Model using Trendline (Linear) in Excel 2013

by
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US Rep: International Statistical Literacy Project
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Slides at: www.StatLit.org/pdf /Excel2013-Model-Trendline-Linear-Slides.pdf

Goal: Summarize association between two variables

1. Create three charts involving two quantitative variables. Slides 15, 19 & 21.
2. Show trend-line for the association. Show the equation and R^2: the goodness of fit.
3. **Describe trend (qualitative and quantitative) in words for each graph**. See slides 15 & 20.
4. [Optional] Describe R^2 and model in words.

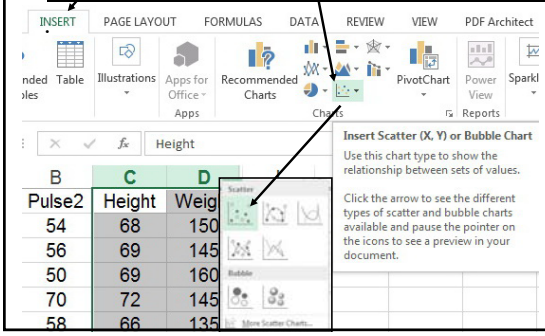
Data source: www.StatLit.org/excel/pulse.xls

Approach: Data Selection

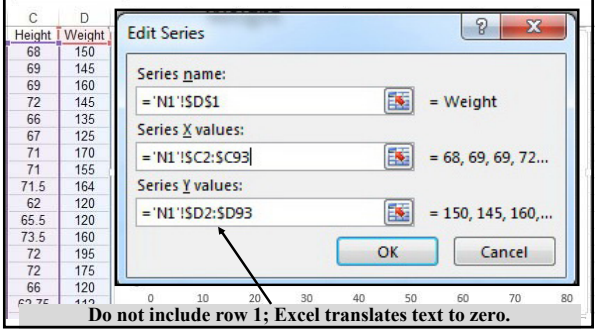
Three approaches to selecting data
1. Select X and Y axis data *before* inserting chart
2. Select just the Y-axis data *before* inserting chart
3. Select X and Y axis data *after* inserting chart.

Evaluation:
#1: best if X-axis data is *to the* left of Y-axis data
#2: best if X-axis data is to the right of Y-axis data
#3: allows the most control.

#1 Select columns (Ht & Wt) Insert Scatter (XY) chart

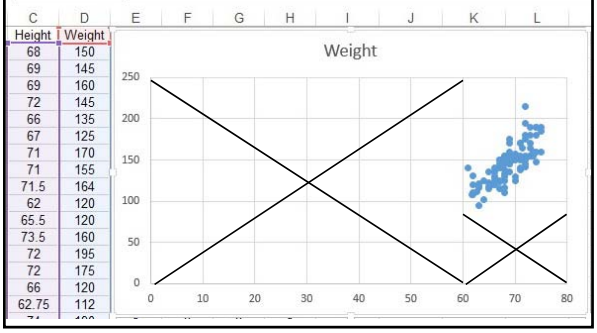


If you select a column, Excel ignores row 1 if text.



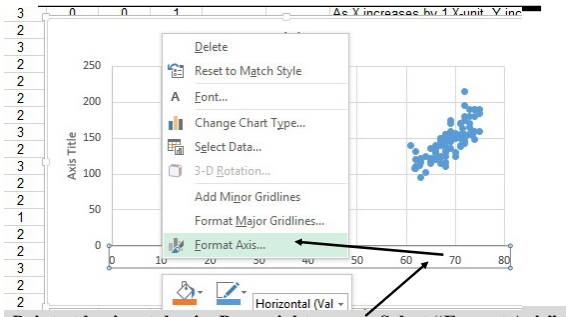
Do not include row 1; Excel translates text to zero.

First Chart Next: Remove white space



XL2A V0L Model Trendline Linear Excel 2013 7

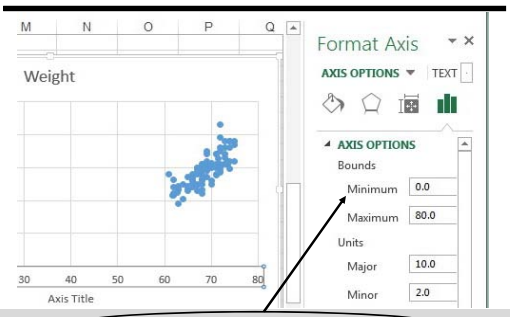
Format X Axis



Point at horizontal axis; Press right mouse; Select "Format Axis"

XL2A V0L Model Trendline Linear Excel 2013 8

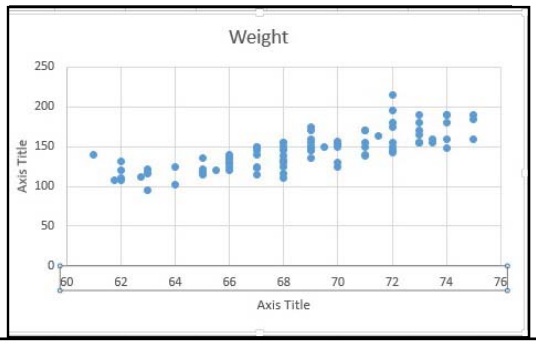
Format X Axis



Change Minimum from zero to 60

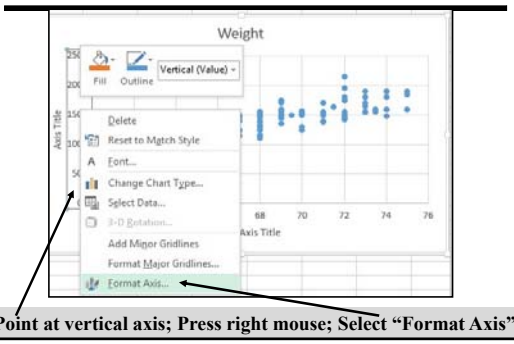
XL2A V0L Model Trendline Linear Excel 2013 9

Format X Axis: Result



XL2A V0L Model Trendline Linear Excel 2013 10

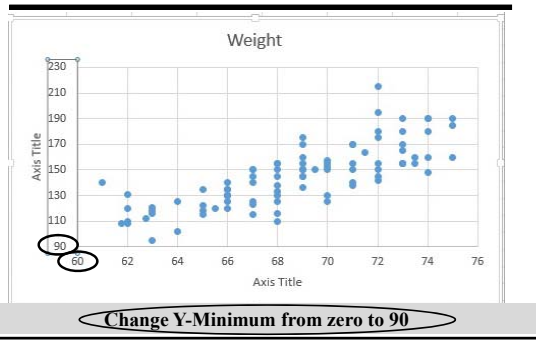
Format Y Axis:



Point at vertical axis; Press right mouse; Select "Format Axis"

XL2A V0L Model Trendline Linear Excel 2013 11

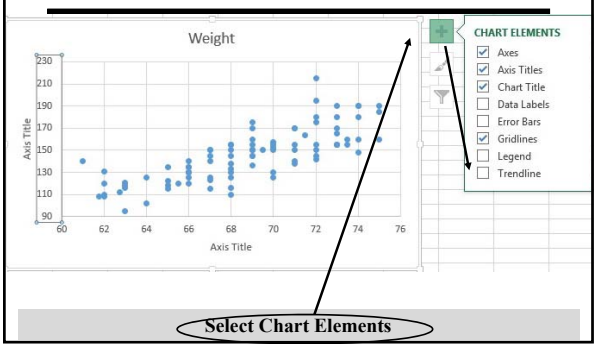
Format Y Axis: Result



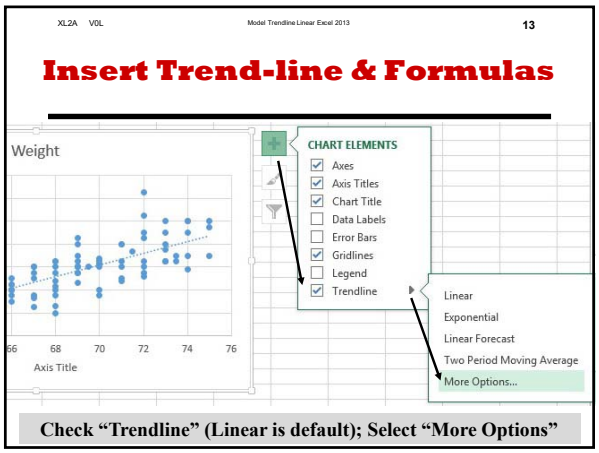
Change Y-Minimum from zero to 90

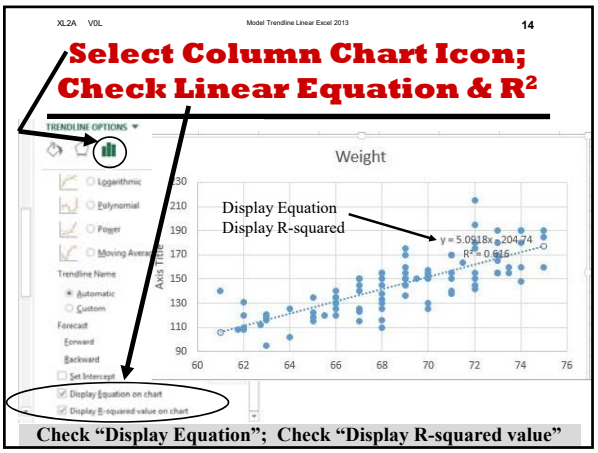
XL2A V0L Model Trendline Linear Excel 2013 12

