Pre-Lecture Lesson

Glossary

Here are some terms we may encounter in our talk:

- **Transmissibility:** how easy it is for a disease to pass from one person to another
- **Susceptibility:** how susceptible (or easily) a person can be infected
- **Exponential growth:** a sequence that grows more as time goes on and gets bigger rapidly. It is dependent on how big the exponent is. For example
  - $1^2 = 1,\ 2^2 = 4,\ 4^2 = 16,\ \ 16^2 = 256, \ldots$
  - $1^3 = 1,\ 2^3 = 8,\ 8^3 = 512,\ 512^3 = 134{,}217{,}728$
  - $1^4 = 1,\ 2^4 = 16, 16^4 = \ 65{,}536,\ 65{,}536^4 = \ 1.8\ x\ 10^{19}$ or 180,000,000,000,000,000,000

And here are some concepts we may encounter:

- The symbol $\frac{dx}{dt}$ means whatever the change in 'x' is over the change in 't' (which is time). The 'd' means change in.

Sequences

A sequence is a list of numbers that are in a special order. They follow a specific pattern from one number to the next.

Can you find the pattern in these sequences?[1]

3, 5, 7, 9, … (the dots mean the list continues forever – to infinity)

5, 10, 15, 20, …

7, 11, 15, 19, 23, …

3, 11, 35, 107, … (this one involves more than one operation)

4, 16, 256, 65536, 4294967296, …

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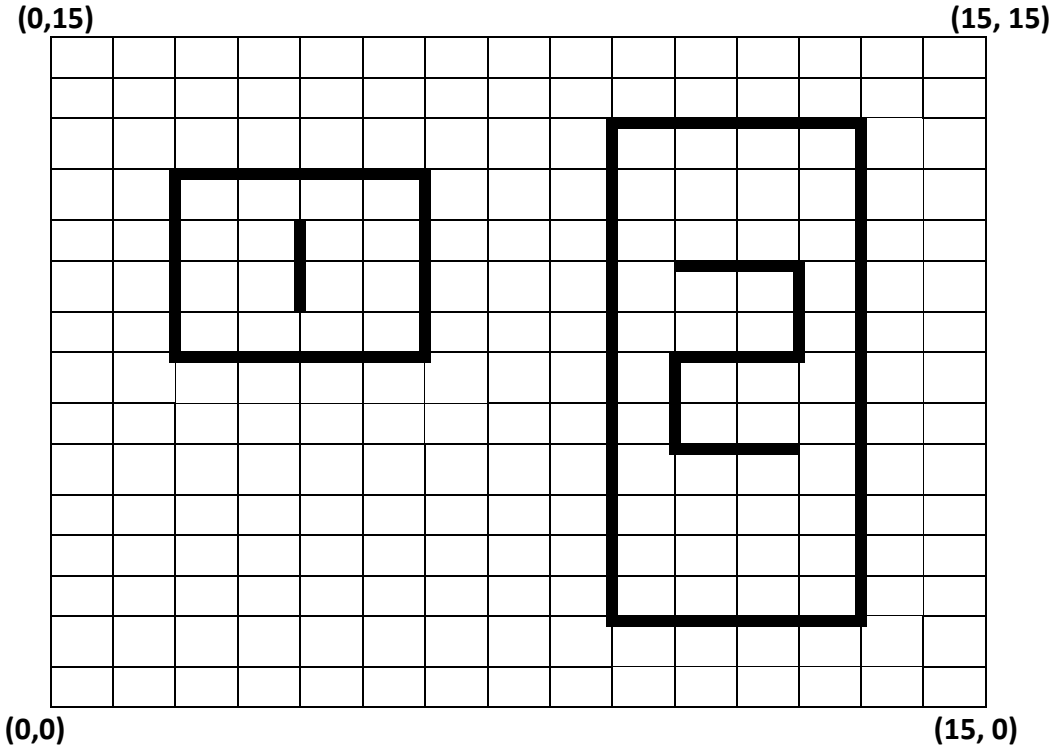
[1] **Answer:** first sequence starts at 3 and goes up by 2 each new number; second sequence starts at 5 and goes up by 5 each new number; third sequence starts at 7 and goes up by 4 each time; the fourth sequence starts at 3 and each new number is the number before multiplied by 3 with 2 added to it (3 * 3 = 9 + 2 = 11 ; 11 * 3 = 33 + 2 = 35 ; 35 *3 = 105 + 2 = 107, …). The final sequence is an exponential growth starting at 4, $4^2 = 16$; $16^2 = 256$; $256^2 = \ 65{,}536$; $65{,}536^2 = \ 4{,}294{,}967{,}296$, …

