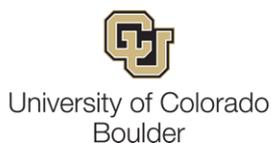


# Two-Axis Graph Help!

Part of a Series of Avoiding Graph Pitfalls

*Last updated: January 17, 2019*



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UNIVERSITY



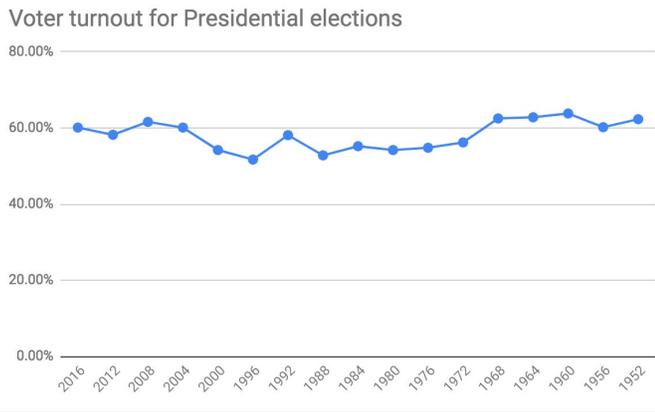
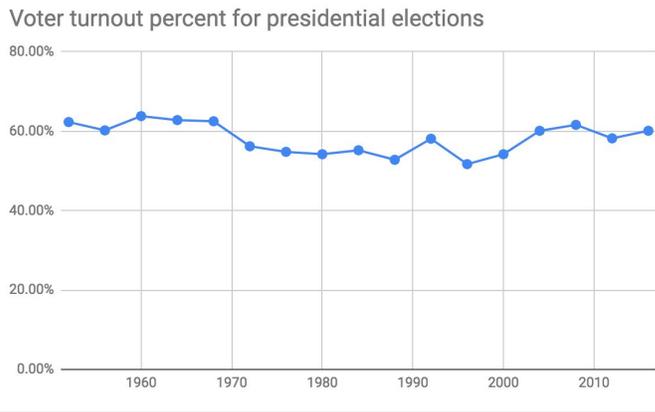
These materials are based upon work supported by the National Science Foundation under Grant Nos. IIS-1441561, IIS-1441471, & IIS-1441481. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the NSF.

# Two-Axis Graph Help!

By Ada Ren & Andee Rubin

If you're reading this, it's probably because you have a line graph or scatter plot that is statistically incorrect or visually misleading. Try to figure out which issue your graph has and consider the suggestions here for improving it.

## Problem: X-axis for time reads from right to left

Problem	A Solution																																																																				
X-axis for time reads backwards from what we expect. Time is typically represented moving from left to right on a graph.	Unless you have a specific reason to want the most recent data on the left, sort your data so that the later dates are on the bottom rows.																																																																				
 <p>Voter turnout for Presidential elections</p> <table border="1"><caption>Voter turnout for Presidential elections (Problem)</caption><thead><tr><th>Year</th><th>Turnout (%)</th></tr></thead><tbody><tr><td>2016</td><td>60.00</td></tr><tr><td>2012</td><td>58.00</td></tr><tr><td>2008</td><td>61.00</td></tr><tr><td>2004</td><td>60.00</td></tr><tr><td>2000</td><td>54.00</td></tr><tr><td>1996</td><td>52.00</td></tr><tr><td>1992</td><td>58.00</td></tr><tr><td>1988</td><td>53.00</td></tr><tr><td>1984</td><td>55.00</td></tr><tr><td>1980</td><td>54.00</td></tr><tr><td>1976</td><td>55.00</td></tr><tr><td>1972</td><td>56.00</td></tr><tr><td>1968</td><td>62.00</td></tr><tr><td>1964</td><td>62.00</td></tr><tr><td>1960</td><td>63.00</td></tr><tr><td>1956</td><td>60.00</td></tr><tr><td>1952</td><td>62.00</td></tr></tbody></table>	Year	Turnout (%)	2016	60.00	2012	58.00	2008	61.00	2004	60.00	2000	54.00	1996	52.00	1992	58.00	1988	53.00	1984	55.00	1980	54.00	1976	55.00	1972	56.00	1968	62.00	1964	62.00	1960	63.00	1956	60.00	1952	62.00	 <p>Voter turnout percent for presidential elections</p> <table border="1"><caption>Voter turnout percent for presidential elections (Solution)</caption><thead><tr><th>Year</th><th>Turnout (%)</th></tr></thead><tbody><tr><td>1960</td><td>63.00</td></tr><tr><td>1964</td><td>62.00</td></tr><tr><td>1968</td><td>62.00</td></tr><tr><td>1972</td><td>56.00</td></tr><tr><td>1976</td><td>55.00</td></tr><tr><td>1980</td><td>54.00</td></tr><tr><td>1984</td><td>55.00</td></tr><tr><td>1988</td><td>53.00</td></tr><tr><td>1992</td><td>58.00</td></tr><tr><td>1996</td><td>52.00</td></tr><tr><td>2000</td><td>54.00</td></tr><tr><td>2004</td><td>60.00</td></tr><tr><td>2008</td><td>61.00</td></tr><tr><td>2012</td><td>58.00</td></tr><tr><td>2016</td><td>60.00</td></tr></tbody></table>	Year	Turnout (%)	1960	63.00	1964	62.00	1968	62.00	1972	56.00	1976	55.00	1980	54.00	1984	55.00	1988	53.00	1992	58.00	1996	52.00	2000	54.00	2004	60.00	2008	61.00	2012	58.00	2016	60.00
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## Problem: Y-axis not labeled appropriately