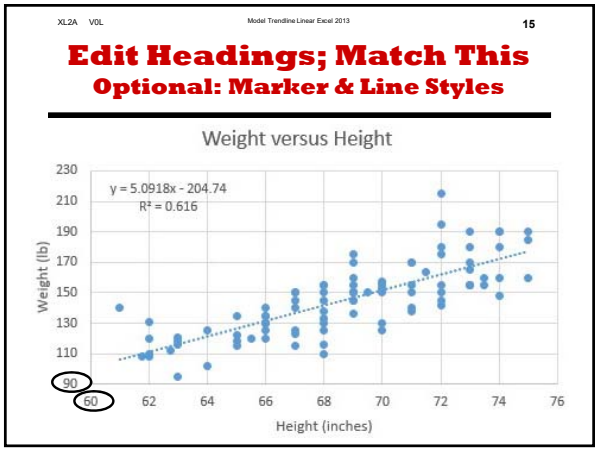
Insert Trend-line & Formulas

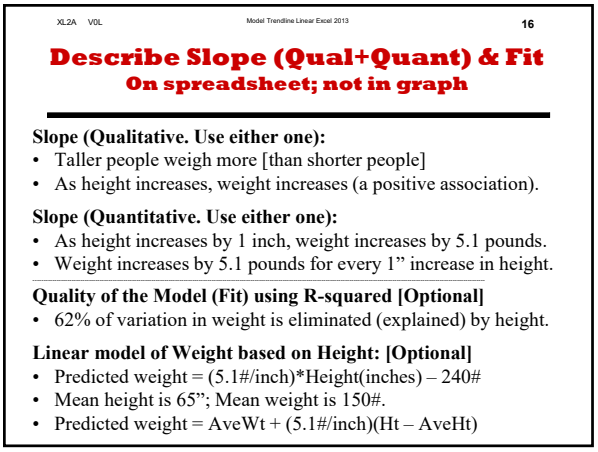


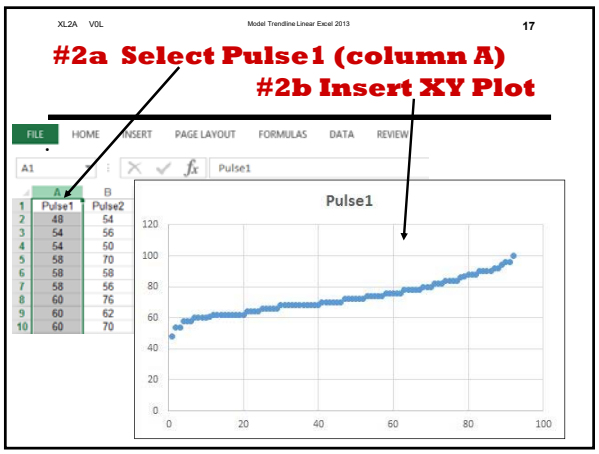
Select Chart Elements

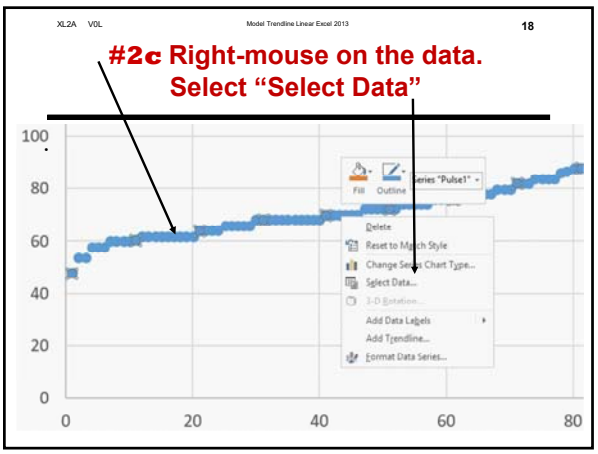

XL2A V0L
Model Trendline Linear Excel 2013
13
Insert Trend-line & Formulas
Weight
CHART ELEMENTS
Axes
Axis Titles
Chart Title
Data Labels
Error Bars
Gridlines
Legend
Trendline
Linear
Exponential
Linear Forecast
Two Period Moving Average
More Options...
Axis Title
Check "Trendline" (Linear is default); Select "More Options"


XL2A V0L
Model Trendline Linear Excel 2013
14
Select Column Chart Icon;
Check Linear Equation & R²
TRENDLINE OPTIONS
Weight
Display Equation
Display R-squared
Check "Display Equation"; Check "Display R-squared value"

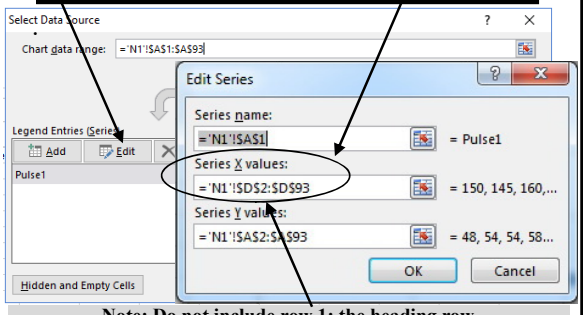

XL2A V0L
Model Trendline Linear Excel 2013
15
Edit Headings; Match This
Optional: Marker & Line Styles
Weight versus Height
y = 5.0918x - 204.74
R² = 0.616
Weight (lb)
Height (inches)


XL2A V0L
Model Trendline Linear Excel 2013
16
Describe Slope (Qual+Quant) & Fit
On spreadsheet; not in graph
Slope (Qualitative. Use either one):
• Taller people weigh more [than shorter people]
• As height increases, weight increases (a positive association).
Slope (Quantitative. Use either one):
• As height increases by 1 inch, weight increases by 5.1 pounds.
• Weight increases by 5.1 pounds for every 1" increase in height.
Quality of the Model (Fit) using R-squared [Optional]
• 62% of variation in weight is eliminated (explained) by height.
Linear model of Weight based on Height: [Optional]
• Predicted weight = (5.1#/inch)*Height(inches) – 240#
• Mean height is 65"; Mean weight is 150#.
• Predicted weight = AveWt + (5.1#/inch)(Ht – AveHt)


XL2A V0L
Model Trendline Linear Excel 2013
17
#2a Select Pulse1 (column A)
#2b Insert XY Plot
FILE
HOME
INSERT
PAGE LAYOUT
FORMULAS
DATA
REVIEW
Pulse1
Pulse2
Pulse1

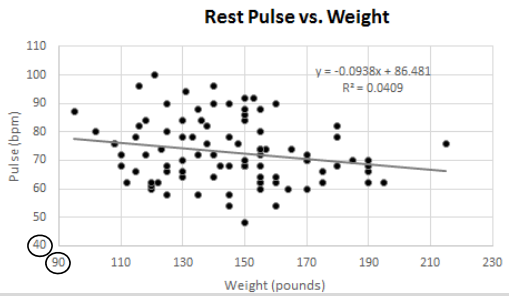

XL2A V0L
Model Trendline Linear Excel 2013
18
#2c Right-mouse on the data.
Select "Select Data"
Delete
Reset to Match Style
Change Series Chart Type...
Select Data...
Add Data Labels
Add Trendline...
Format Data Series...

#2d Select "Edit Data" #2e In Series X, select *Weight*



Note: Do not include row 1: the heading row

#2f Format Axis & Title. Add Trendline, Equation & R^2



Formatting of trend line and markers is optional

Describe slope (Qual+Quant) & Fit on spreadsheet; not in graph

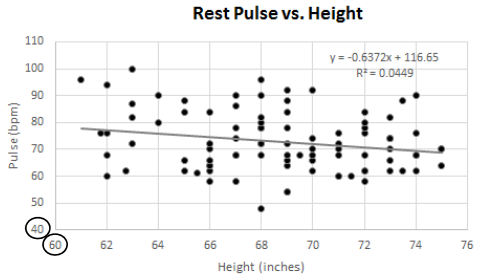
Slope (Qualitative, Use either one):
- Heavier people have a lower rest pulse rate [than lighter people]
- As weight increases, rest pulse decreases.
- There is a negative association between rest pulse and weight.

Slope (Quantitative, Use either one):
- As weight increases by 1#, rest pulse decreases by 0.09 BPM.
- Rest pulse decreases by 0.09 bpm for every extra # of weight.

Quality of the Model (Fit) using R-squared [Optional]
- 4% of variation in rest pulse is eliminated (explained) by weight

Linear model of Rest Pulse based on Weight: [Optional]
- Predicted rest pulse = [-0.094 bpm/#]*Weight(#) + 86.5 bpm
- Predicted weight = AveWeight + [5.1#/inch][Height – AveHt]

#3: Duplicate previous graph but with *Height* on X-Axis



Erase old Trendline; Create new one

In Select Data, replace D with C

#3b: Describe Slope and Fit On spreadsheet; not in graph

Required: [See slide 21 for examples]
1. **Give a qualitative description of the trend.**
2. **Give a quantitative description of the trend.**

Optional:
1. **Give an algebraic description of the relationship.**
2. **Give an arithmetic description of the fit. Use the value of R-squared, but do not use that phrase.**
3. **Describe the linear model in words (no symbols)**

Compare Models [Not Required]

R-squared: quality of the model.
- 62% of weight variation is explained by height
- 4.1% of Pulse1 variation explained by Weight
- 4.5% of Pulse1 variation explained by Height

Conclusions:

Height is a fair predictor ($R^2 \sim 60\%$) of weight.

Height and weight are poor predictors ($R^2 < 5\%$) of rest pulse (Pulse1)

