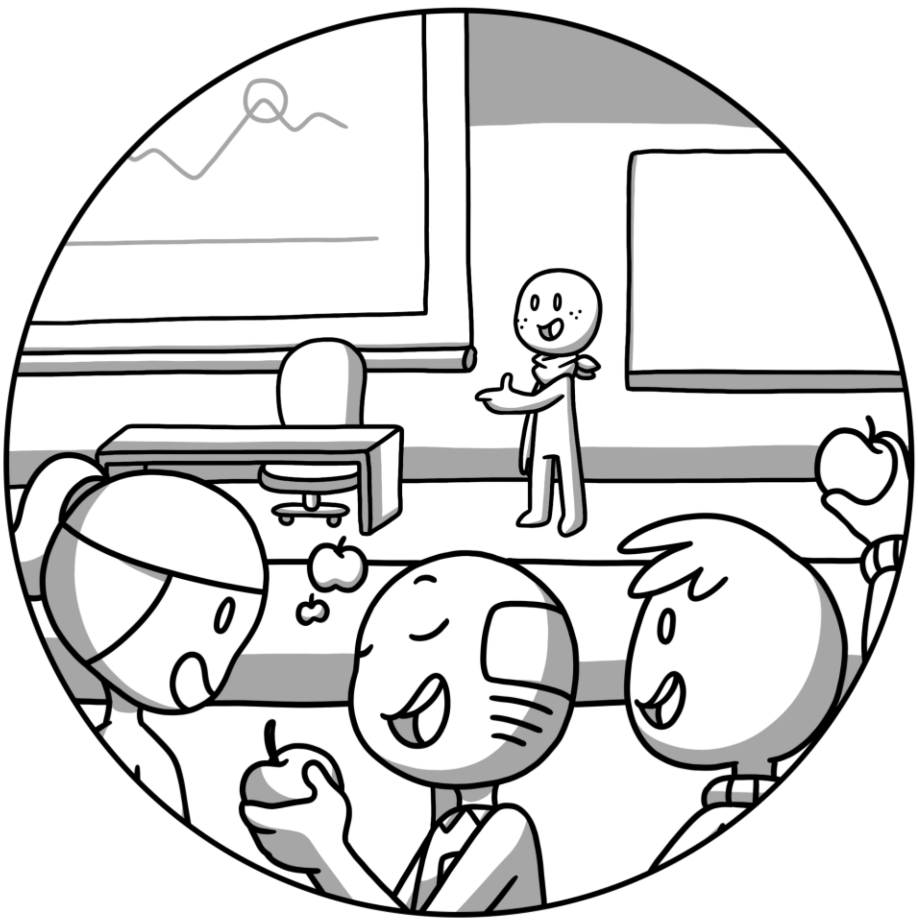
Central Tendency



COMIXPLAIN

This comic was created in the course of the research project Comixplain, funded by St. Pölten UAS in the course of the Innovation Call 2022.

