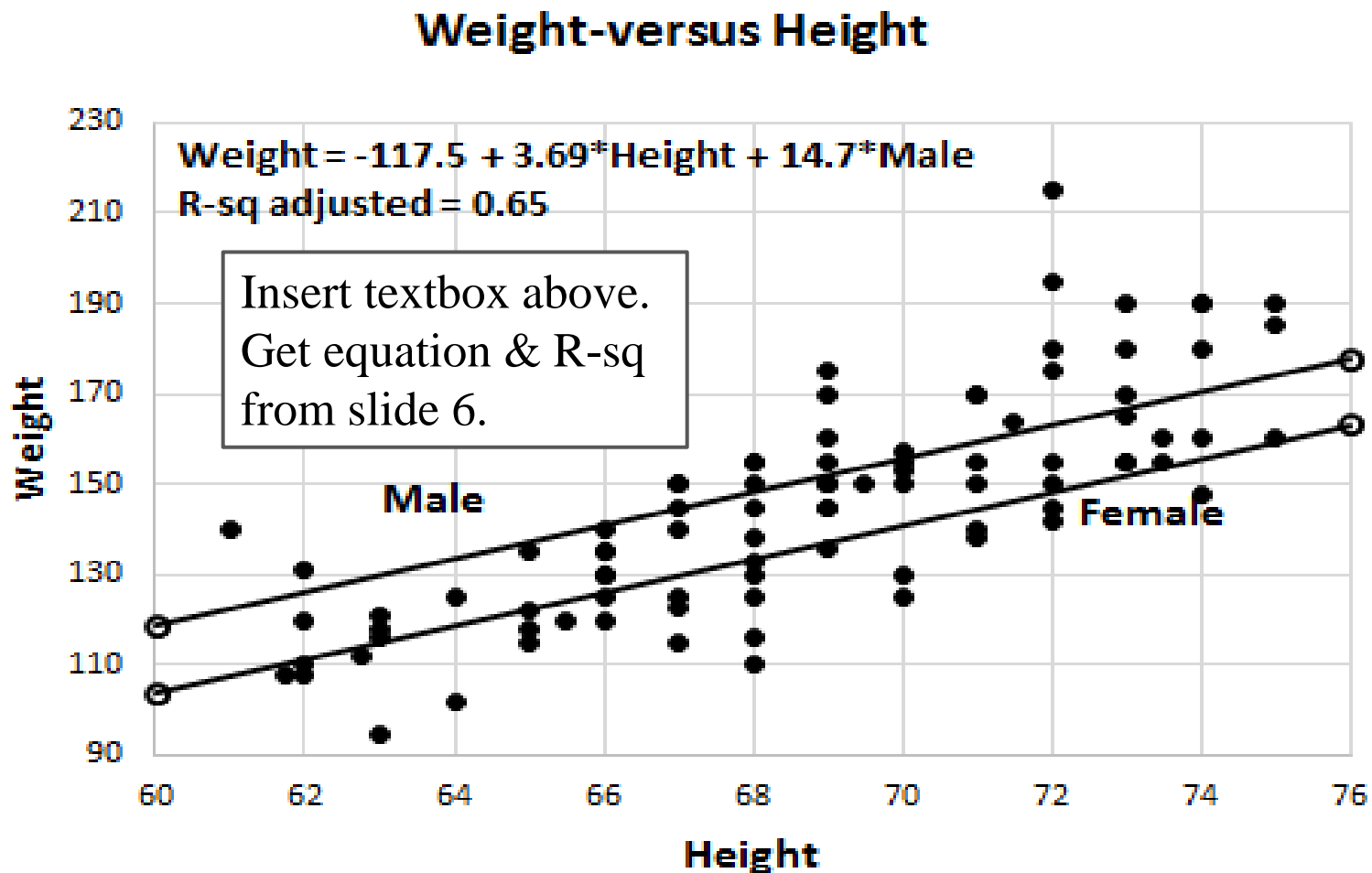
35	60	1	119
36	76	1	178
	Height	Male	Weight
	J	K	L