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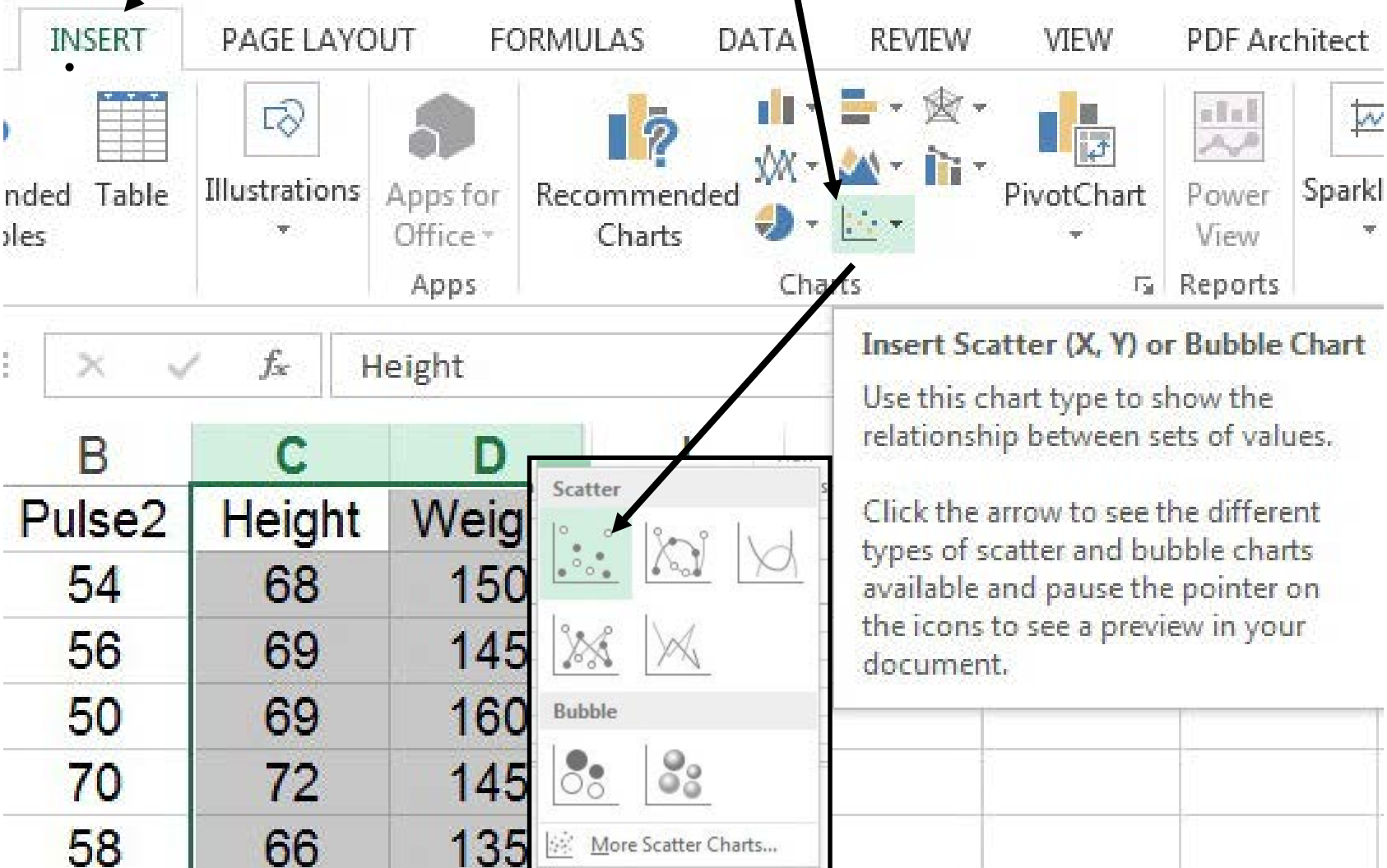
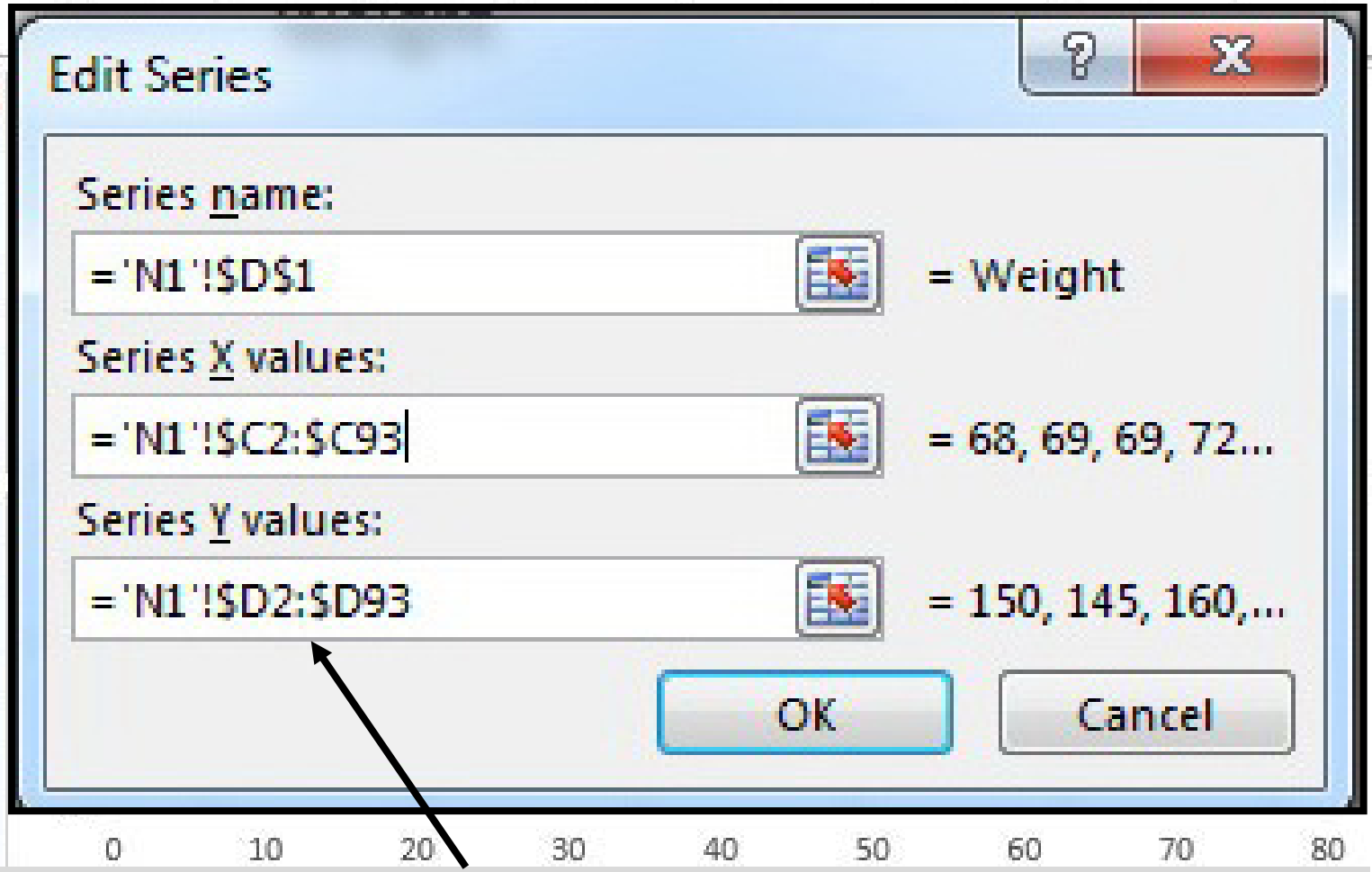


If you select a column, Excel ignores row 1 if text.

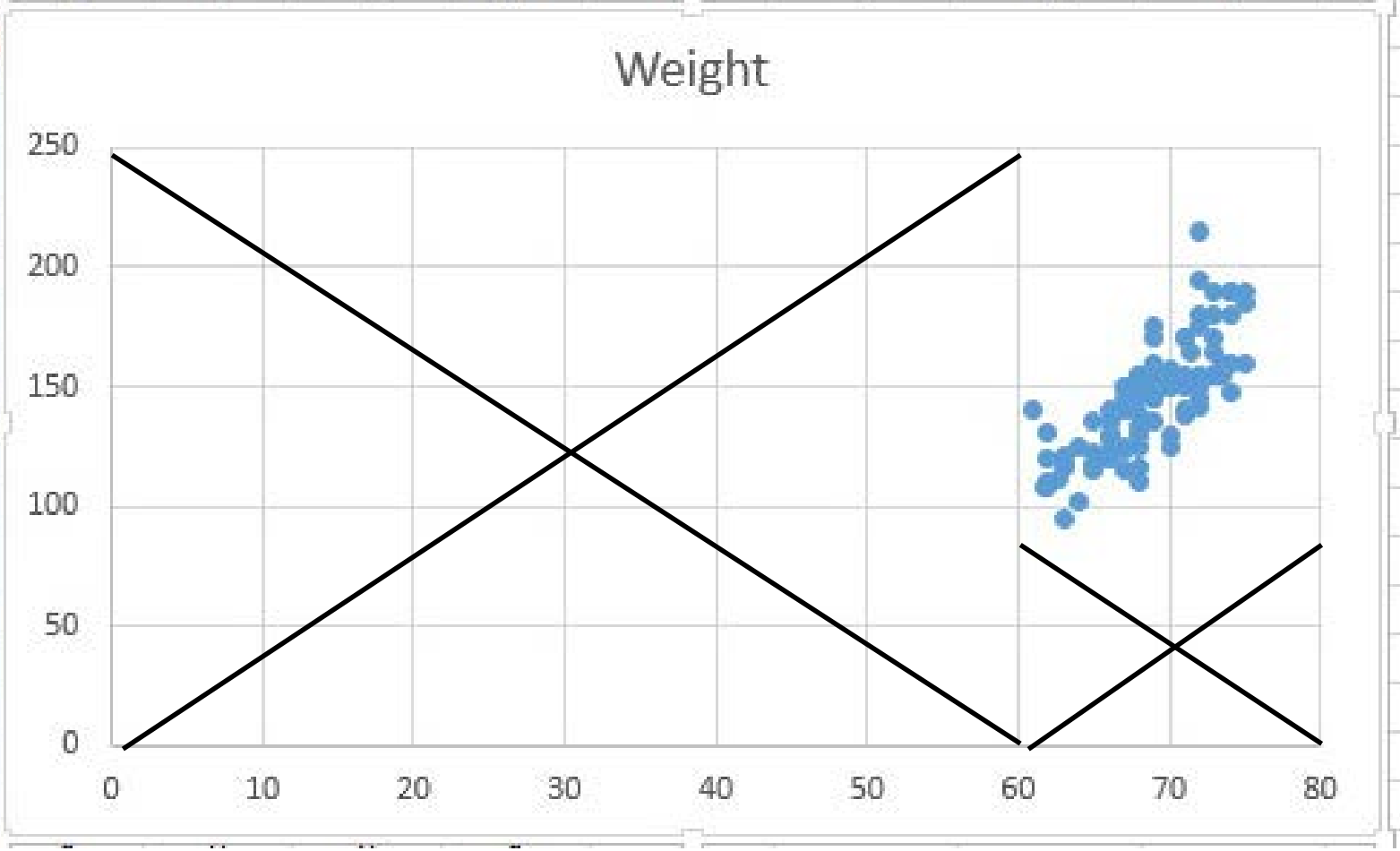
C	D
Height	Weight
68	150
69	145
69	160
72	145
66	135
67	125
71	170
71	155
71.5	164
62	120
65.5	120
73.5	160
72	195
72	175
66	120