Distances on a Graph



What are the coordinates of the square (1) and the rectangle (2)?[2]

Now what is the distance between the upper left corner of the square (1) and the lower right corner of the rectangle (2)?[3]

If you've learned the Pythagorean theorem you can use the coordinates of the points and the following formula:

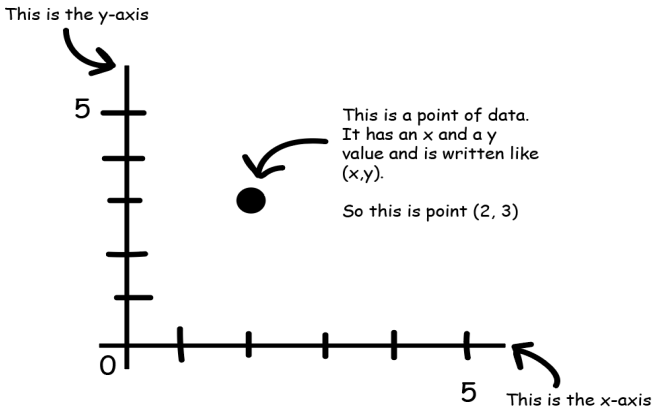
$$\sqrt{(x_2 - x_1) + (y_2 - y_1)^2}$$

[2] The square has its 4 corners at (2, 8), (2, 12), (6, 8) and (6, 12). The rectangle at (9, 2), (9, 13), (13, 2), and (13, 13)

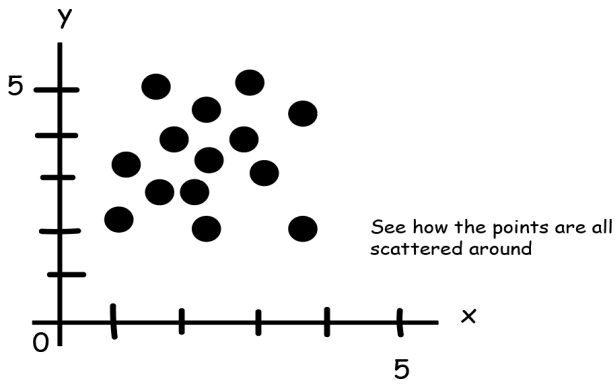
[3] Using the formula, we have points (2, 12) and (13, 2), so x1 = 2, x2 = 13, y1 = 12, and y2 = 2)

$$\sqrt{(13-2)^2 + (2-12)^2} = \sqrt{11^2 + (-10)^2} = \sqrt{121 + 100} = 14.87$$

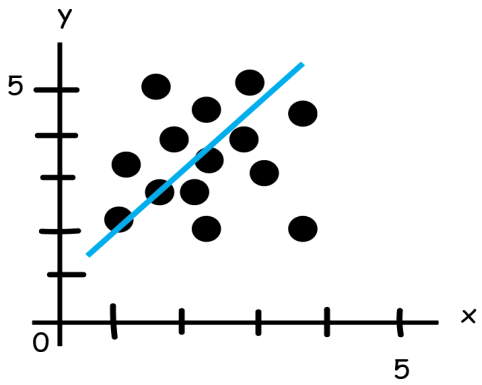
Scatterplots and Lines of Best Fit



And this is a scatterplot graph:



A line of best fit is a line that is the closest to the most points it can be on the graph. It might go through some points but not others.



This is the equation for a line:

$$y = mx + c$$

Where:

- y is the thing you are looking for (the output)
- x is the thing you are using (the input)
- m is the slope (see below)
- c is the y-intercept (where the line meets the y-axis)

Slope formula:

- $m = \frac{y_2 - y_1}{x_2 - x_1}$

And here's how you find it…