**4c) Select top/guys data point.
Format data series/Paint/Line/Solid
Repeat for bottom/gals data point.**

To select: Point
and right mouse



4d) Insert text boxes for Male, Female and Equation with R²



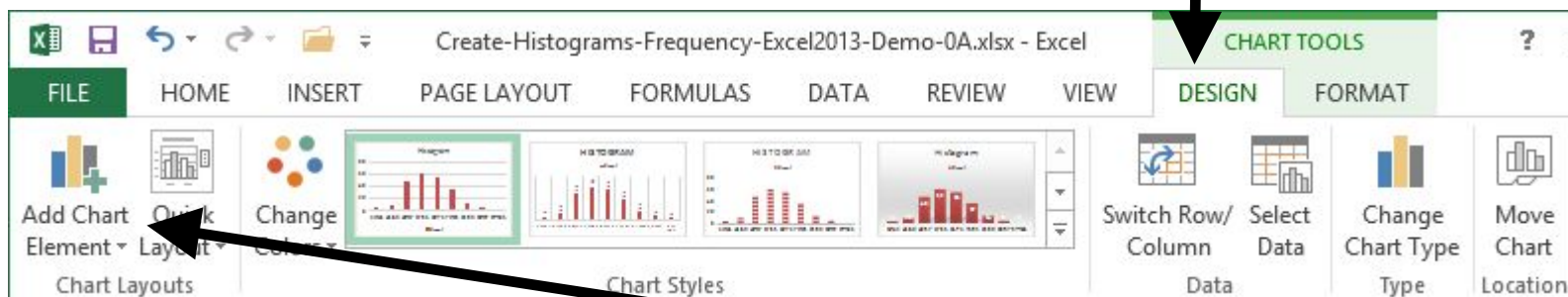
Appendix

Slide 16: What to do if the plus sign doesn't appear on the upper-right side of the graph

Slides 17 & 18: What to do if the Data Analysis object doesn't appear on the right side of the Data toolbar.

If + Sign doesn't appear on upper-right side of graph...

Select the graph. Select the Chart-Tools Design tab.



At the far-left, select “Add Chart Element”.

Select “Axis Titles” and “Chart Title”.

To add a Trendline, either select “Trendline” under “Add Chart Element” or right-mouse on a data point and select Trendline from menu.

If Data Analysis doesn't appear on Data Toolbar

1) Select File/Options. 2) Select Add-Ins.

Excel Options

View and manage Microsoft Office Add-ins.

Add-ins

Name ^	Location	Type
Active Application Add-ins		
Acrobat PDFMaker Office COM Addin	C:\...\Adobe\Acrobat 11.0\PDFMaker\Office\PDFMOfficeAddin.dll	COM Add-in
Analysis ToolPak	C:\...x86\Microsoft Office\Office15\Library\Analysis\ANALYS32.XLL	Excel Add-in
Analysis ToolPak - VBA	C:\...\Microsoft Office\Office15\Library\Analysis\ATPVBAEN.XLAM	Excel Add-in
Inactive Application Add-ins		
Date (XML)	C:\...s (x86)\Common Files\Microsoft Shared\Smart Tag\MOFL.DLL	Action
Euro Currency Tools	C:\...iles (x86)\Microsoft Office\Office15\Library\EUROTOOL.XLAM	Excel Add-in
Inquire	C:\...gram Files (x86)\Microsoft Office\Office15\DCF\NativeShim.dll	COM Add-in
Microsoft Actions Pane 3		XML Expansion Pack
Microsoft Office PowerPivot for Excel 2013	C:\...DINS\PowerPivot Excel Add-in\PowerPivotExcelClientAddIn.dll	COM Add-in
Power View	C:\...DINS\Power View Excel Add-in\AdHocReportingExcelClient.dll	COM Add-in
Document Related Add-ins		
No Document Related Add-ins		
Disabled Application Add-ins		
Solver Add-in		
Add-in:	Acrobat PDFMaker Office COM Addin	C:\...
Publisher:	Adobe Systems, Incorporated	
Compatibility:	No compatibility information available	
Location:	C:\Program Files (x86)\Adobe\Acrobat 11.0\PDFMaker\O	
Description:	Acrobat PDFMaker Office COM Addin	