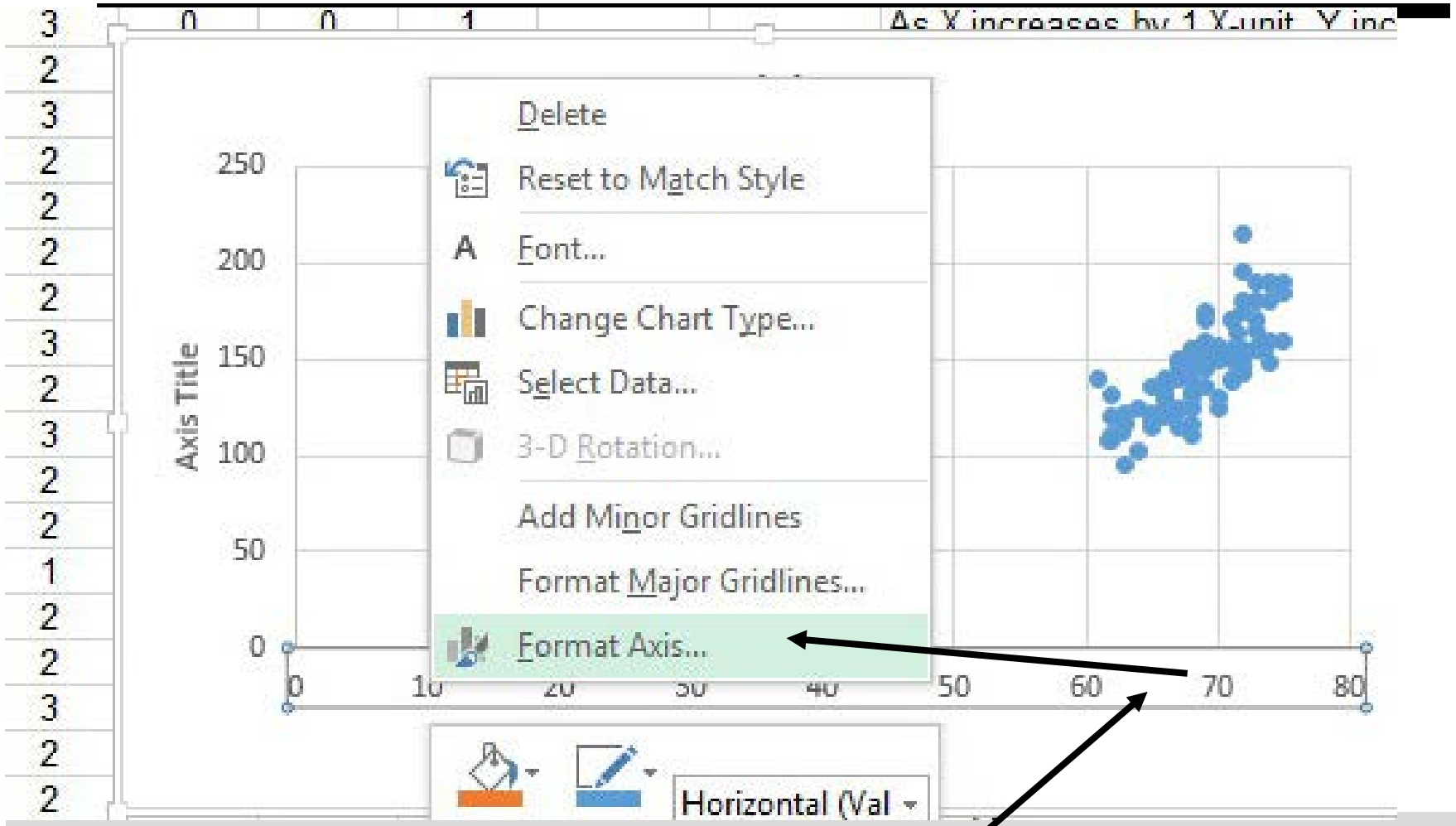
Do not include row 1; Excel translates text to zero.

First Chart
Next: Remove white space

Height	Weight
68	150
69	145
69	160
72	145
66	135
67	125
71	170
71	155
71.5	164
62	120
65.5	120
73.5	160
72	195
72	175
66	120
62.75	112

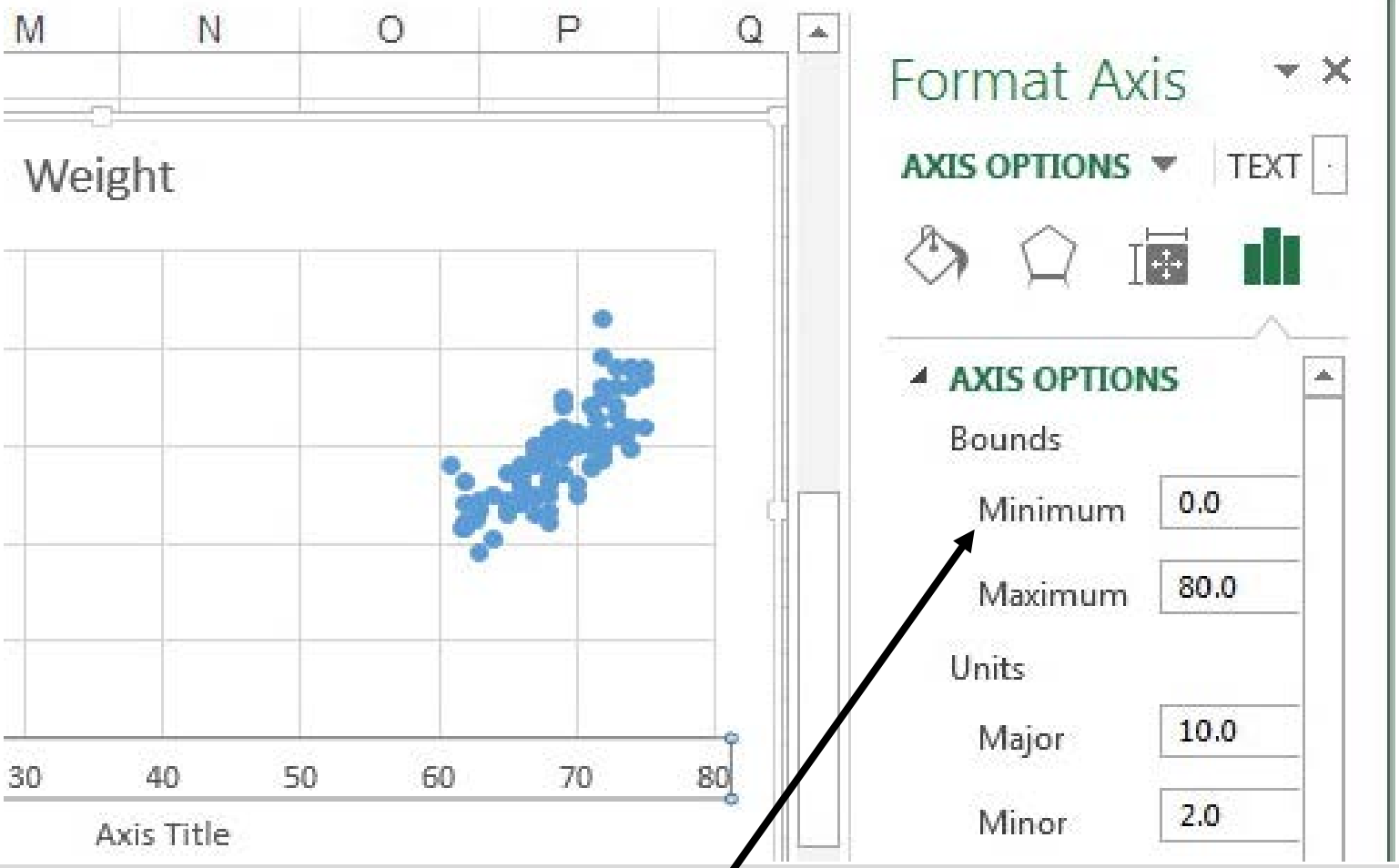


Format X Axis



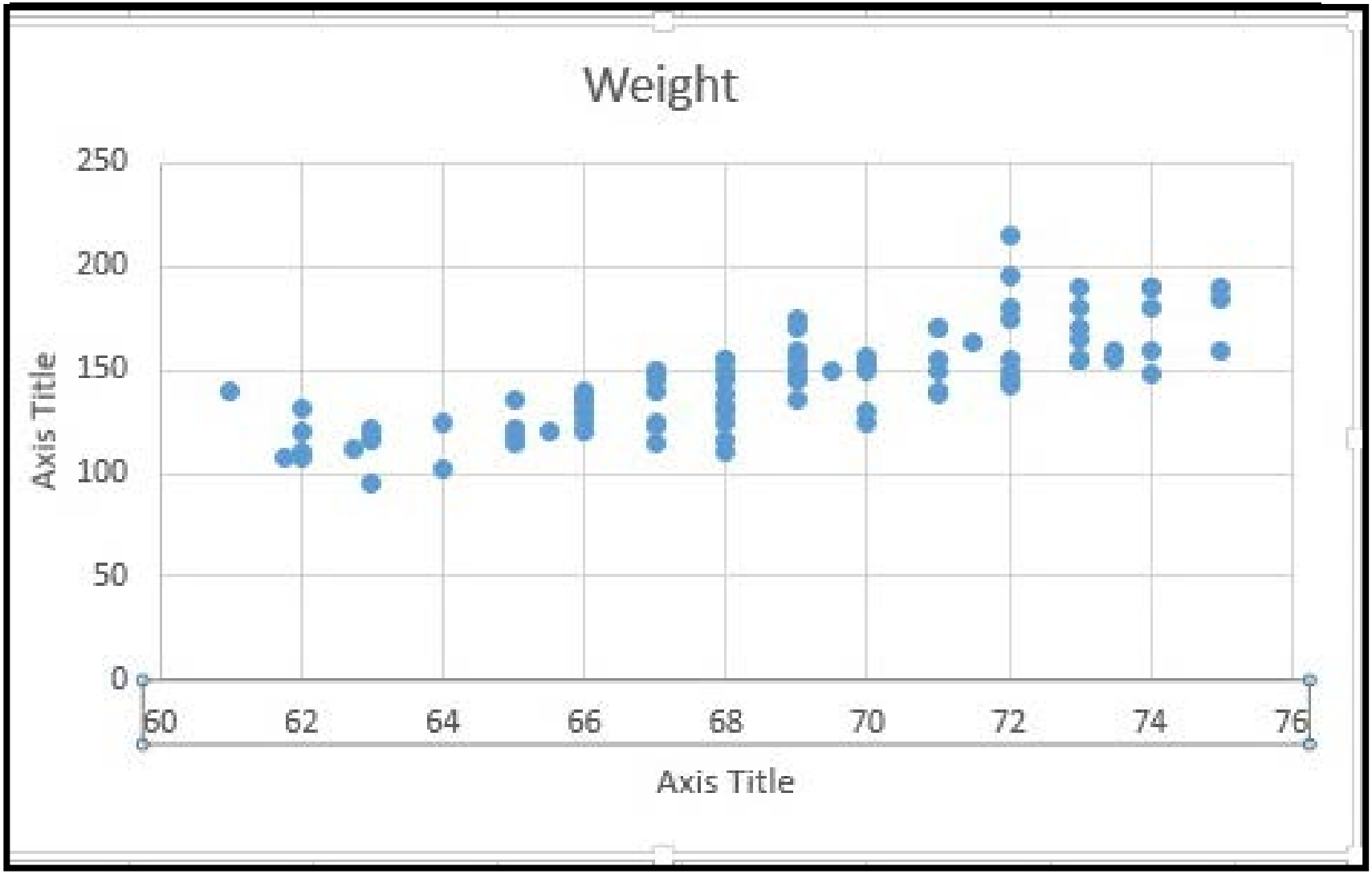
Point at horizontal axis; Press right mouse; Select “Format Axis”