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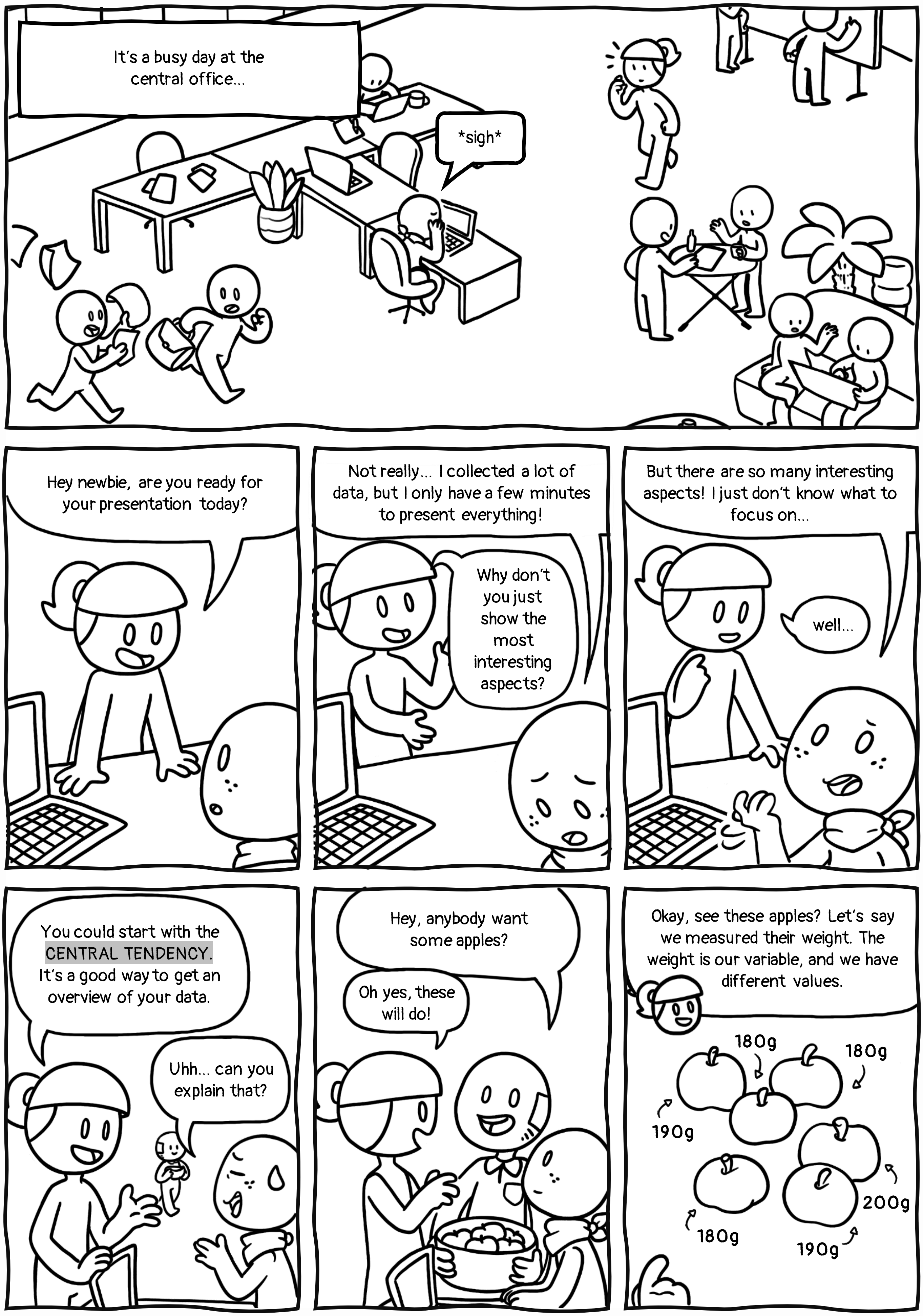