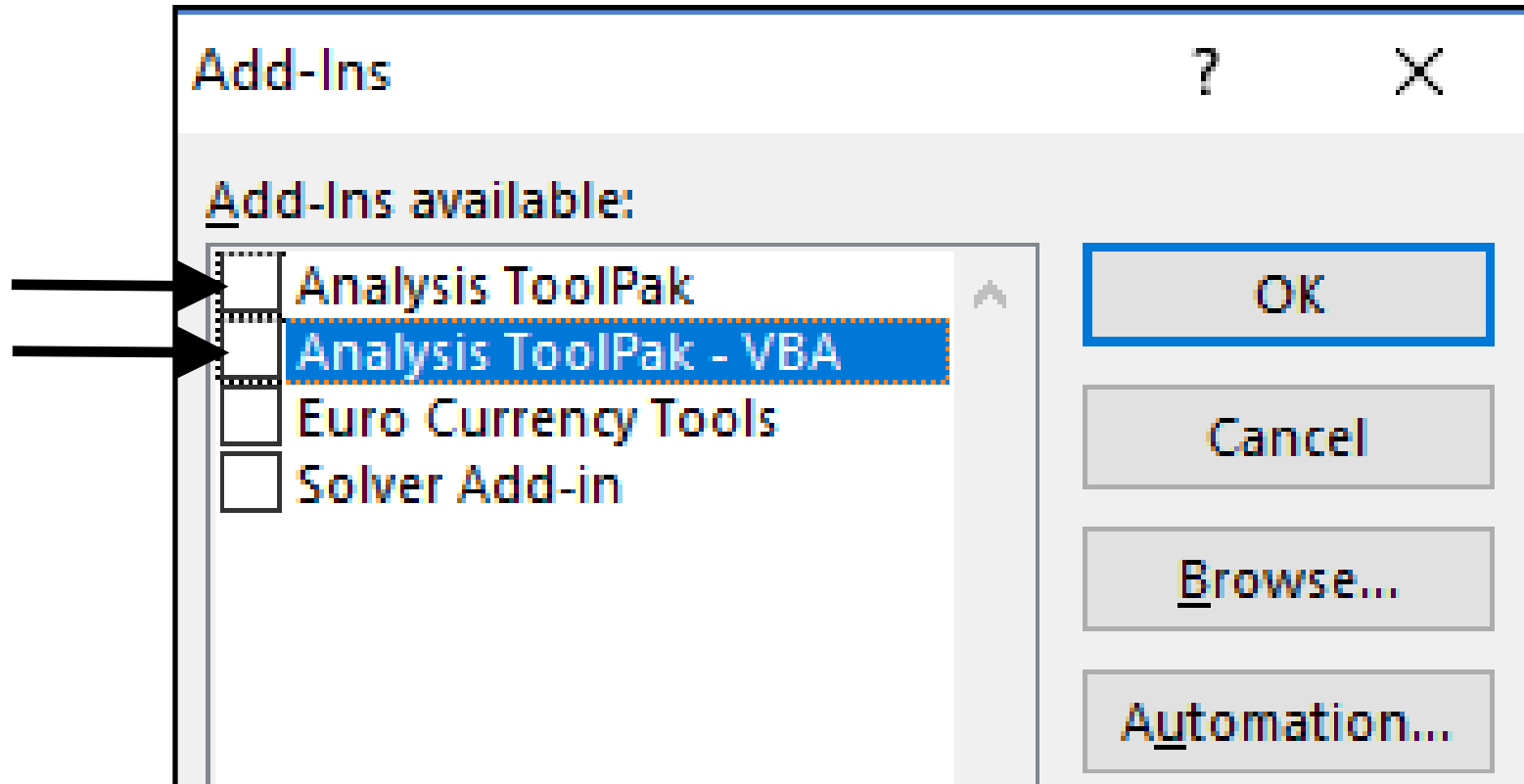
Manage: Excel Add-ins Go...

3) In the lower-left corner next to Manage, select Excel Add-Ins.