Format X Axis



Change Minimum from zero to 60

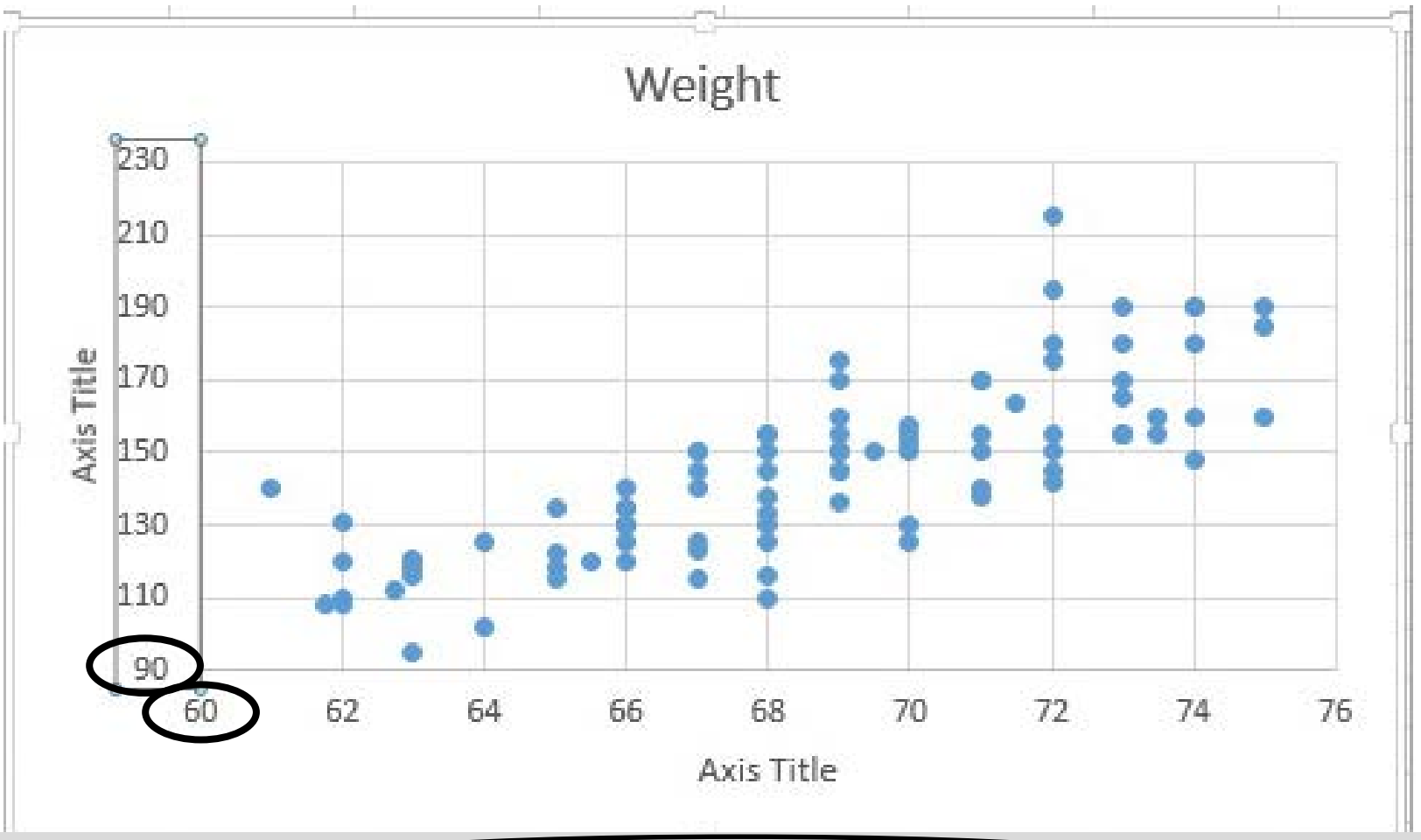
Format X Axis: Result



Format Y Axis:

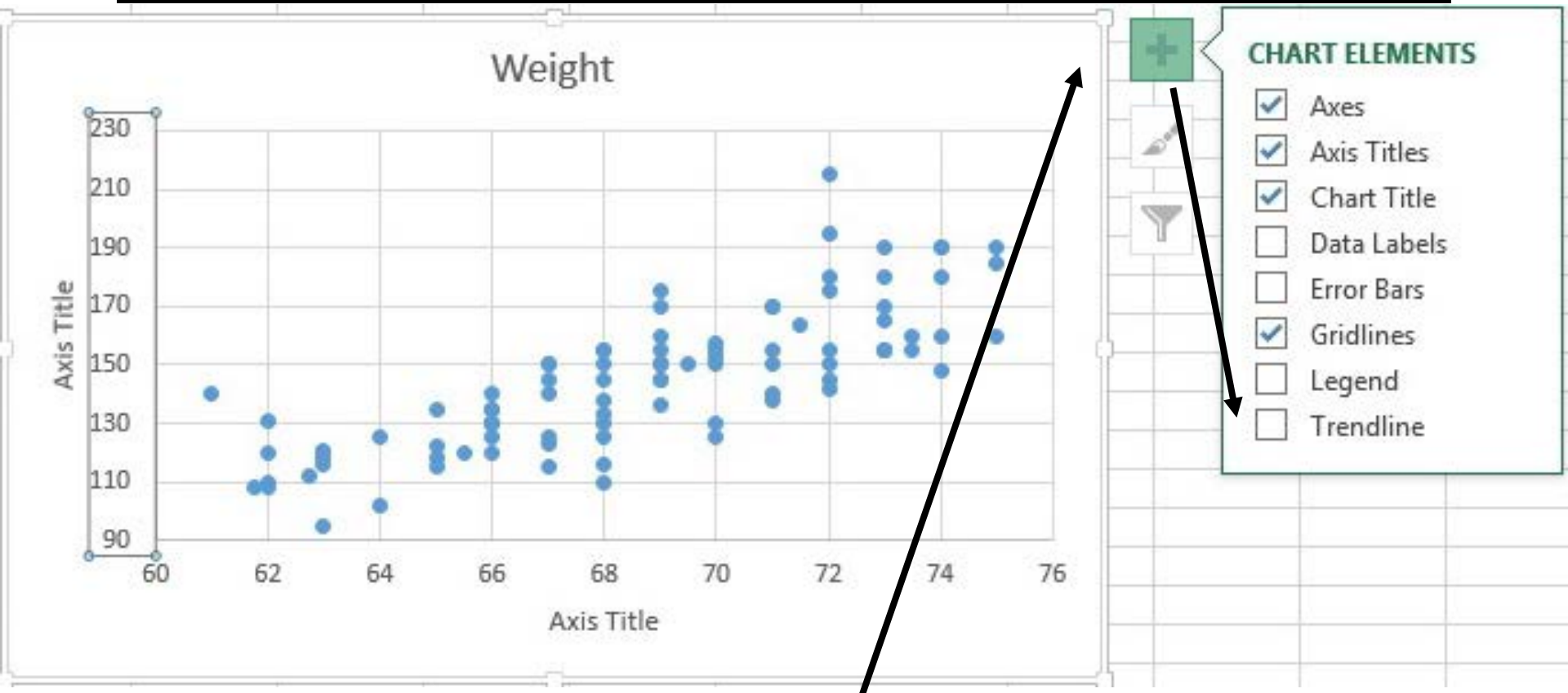
Point at vertical axis; Press right mouse; Select “Format Axis”

