20. Statistics and Box Plots

The Mauna Loa Observatory in Hawaii constantly monitors CO2 levels in the atmosphere. You contact them to obtain datasets that you can use as part of your upcoming research project on changes in atmospheric CO2 over the past decade.

1. The Mauna Loa Observatory has sent you the table below containing information relating to atmospheric CO2 levels over the past 10 years but the file has been corrupted and is missing some data. Fortunately, the observatory has also sent you raw data. Use the raw data provided in Appendix 1 to complete the table below.

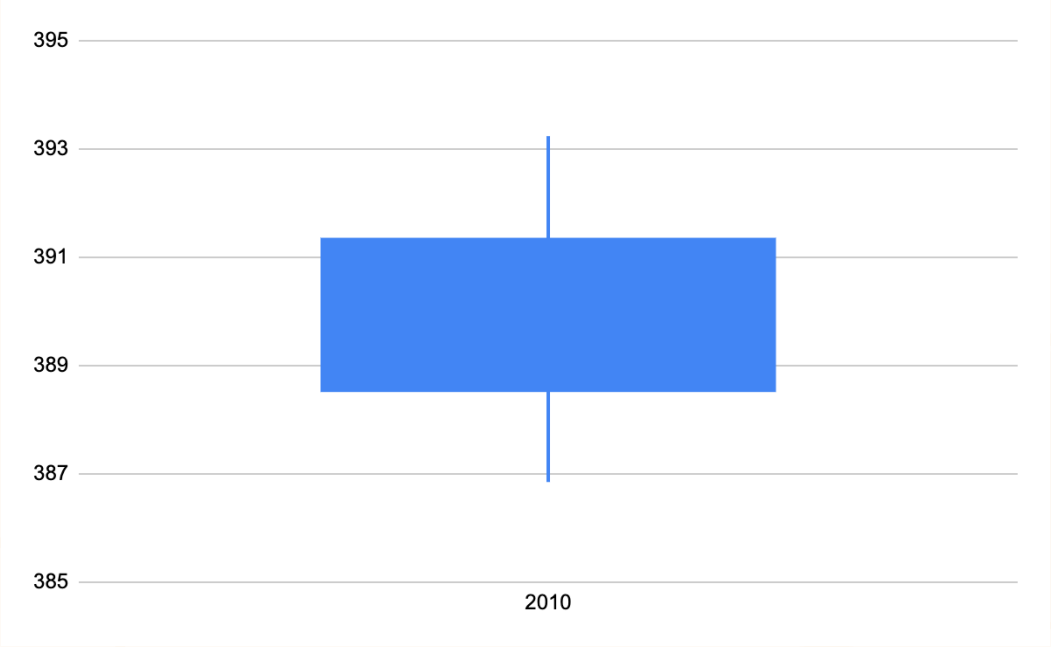
Year	Min	Lower quartile	Median	Upper quartile	Max
2010	**387**	**389**	**390**	**391**	**393**
2011	389	390	392	393	394
2012	**391**	**393**	**394**	**395**	**397**
2013	393	395	397	398	400
2014	395	397	399	400	402
2015	397	400	401	402	404
2016	401	402	404	405	408
2017	403	405	407	408	410
2018	**406**	**408**	**409**	**409**	**411**
2019	408	410	412	412	415
2020	411	413	414	415	417

NB: The unit used for CO2 in the table above is the concentration of atmospheric CO2 in parts per million.

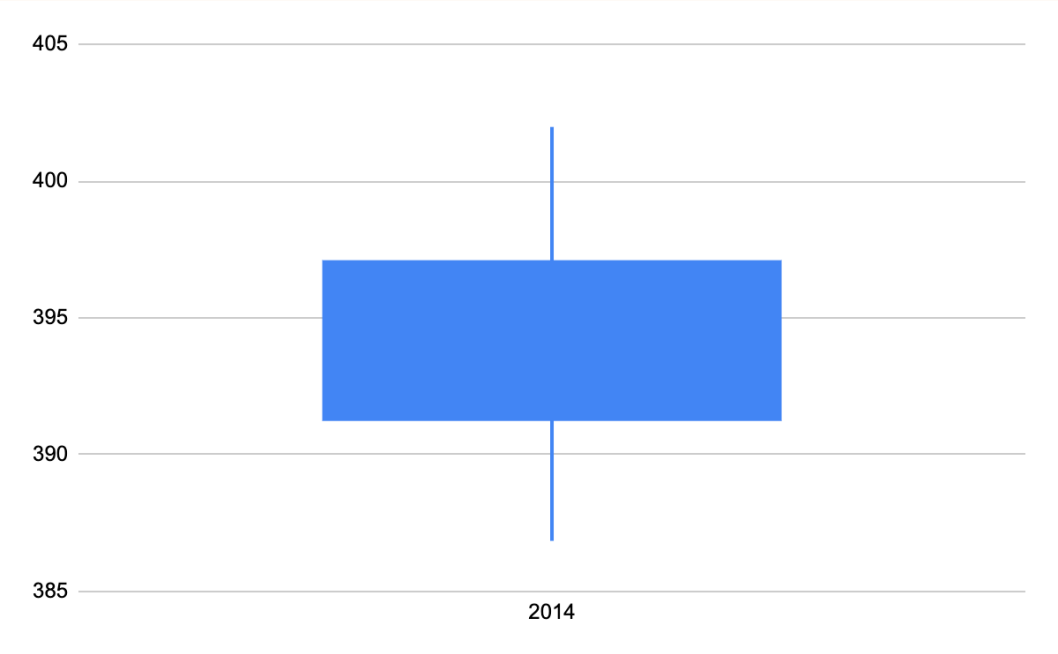
2. Comment on any seasonal patterns that you observe in this data.

Each year, the highest atmospheric CO2 is recorded in the spring months (April to June). It then decreases over summer then builds up slightly again over the winter months (November to January).

3. Draw a box plot summarising the 2010 data that you provided in the table above as part of your answer to question 1.



4. Draw a box plot to display the 2014 data in the table on page 1.



5. Compare the distribution of atmospheric CO2 recorded in 2010 to the distribution of atmospheric CO2 recorded in 2014.

The median atmospheric Co2 was higher in 2014 than 2010. The interquartile and absolute ranges in 2014 were larger than 2010 - the data was more spread out.

6. The graph in Appendix 2 displays the data recorded from 2010 to 2021. Use the graph to infer the minimum, maximum, median, and lower and upper quartiles in 2021.

Min: 413
Lower quartile: 415
Median: 416
Upper quartile: 417
Max: 419

Appendix 1: Raw monthly data

NB: The unit used for CO2 in the below tables is the concentration of atmospheric CO2 in parts per million.

Year	Month	CO2
2010	1	389
2010	2	390
2010	3	391
2010	4	392
2010	5	393
2010	6	392
2010	7	390
2010	8	389
2010	9	387
2010	10	387
2010	11	389
2010	12	390

Year	Month	CO2
2012	1	393
2012	2	393
2012	3	394
2012	4	397
2012	5	397
2012	6	396
2012	7	395
2012	8	393
2012	9	391
2012	10	391
2012	11	393
2012	12	394

Year	Month	CO2
2018	1	408
2018	2	408
2018	3	409
2018	4	410
2018	5	411
2018	6	411
2018	7	409
2018	8	407
2018	9	406
2018	10	406
2018	11	408
2018	12	409

Appendix 2: Graph