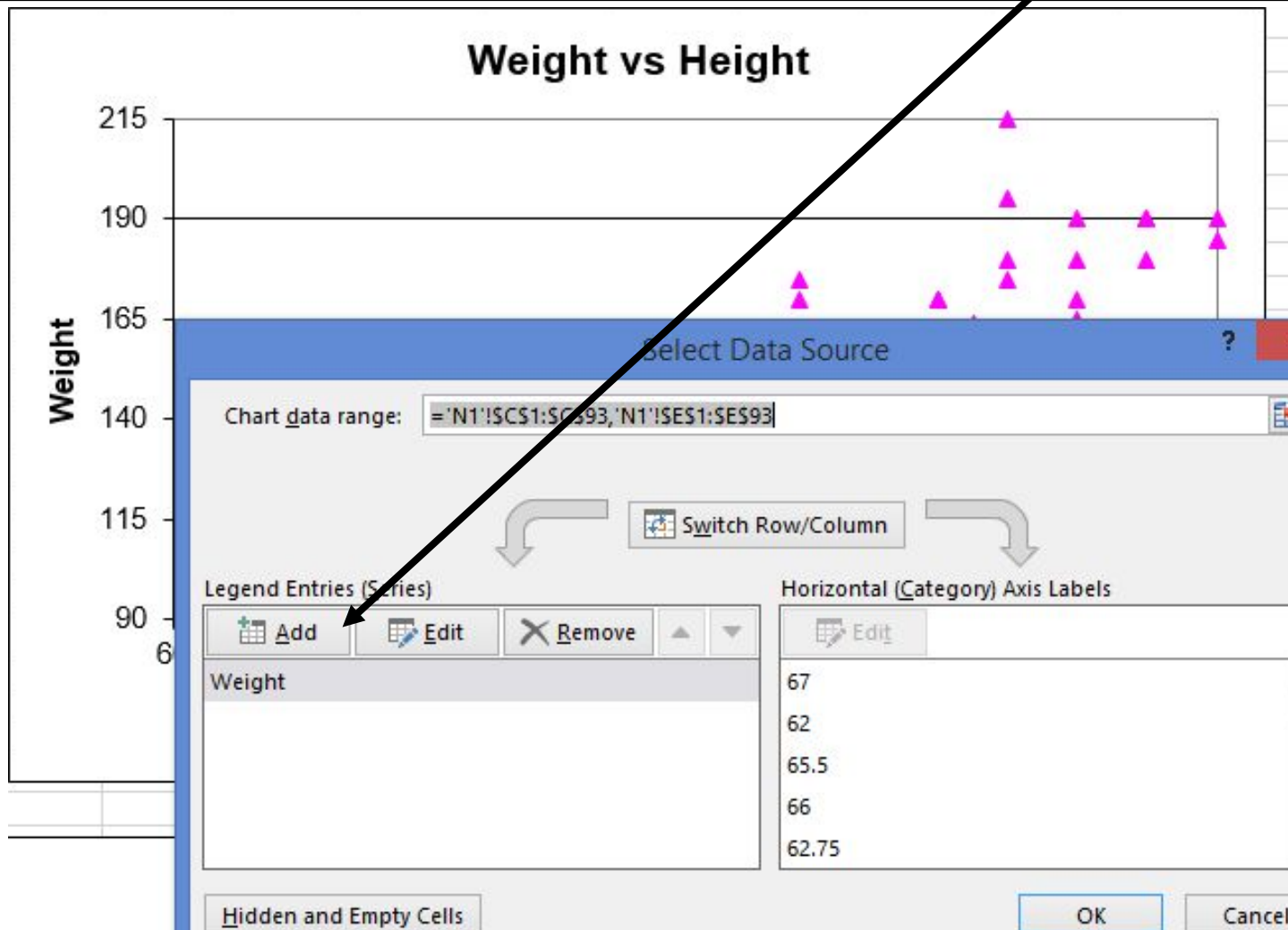
4) Press GO.

Add Data Analysis to the Data Toolbar

- 1) Checks the boxes involving Analysis ToolPak.
- 2) Press OK



4b2) Select Data; Select “Add”



4c2) After Adding Two New Series, Press “OK”

Select Data Source

?

X

Chart data range:



The data range is too complex to be displayed. If a new range is selected, it will replace all of the series in the Series panel.



Switch Row/Column



Legend Entries (Series)

	Add		Edit		Remove		
<input checked="" type="checkbox"/>	Weight						
<input checked="" type="checkbox"/>	Guys						
<input checked="" type="checkbox"/>	Gals						

Horizontal (Category) Axis Labels

	Edit
60	
76	

Hidden and Empty Cells

OK

Cancel