What's the Scale?

READ 📘 CPO Science

Graphs allow you to present data in a form that is easy to understand. With a graph, you can see whether your data shows a pattern and you can picture the relationship between your variables.

The **scale** on a graph is the quantity represented per line on the graph. Your graph's scales will depend on the type of data you are plotting. Each of your graph's axes has its own separate scale. You need to be consistent with your scales. If one line on a graph represents 1 cm on the *x*-axis, it has to stay that way for the entire *x*-axis.

When figuring out the scale for your graph, you first need to know the **range**. When you want your axis to start at zero, your range is equal to your highest data value. Once you have the range, you can calculate the scale. Count the number of lines you have available on your graph paper. Now, divide the range by the number of lines. This number is your scale. Then you adjust your scale by rounding up to a whole number.

EXAMPLE ▶

Calculate the scales for the data set listed in the table below. Your graph paper is 20 boxes by 20 boxes.

Time (hours)	Amount of rainfall (mL)
5	5
10	11
15	21
20	28
25	37
30	59

Identify the variables.

1. Which is the independent variable?   Time is your independent variable; it goes on the *x*-axis.
    Which is the dependent variable?   Amount of rainfall is your dependent variable; it goes on the *y*-axis.

Find the ranges.

2. What is the range of data for the x-axis? 30 hours
    What is the range of data for the y-axis? 59 mL

Calculate the scales.

3. What is the scale for your *x*-axis?   30 hrs divided by 20 boxes = 1.5 hrs/box rounded up to 2 hrs/box
    Each line on the graph is equal to 2 hours.
    The *x*-axis will start at zero and go up to 40 hours, with each line counting as 2 hours.

    What is the scale for your *y*-axis?   59 mL divided by 20 boxes = 2.95 mL/box rounded up to 3 mL/box
    Each line on the graph is equal to 3 mL.
    The *y*-axis will start at zero and go up to 60 mL, with each line counting as 3 mL.

PRACTICE

1. Given the variable range and the number of lines, calculate the scale for an axis. Often the calculated scale is not an easy-to-use value. To make the calculated scale easy-to-use, round the value and write this number in the column with the heading "Adjusted scale." The first two are done for you.

Range from 0	Number of Lines	Range ÷ Number of Lines	Calculated scale	Adjusted scale (whole number)
14	10	$14 \div 10 =$	1.4	2
8	5	$8 \div 5 =$	1.6	2
1000	20	$1000 \div 20 =$		
547	15	$547 \div 15 =$		
99	30	$99 \div 30 =$		
35	12	$35 \div 12 =$		

2. Calculate the range and the scale for the x-axis starting at zero, given the following data pairs and a 30 box by 30 box piece of graph paper. Each data point is given in the format of (x, y): (1, 27), (30, 32), (20, 19), (6, 80), (15, 21).

3. Calculate the range and the scale for the y-axis starting at zero, given the following data pairs and a 10 box by 10 box piece of graph paper. Each data point is given in the format of (x, y): (1, 5), (2, 10), (3, 15), (4, 20), (5, 25).

4. Calculate the scale for both the x-axis and the y-axis of a graph using the data set in the table below. Your graph paper is 20 boxes by 20 boxes. Start both the x- and y-axis at zero.

    a. Which is the independent variable? Which is the dependent variable?

    b. What is the range of data for the x-axis? What is the range of data for the y-axis?

    c. What is the scale for your x-axis? What is the scale for your y-axis?

Day	Average Daily Temperature (°F)
1	67
3	68
5	73
7	66
9	70
11	64