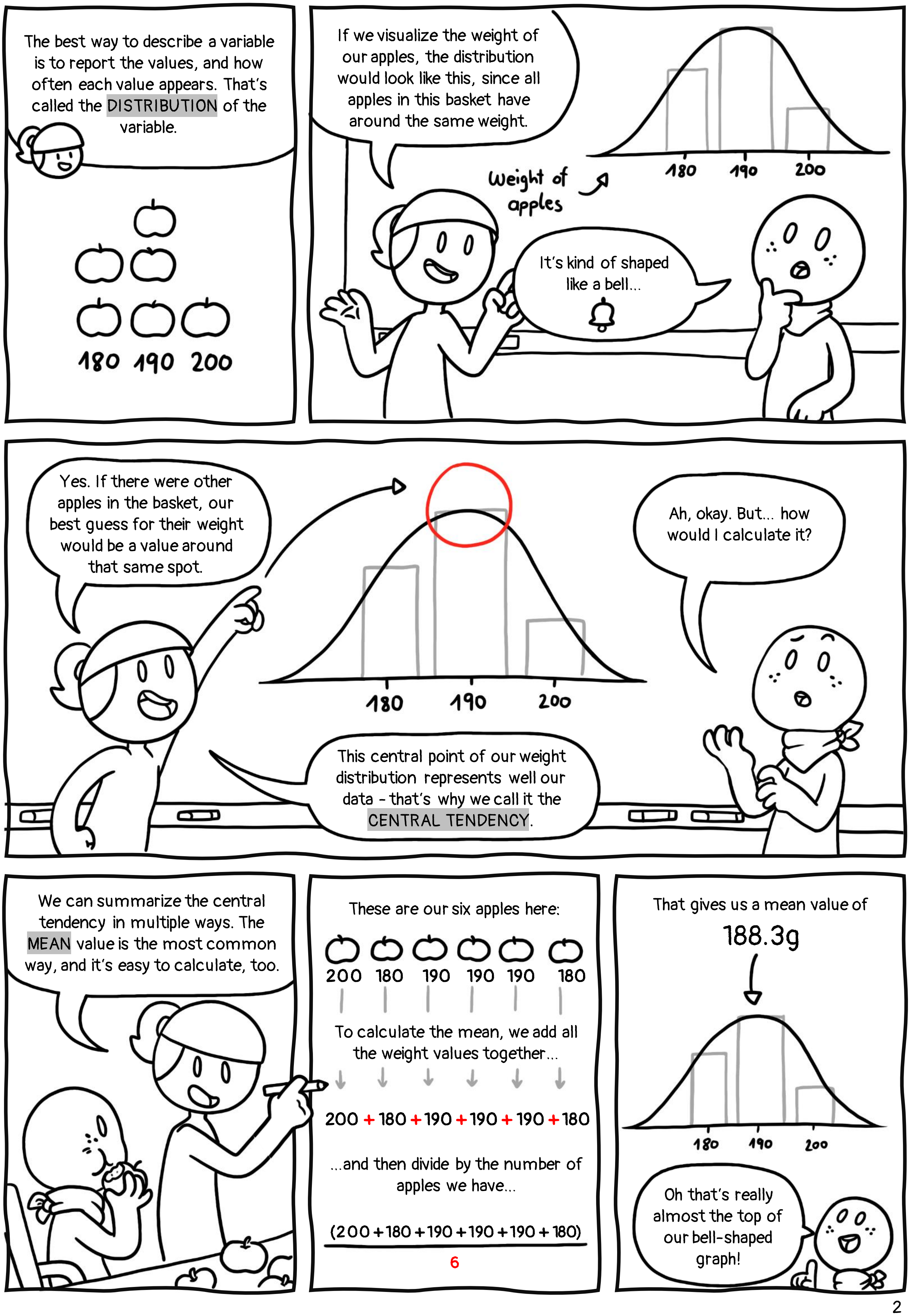
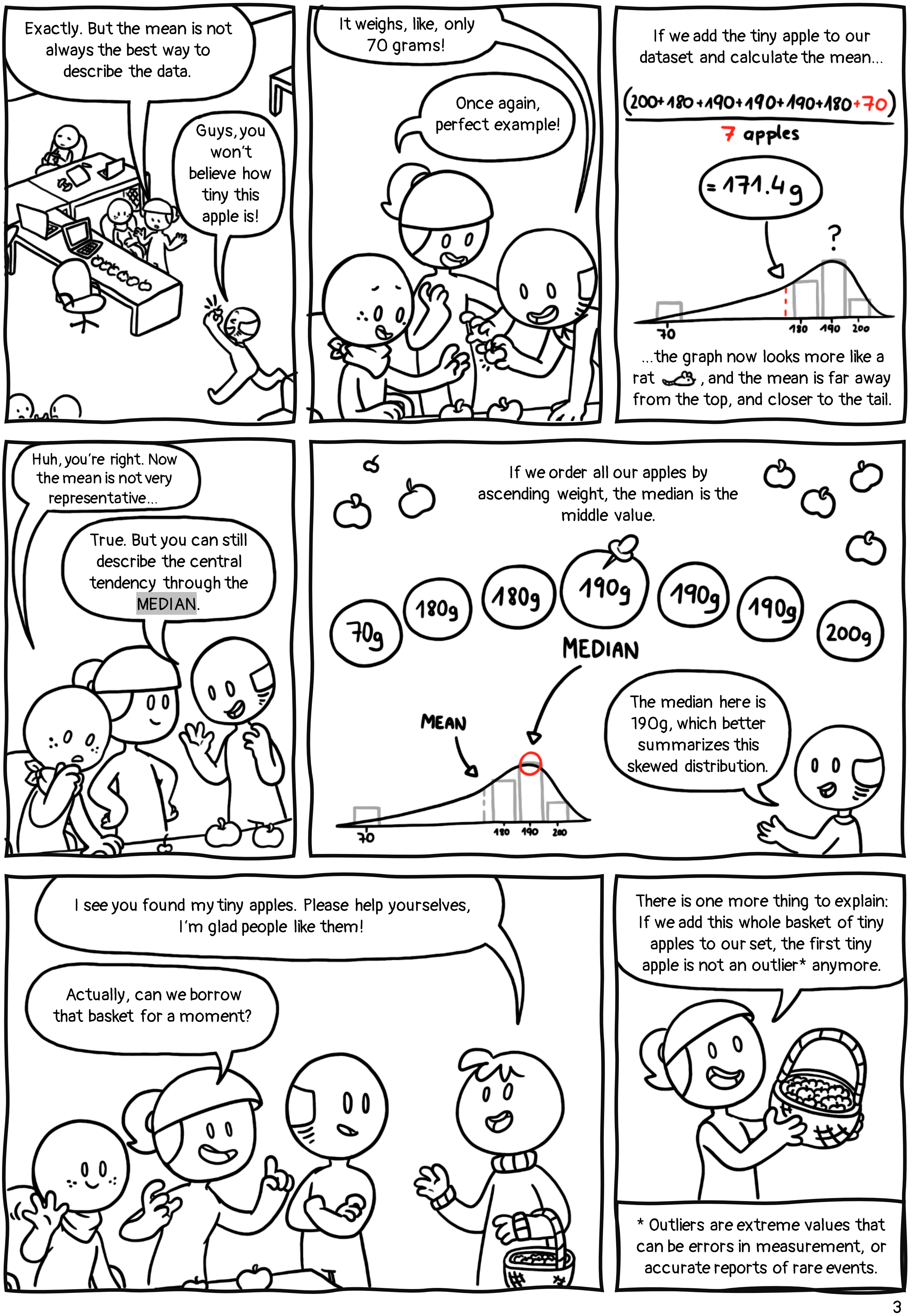