Format Y Axis: Result



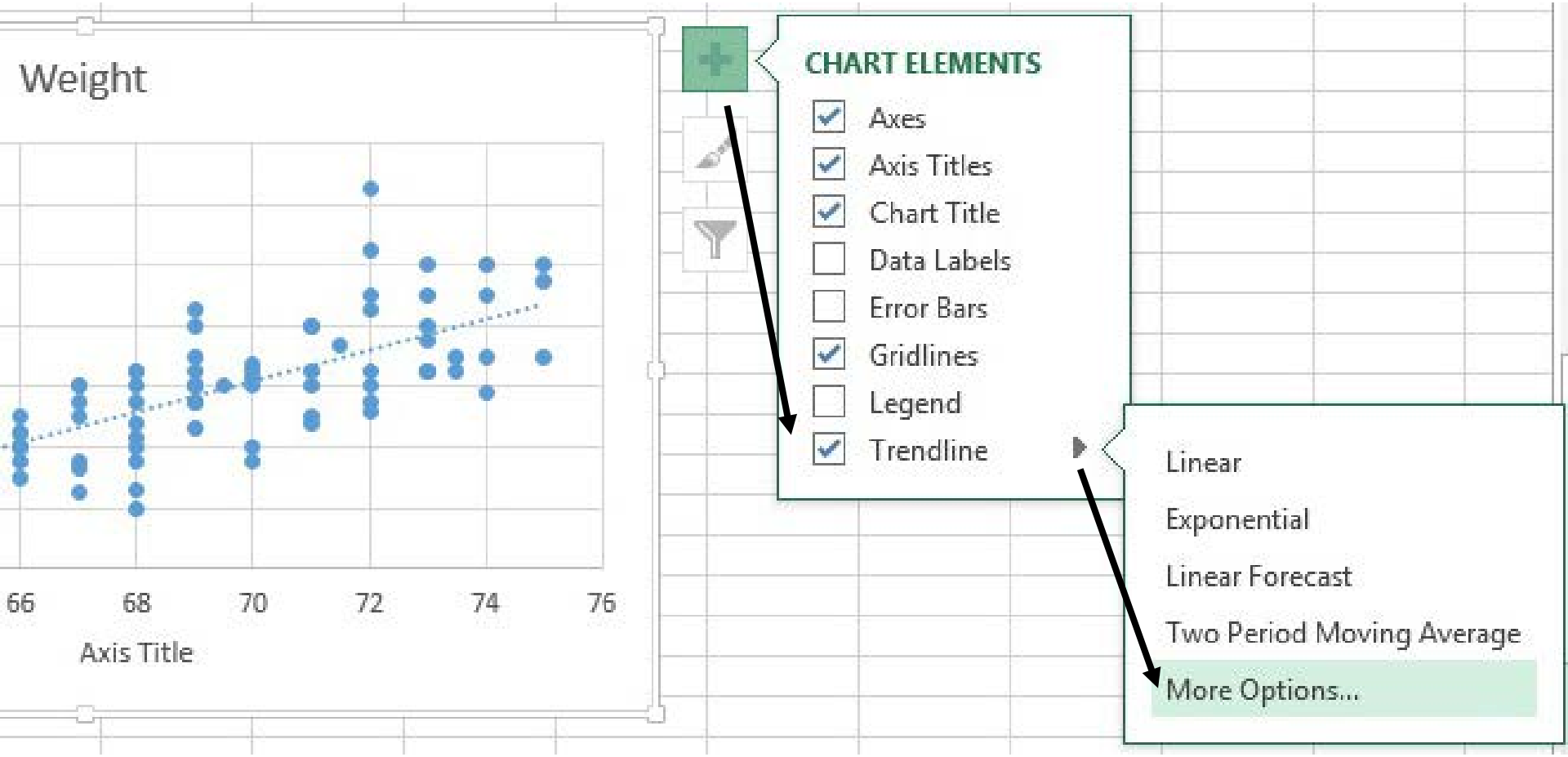
Change Y-Minimum from zero to 90

Insert Trend-line & Formulas



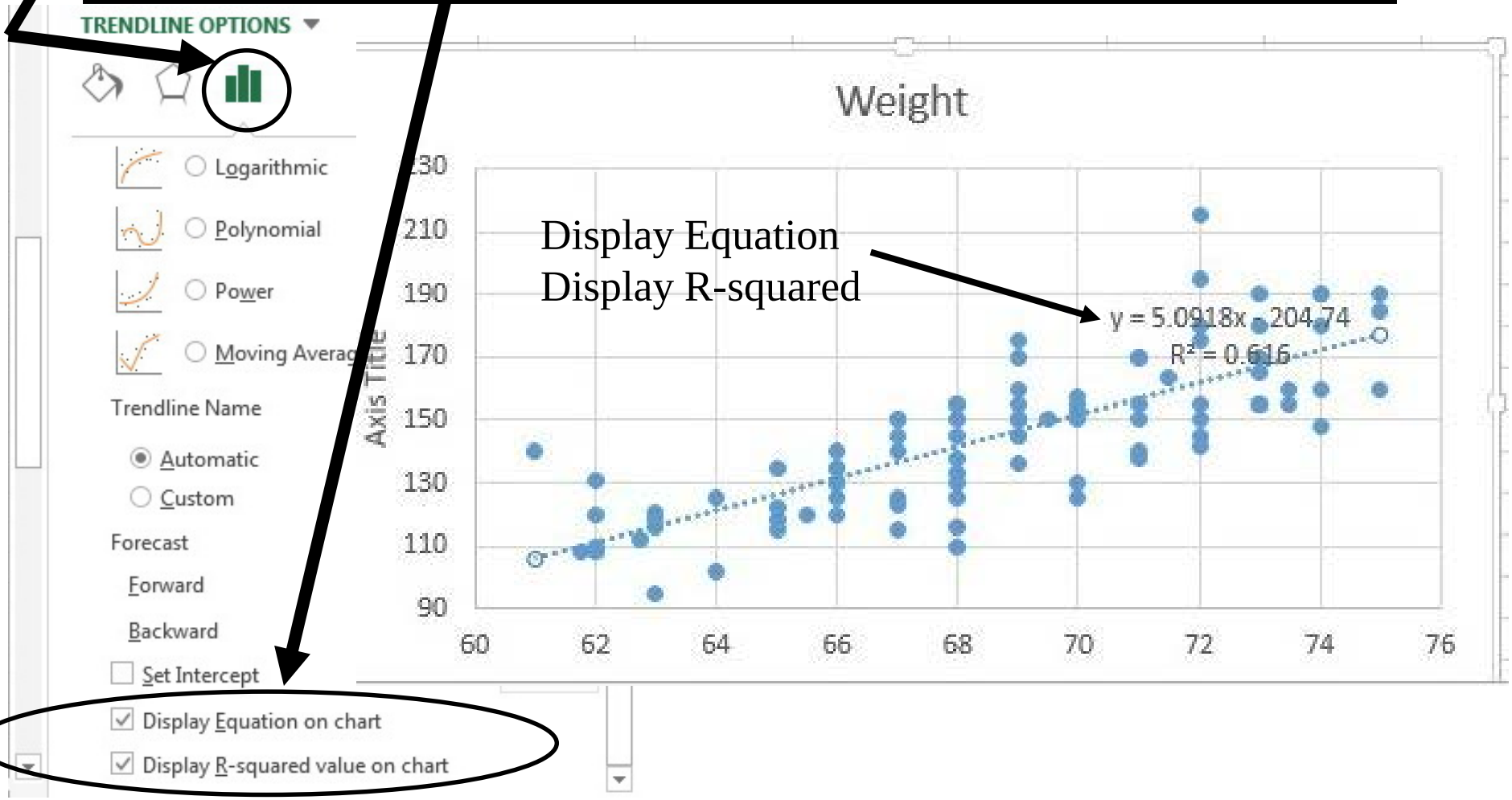
Select Chart Elements

Insert Trend-line & Formulas



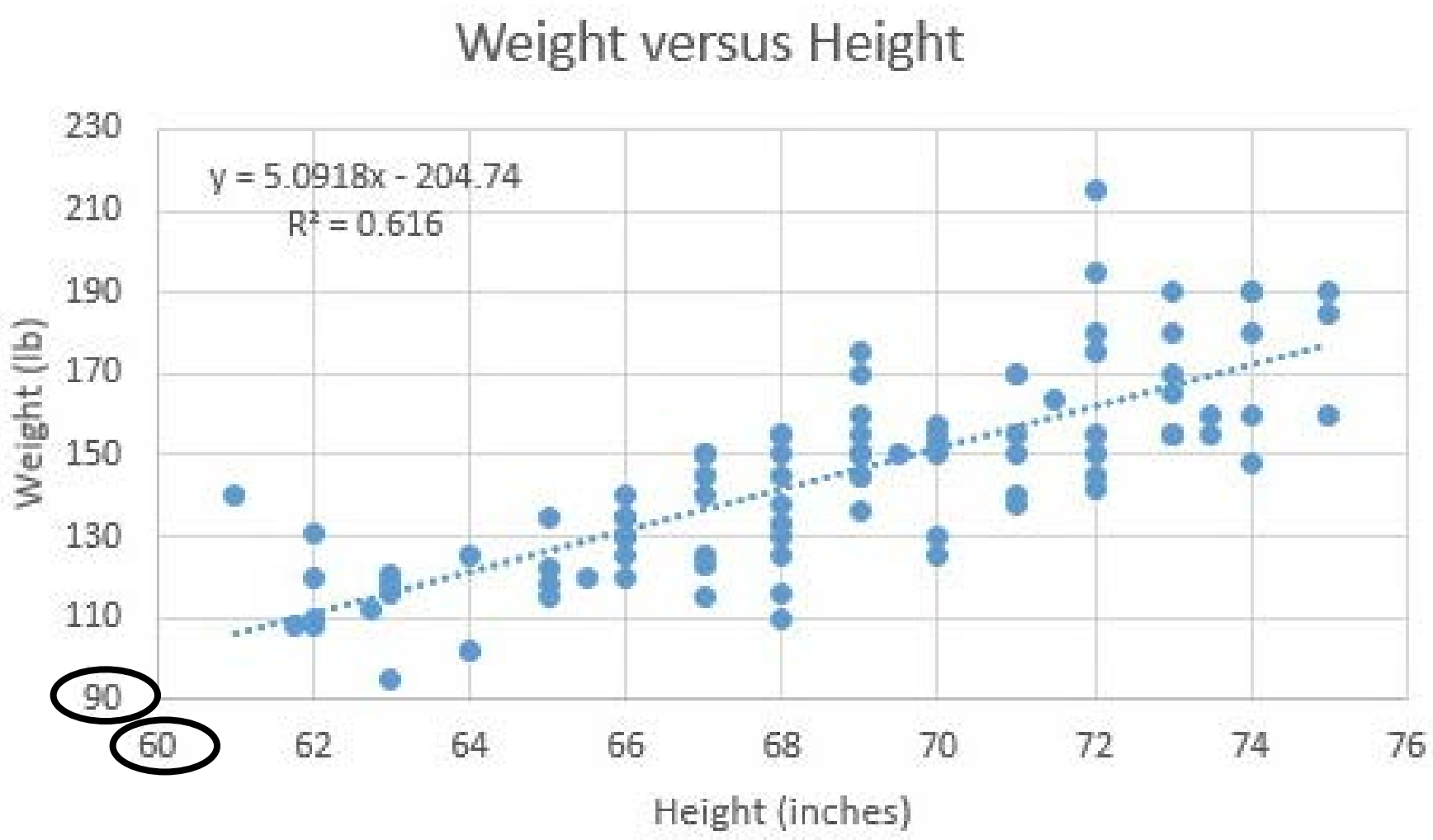
Check “Trendline” (Linear is default); Select “More Options”

Select Column Chart Icon; Check Linear Equation & R^2



Check "Display Equation"; Check "Display R-squared value"

Edit Headings; Match This
Optional: Marker & Line Styles



Describe Slope (Qual+Quant) & Fit
On spreadsheet; not in graph

Slope (Qualitative. Use either one):

- Taller people weigh more [than shorter people]
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- As height increases by 1 inch, weight increases by 5.1 pounds.
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Linear model of Weight based on Height: [Optional]