Problem	A Solution																												
It's hard to tell what the numbers represent on the Y-axis; They could be seconds, minutes, or hours.	Add an appropriate y-axis label, in this case "minutes."																												
 <p>5k Run time</p> <table border="1"><caption>5k Run time (Problem)</caption><thead><tr><th>Grade</th><th>Run Time</th></tr></thead><tbody><tr><td>7th Grade</td><td>0:22:00</td></tr><tr><td>8th Grade</td><td>0:21:45</td></tr><tr><td>9th Grade</td><td>0:20:45</td></tr><tr><td>10th Grade</td><td>0:20:30</td></tr><tr><td>11th Grade</td><td>0:20:15</td></tr><tr><td>12th Grade</td><td>0:20:00</td></tr></tbody></table>	Grade	Run Time	7th Grade	0:22:00	8th Grade	0:21:45	9th Grade	0:20:45	10th Grade	0:20:30	11th Grade	0:20:15	12th Grade	0:20:00	 <p>5k Run time</p> <table border="1"><caption>5k Run time (Solution)</caption><thead><tr><th>Grade</th><th>Run Time (minutes)</th></tr></thead><tbody><tr><td>7th Grade</td><td>0:22:00</td></tr><tr><td>8th Grade</td><td>0:21:45</td></tr><tr><td>9th Grade</td><td>0:20:45</td></tr><tr><td>10th Grade</td><td>0:20:30</td></tr><tr><td>11th Grade</td><td>0:20:15</td></tr><tr><td>12th Grade</td><td>0:20:00</td></tr></tbody></table>	Grade	Run Time (minutes)	7th Grade	0:22:00	8th Grade	0:21:45	9th Grade	0:20:45	10th Grade	0:20:30	11th Grade	0:20:15	12th Grade	0:20:00
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## Problem: "Best fit" line drawn on a graph inappropriately

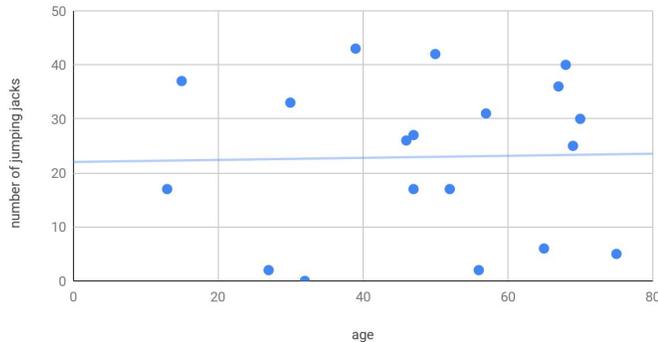
### Problem

Here "best fit" line is drawn on a scatter plot, but the data are scattered far from the line. Add a "best fit" line to a graph only when there is a clear trend that you are trying to illustrate.

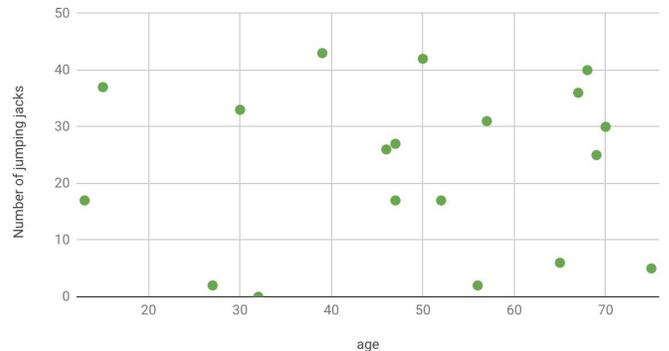
### A Solution

If there's no trend, just say so. Remove the trendline. Sometimes that's what the data say.