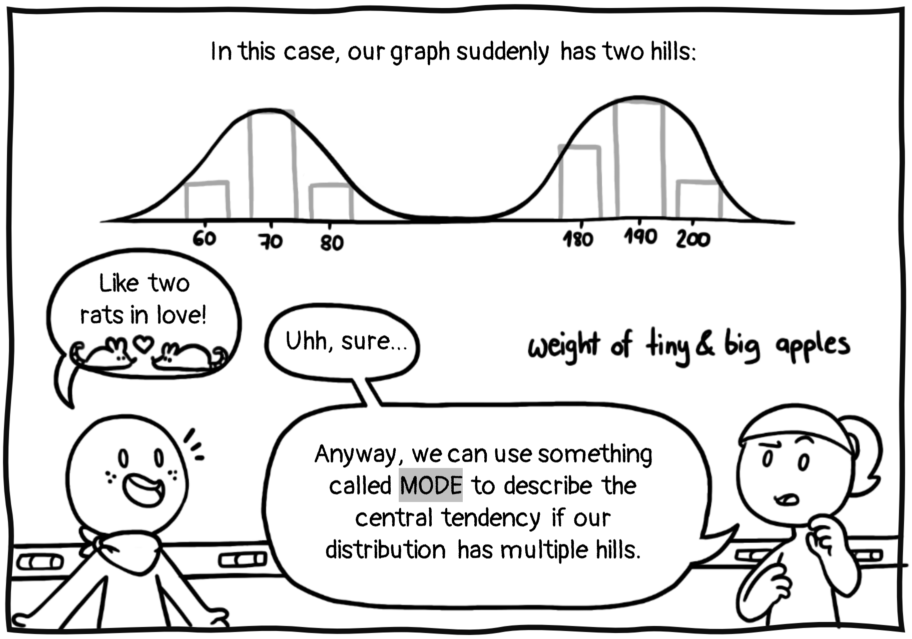
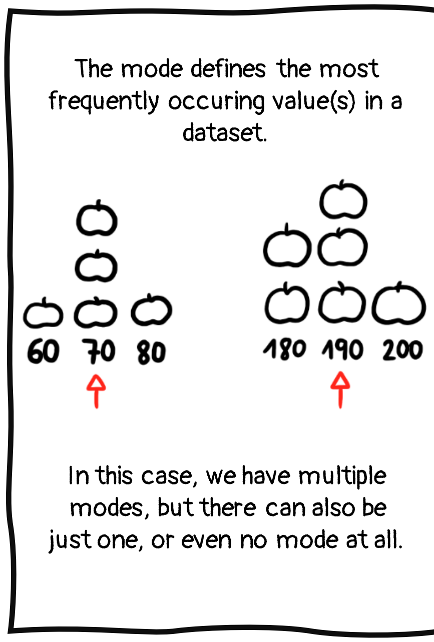
https://fhstp.github.io/comixplain