- Predicted weight = (5.1#/inch)*Height(inches) – 240#
- Mean height is 65”; Mean weight is 150#.
- Predicted weight = AveWt + (5.1#/inch)(Ht – AveHt)

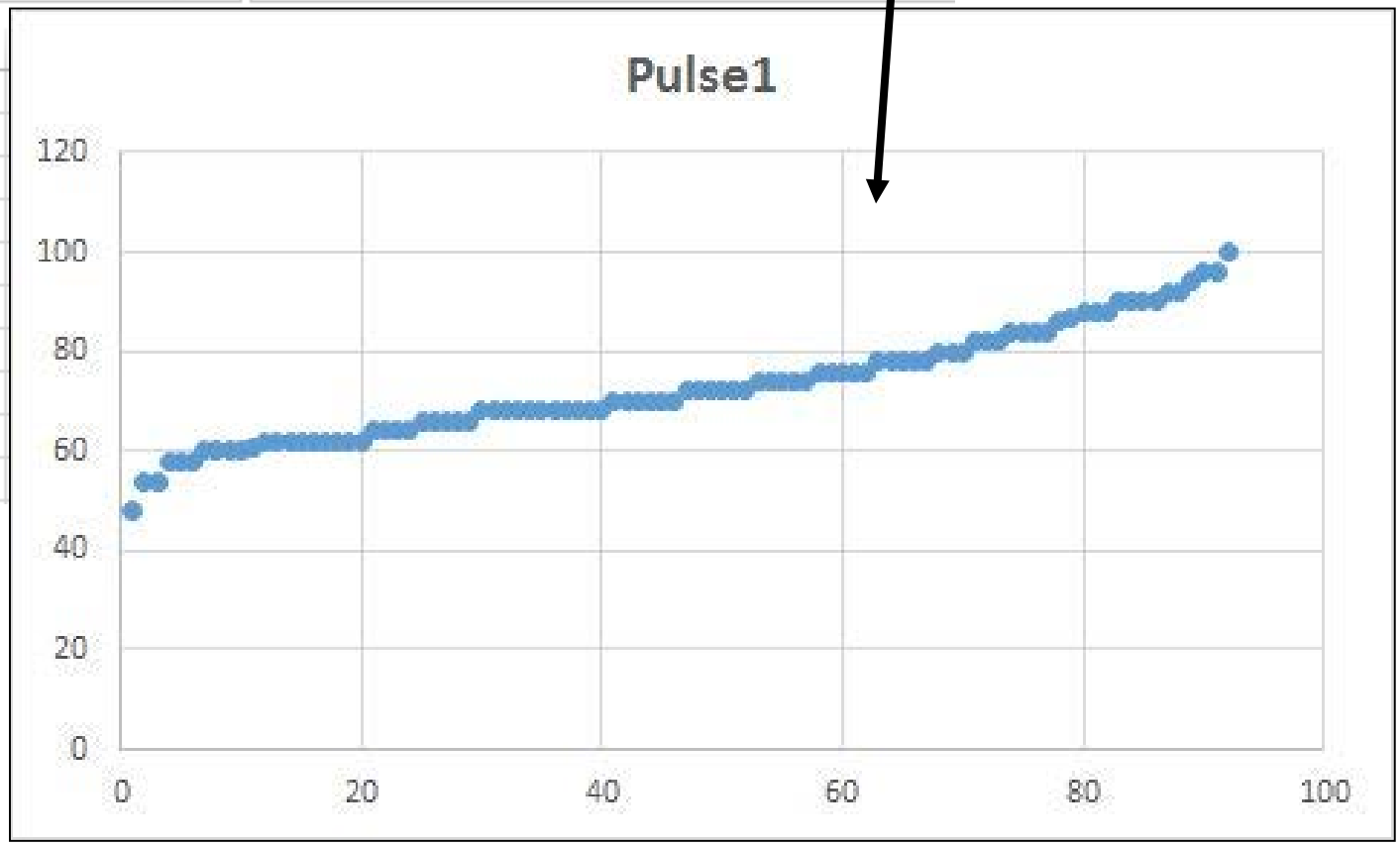
#2a Select Pulse1 (column A)

#2b Insert XY Plot

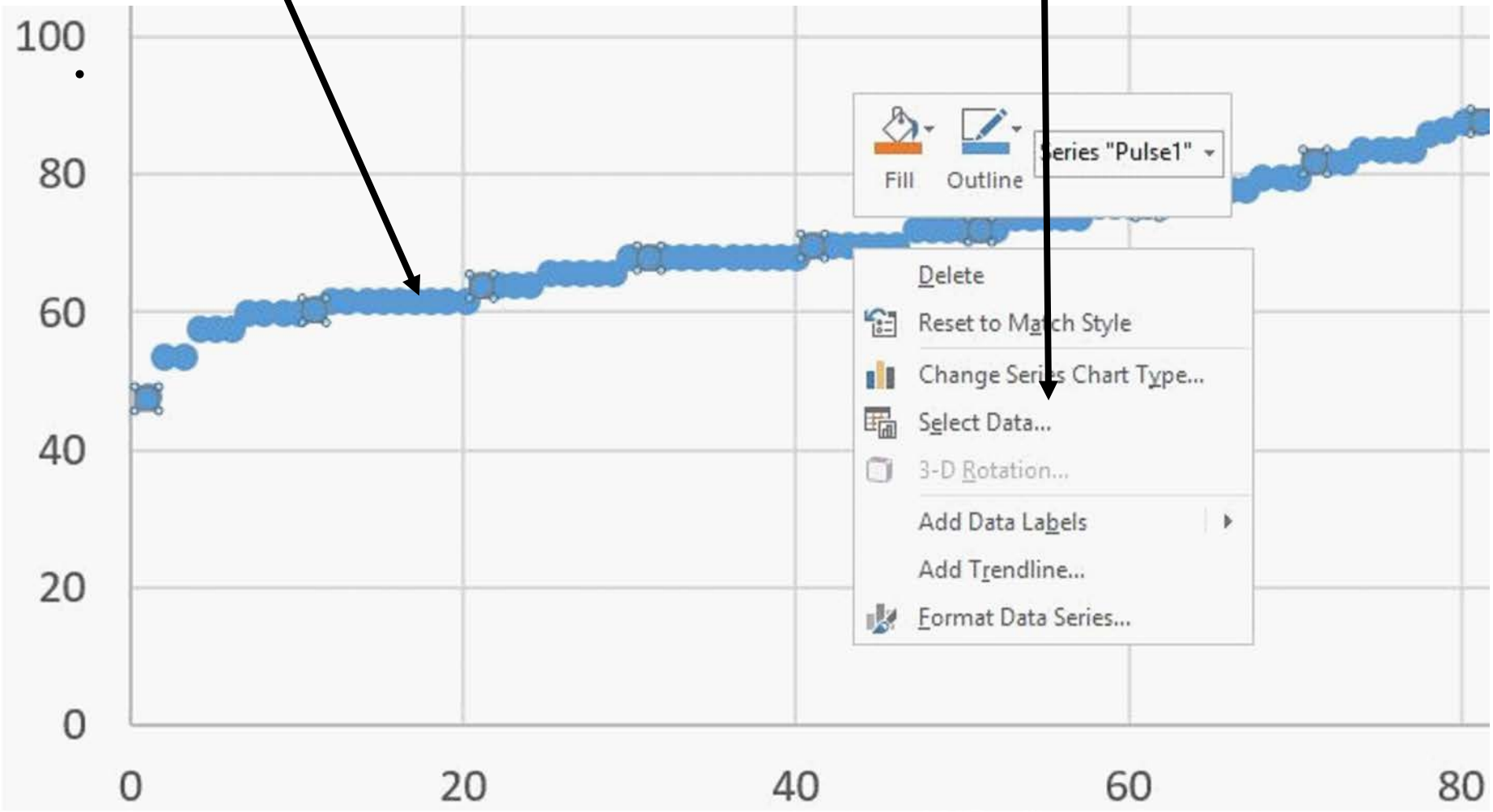
FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW

A1 | Pulse1

	A	B
1	Pulse1	Pulse2
2	48	54
3	54	56
4	54	50
5	58	70
6	58	58
7	58	56
8	60	76
9	60	62
10	60	70