Number of jumping jacks vs Age



Number of jumping jacks vs. age



## Problem: Points on graph connected by lines inappropriately

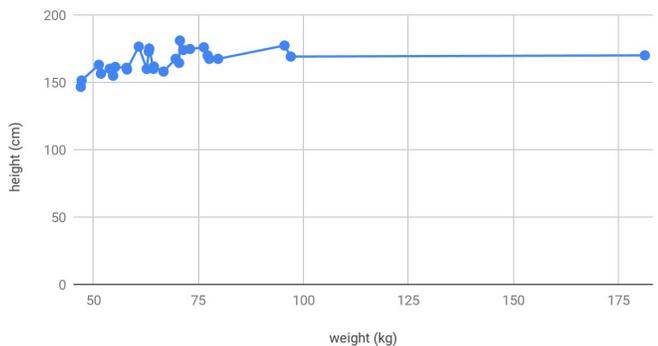
### Problem

Connecting successive points on a graph implies that there could be points on the drawn line, but the data may not support that implication. The graph below implies that a high school student who weighs 150 pounds is likely to be 160 cm tall, but there is no data point there to support it.

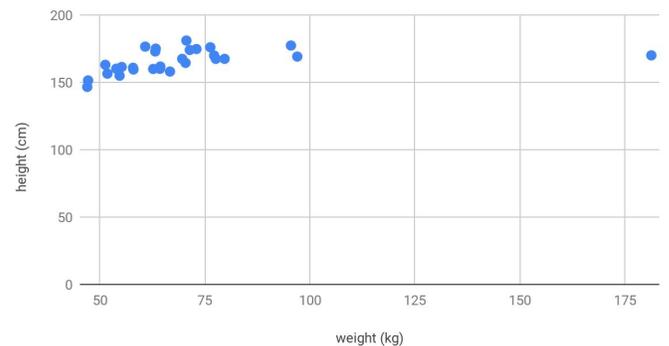
### A Solution

Create a graph with the individual points on it, but don't connect them with a line.

High Schoolers' weight vs height



High Schoolers' weight vs height



## Problem: Two variables graphed on the same line plot have different units.

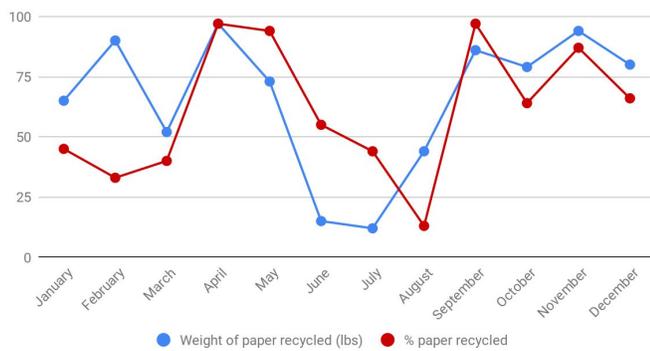
### Problem

Two variables are graphed on the same axis, but have different units, so the graph implies the values are “the same” when they are not.

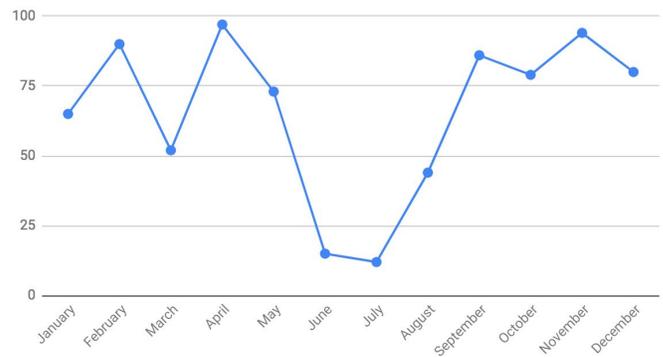
### A Solution

Even though both values have the same range, from 0 to 100, they have different units - one is pounds and the other is percents. Add a second Y-axis to make that distinction clear or use two graphs.

Weight of paper recycled (lbs) and % paper recycled



Weight of paper recycled (lbs)



Percent paper recycled