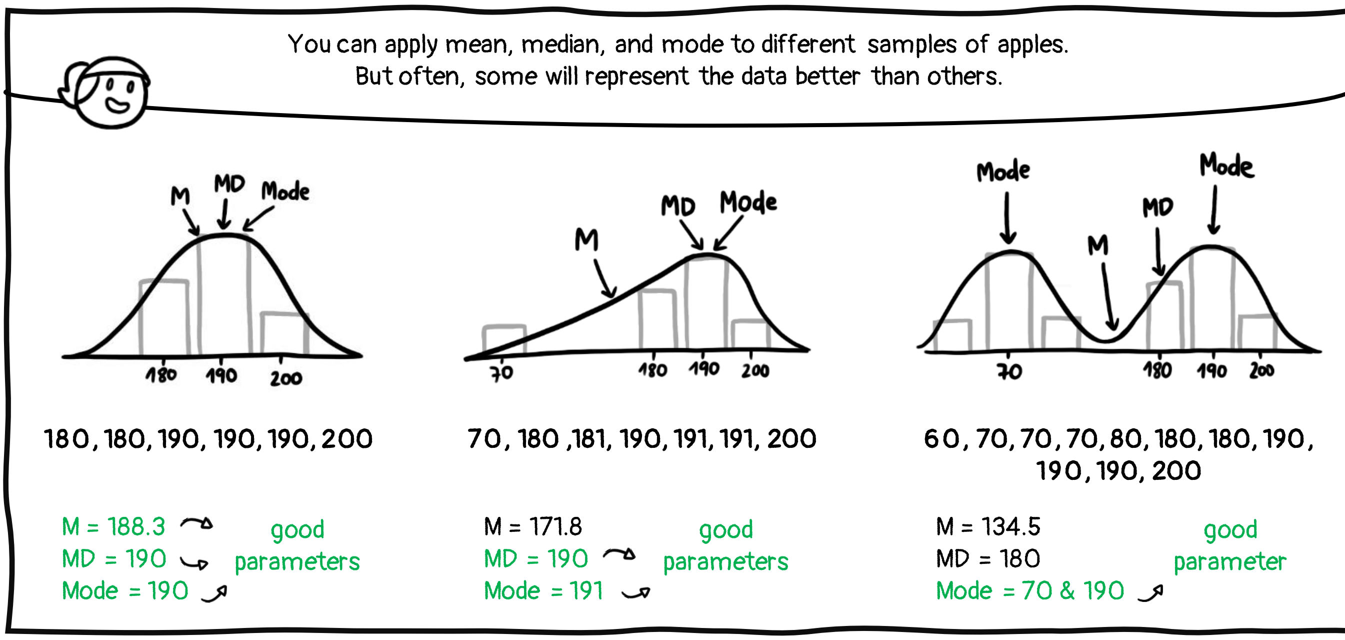

It's a busy day at the central office...
sigh
Hey newbie, are you ready for your presentation today?
Not really... I collected a lot of data, but I only have a few minutes to present everything!
Why don't you just show the most interesting aspects?
But there are so many interesting aspects! I just don't know what to focus on...
well...
You could start with the CENTRAL TENDENCY. It's a good way to get an overview of your data.
Uhh... can you explain that?
Hey, anybody want some apples?
Oh yes, these will do!
Okay, see these apples? Let's say we measured their weight. The weight is our variable, and we have different values.
180g
180g
190g
200g
180g
190g