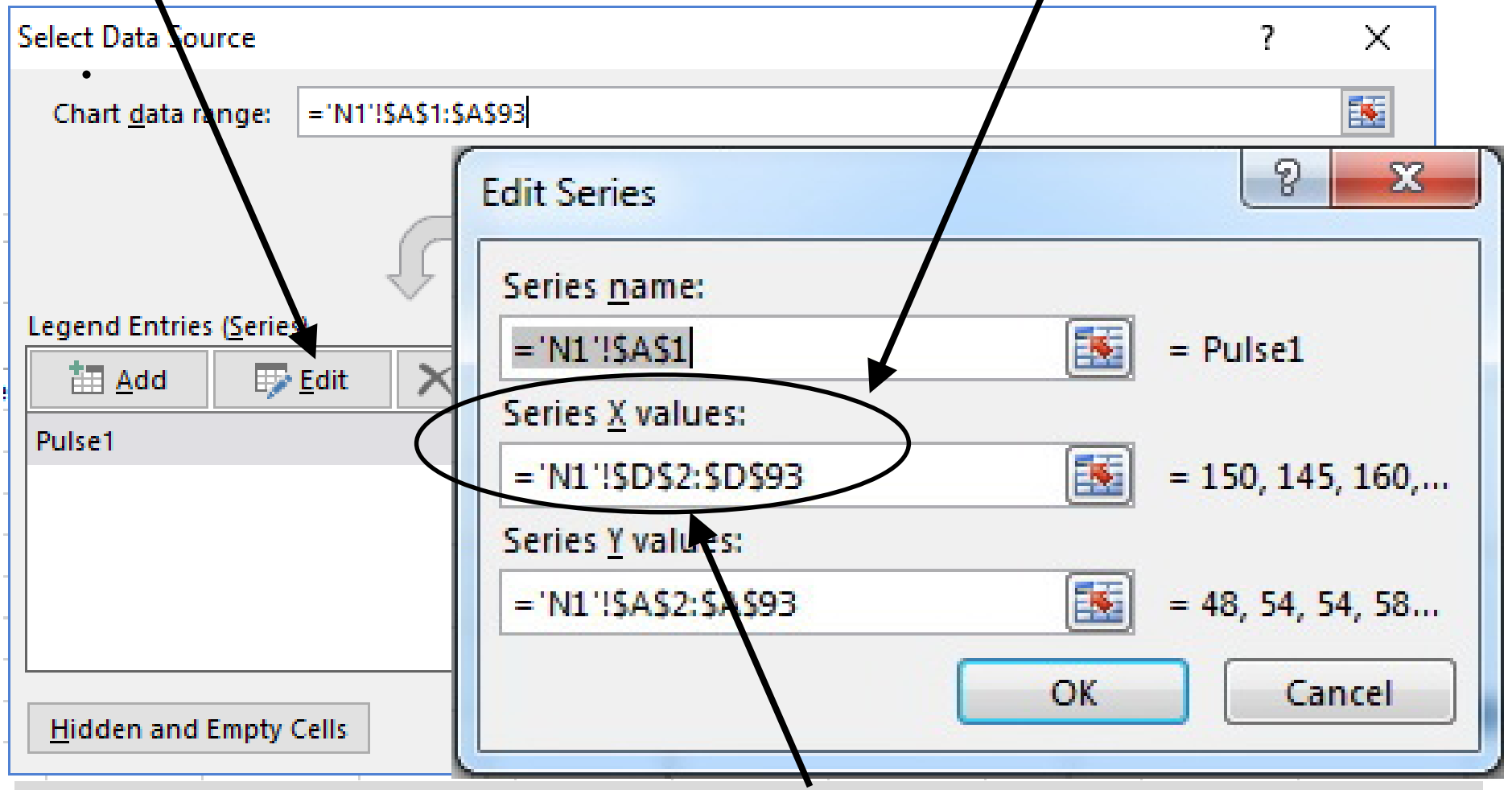


#2c Right-mouse on the data. Select "Select Data"



#2d Select "Edit Data"

#2e In Series X, select *Weight*



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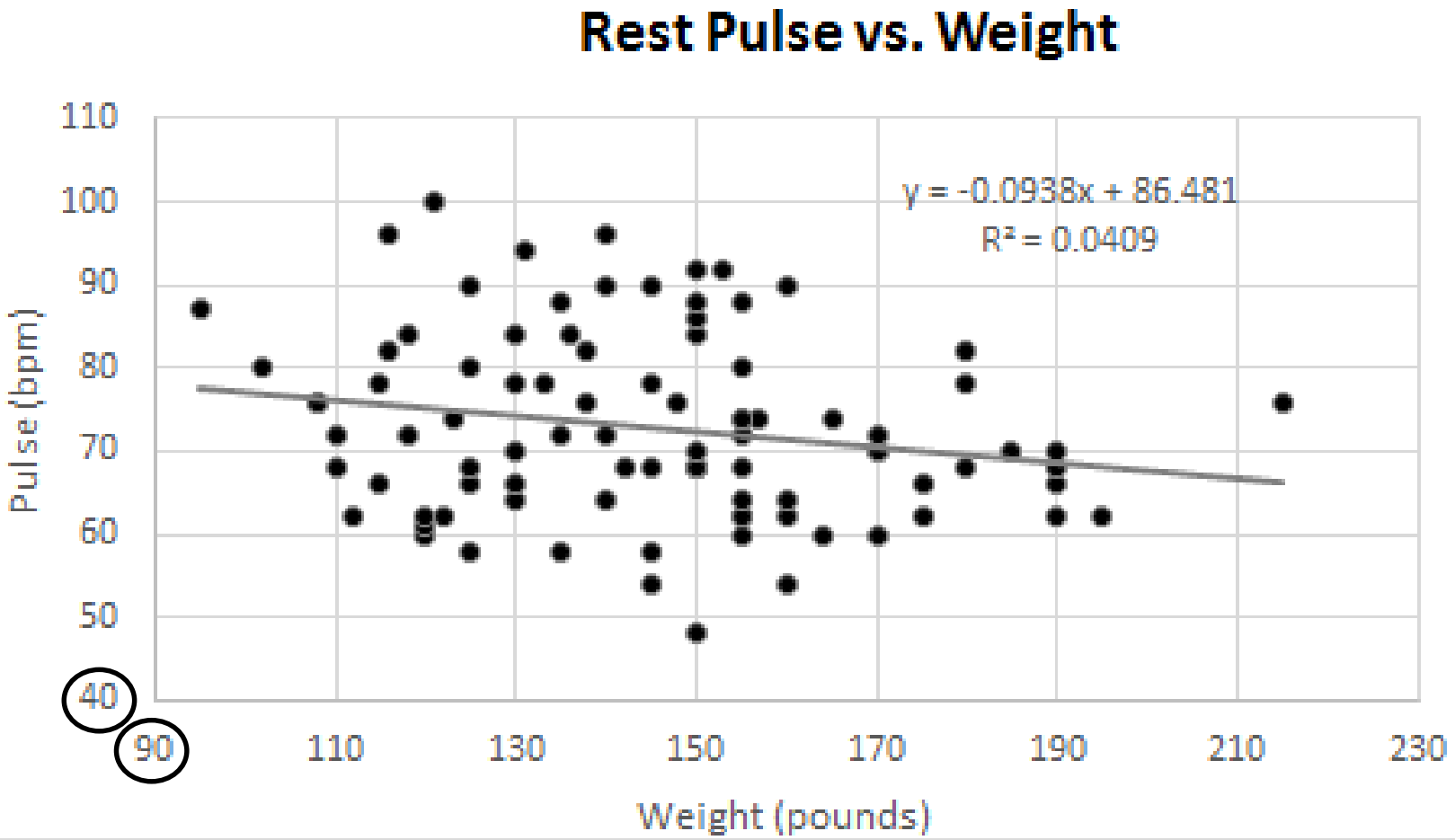

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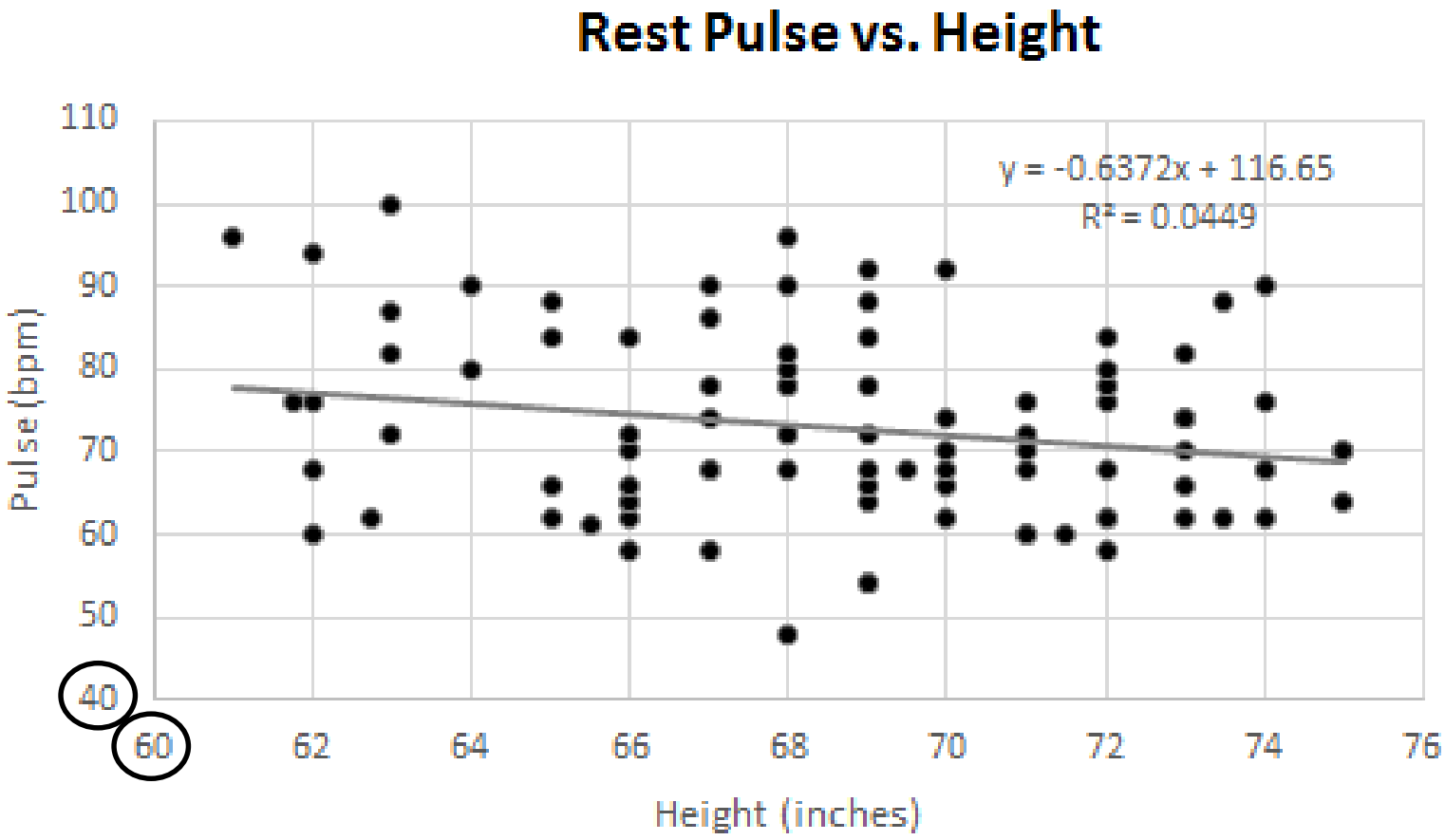
- Predicted rest pulse = [-0.094 bpm/#]*Weight(#) + 86.5 bpm
- Predicted weight = AveWeight + [5.1#/inch][Height – AveHt]

#3: Duplicate previous graph but with *Height* on X-Axis



Erase old Trendline; Create new one

In Select Data, replace D with C

#3b: Describe Slope and Fit
On spreadsheet; not in graph

Required: [See slide 21 for examples]

1. **Give a qualitative description of the trend.**
2. **Give a quantitative description of the trend.**

Optional:

1. **Give an algebraic description of the relationship.**
2. **Give an arithmetic description of the fit.**
   Use the value of R-squared, but do not use that phrase.
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Compare Models [Not Required]

R-squared: quality of the model.

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Height and weight are poor predictors ($R^2 < 5\%$) of rest pulse (Pulse1)