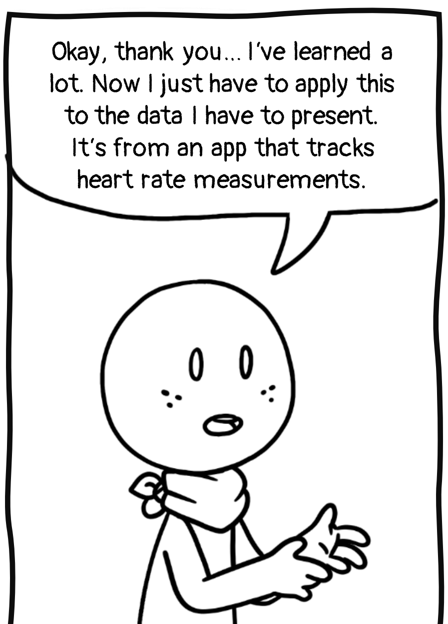

The best way to describe a variable is to report the values, and how often each value appears. That's called the DISTRIBUTION of the variable.
180 190 200
If we visualize the weight of our apples, the distribution would look like this, since all apples in this basket have around the same weight.
Weight of apples
180 190 200
It's kind of shaped like a bell...
Yes. If there were other apples in the basket, our best guess for their weight would be a value around that same spot.
180 190 200
Ah, okay. But... how would I calculate it?
This central point of our weight distribution represents well our data - that's why we call it the CENTRAL TENDENCY.
We can summarize the central tendency in multiple ways. The MEAN value is the most common way, and it's easy to calculate, too.
These are our six apples here:
200 180 190 190 190 180
To calculate the mean, we add all the weight values together...
200 + 180 + 190 + 190 + 190 + 180
...and then divide by the number of apples we have...
(200 + 180 + 190 + 190 + 190 + 180) / 6
That gives us a mean value of
188.3g
180 190 200
Oh that's really almost the top of our bell-shaped graph!


Exactly. But the mean is not always the best way to describe the data.
Guys, you won't believe how tiny this apple is!
It weighs, like, only 70 grams!
Once again, perfect example!
If we add the tiny apple to our dataset and calculate the mean...
(200+180+190+190+190+180+70)
7 apples
= 171.4g
?
70
180
190
200
...the graph now looks more like a rat, and the mean is far away from the top, and closer to the tail.
Huh, you're right. Now the mean is not very representative...
True. But you can still describe the central tendency through the MEDIAN.
If we order all our apples by ascending weight, the median is the middle value.
70g
180g
180g
190g
190g
190g
200g
MEDIAN
MEAN
70
180
190
200
The median here is 190g, which better summarizes this skewed distribution.
I see you found my tiny apples. Please help yourselves, I'm glad people like them!
Actually, can we borrow that basket for a moment?
There is one more thing to explain: If we add this whole basket of tiny apples to our set, the first tiny apple is not an outlier* anymore.
* Outliers are extreme values that can be errors in measurement, or accurate reports of rare events.

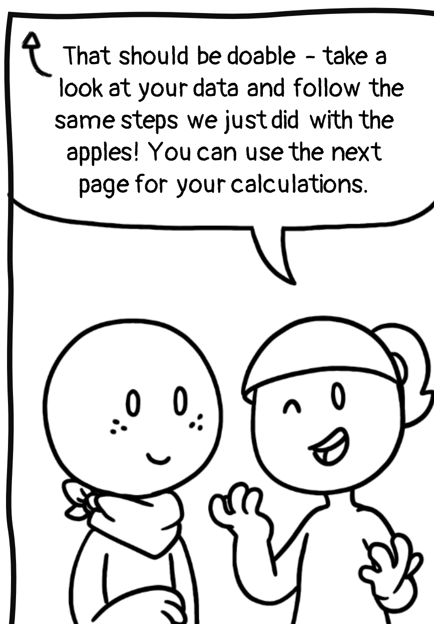








User ID	Heart Rate (bpm)	Time of Use	User Rating
1	45	13:00	1
2	50	9:00	5
3	55	10:00	3
4	57	9:00	4
5	63	14:00	5
6	70	15:00	5
7	65	16:00	4
8	75	15:00	2



Before turning the page, try to calculate mean, median and mode for each variable, and check which parameter is most adequate for describing the central tendency. You can take notes on this page!

Feel free to check the calculations.
You can take further notes on this page!

HEART RATE

Calculating the MEAN:

$$\frac{45+50+55+57+63+70+65+75}{8 \text{ users}} = \frac{480}{8} = 60 \text{ bpm}$$

Calculating the MEDIAN:

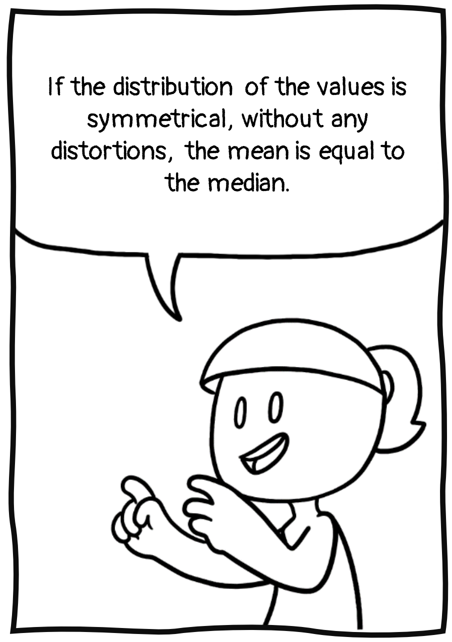
45 50 55 $\boxed{57 \quad 63}$ 65 70 75

If there are two central values, the mean of the two values is the median:
(57+63)/2 = 60bpm)

Calculating the MODE:

45, 50, 55, 57, 63, 70, 65, 75

Each value only exists once - there is no mode!



MOST FREQUENT TIME OF USE

Calculating the MEAN:

$$\frac{9+9+10+13+14+15+15+16}{8 \text{ users}} = \frac{101}{8} = 12.6?$$

Time of use is not a quantitative value - so calculating mean and median does not make any sense!

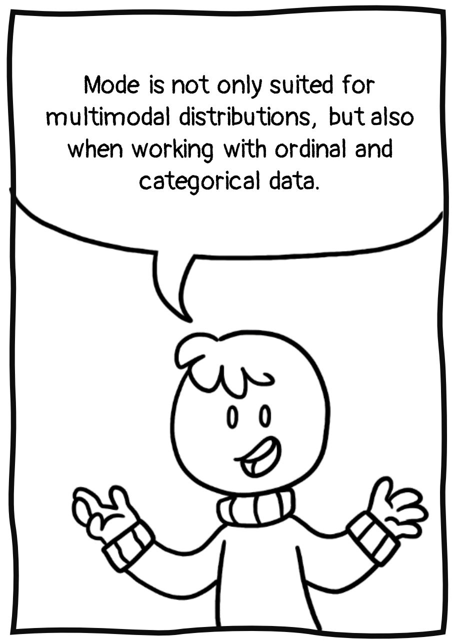
Calculating the MEDIAN:

9 9 10 $\boxed{13 \quad 14}$ 15 15 16 = 13.5?

Calculating the MODE:

9:00	10:00	13:00	14:00	15:00	16:00
2x	1x	1x	1x	2x	1x

= 2 modes: 9:00 & 15:00



STAR RATING

Calculating the MEAN:

$$\frac{1+2+3+4+4+5+5+5}{8 \text{ users}} = \frac{29}{8} = 3.6 \text{ stars}$$

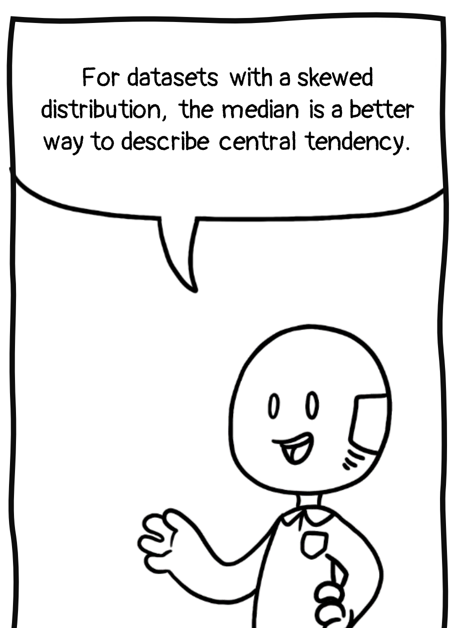
Calculating the MEDIAN:

1 2 3 $\boxed{4 \quad 4}$ 5 5 5 = 4 stars

Calculating the MODE:

1	2	3	4	5
1x	1x	1x	2x	3x

= 5 stars



Sources:

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