

## Welcome back MYP 9 Math!

|  | Assignment<br>Effort Grade<br>(Circle One) | Comments<br>(What was interesting or<br>challenging?) |
|--|--|---|
| <b>Monday</b><br>Date: <u>4-23</u><br>Topic: <u>Friday was Quiz 7.1</u>      | 0 1 2                                      |   |
| <b>Tuesday</b><br>Date: <u>4-24</u><br>Topic: <u>17A Comparing Data Sets</u> | 0 1 2                                      |   |
| <b>Wednesday</b><br>Date: _____<br>Topic: _____                              | 0 1 2                                      |   |
| <b>Thursday</b><br>Date: _____<br>Topic: _____                               | 0 1 2                                      |   |
| <b>Friday</b><br>Date: _____<br>Topic: _____                                 | 0 1 2                                      |   |

## Warm-up:

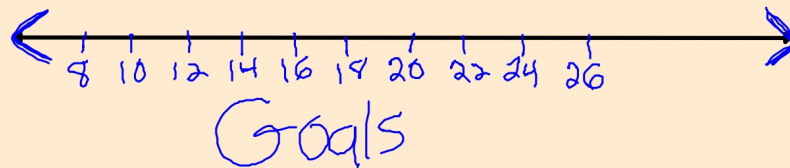
Create two box-and-whisker plots (**parallel box-and whisker plots**) using one number line.

Andrea: Min 8  $Q_1$  11 Median 15  $Q_3$  20 Max 24

Julie: Min 15  $Q_1$  19 Median 21  $Q_3$  23 Max 25



Netball Players



Create parallel box plot to show centers and spread

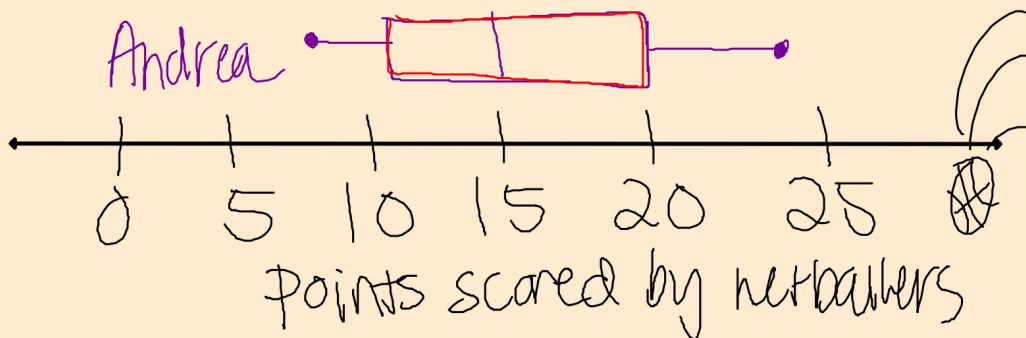
Andrea: Min 8  $Q_1$  11 Median 15  $Q_3$  20 Max 24

Julie: Min 15  $Q_1$  19 Median 21  $Q_3$  23 Max 25

\* Ballers

Julie

Andrea



a single set of data can be useful, but sometimes to fully understand a situation we need two data sets. We can do this by comparing statistics such as measures of **centre** and **spread** graphically.

**Chapter 17**

## Comparing numerical data

**Contents:**

- A** Comparing the measures of centre and spread
- B** Comparing data sets graphically
- C** Parallel box-and-whisker plots

**B****COMPARING DATA SETS GRAPHICALLY**

Combining the two data sets together makes it easier to visually compare the distribution of each data

a back-to-back stem-and-leaf plot.

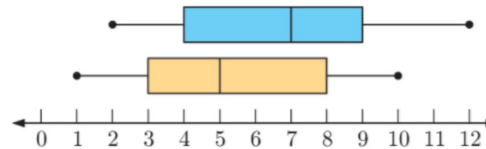
|                     |    |               |
|---------------------|----|---------------|
|                     | 12 | 6             |
| 4                   | 11 | 2 3 7         |
| 7 1                 | 10 | 6 7 8 8       |
| 9 8 7 6 6 5 3 3 2 0 | 9  | 0 3 4 5 5 7 9 |
| 7 5 3 2 1           | 8  | 2 2 4 5 8     |
| 2 0                 | 7  | 0 5 6         |
|                     | 6  | 1             |

*Scale: 6 | 1 means 6.1*

**C****PARALLEL BOX-AND-WHISKER PLOTS**

In **Chapter 10**, we used a **box-and-whisker plot** to display some of the descriptive statistics of a data set.

If we want to compare two data sets, we can draw a box-and-whisker plot for each data set on the same scale. This is known as a **parallel box-and-whisker plot**.



When comparing data sets which are not of equal size, a parallel box-and-whisker plot is often more useful than the graphs we have studied so far.

## Read Restaurant Scenario:

Example 3

Self Test

A restaurant owner operates a Mexican restaurant. He is about to launch a new advertising campaign, and he wants to be able to measure its effect. He records the number of customers in his restaurant for thirty days before he starts advertising, and then for thirty days after he starts advertising. He collects the following data:

|                     |    |    |     |     |     |    |    |     |    |    |     |    |     |    |     |
|---------------------|----|----|-----|-----|-----|----|----|-----|----|----|-----|----|-----|----|-----|
| <b>Before</b>       | 74 | 82 | 63  | 77  | 89  | 91 | 74 | 71  | 57 | 62 | 83  | 79 | 75  | 62 | 59  |
| <b>Advertising:</b> | 84 | 93 | 78  | 68  | 94  | 73 | 77 | 84  | 66 | 72 | 61  | 56 | 76  | 88 | 64  |
| <b>After</b>        | 93 | 98 | 108 | 84  | 89  | 76 | 92 | 69  | 93 | 85 | 101 | 78 | 67  | 99 | 90  |
| <b>Advertising:</b> | 88 | 70 | 93  | 104 | 108 | 95 | 80 | 103 | 79 | 92 | 98  | 84 | 106 | 98 | 101 |

Construct a back-to-back stem-and-leaf plot for this data.

Find the mean of each data set.

Discuss the effect of the advertising.

|                            |    |    |                |     |     |    |    |               |               |               |           |               |               |               |               |
|----------------------------|----|----|----------------|-----|-----|----|----|---------------|---------------|---------------|-----------|---------------|---------------|---------------|---------------|
| <b>Before advertising:</b> | 74 | 82 | <u>63</u>      | 77  | 89  | 91 | 74 | 71            | <del>57</del> | <del>62</del> | 83        | 79            | 75            | <del>62</del> | <del>59</del> |
|                            | 84 | 93 | 78             | 68  | 94  | 73 | 77 | 84            | 66            | 72            | <u>61</u> | <del>56</del> | 76            | 88            | <u>64</u>     |
| <b>After advertising:</b>  | 93 | 98 | <del>108</del> | 84  | 89  | 76 | 92 | <del>60</del> | 93            | 85            | 101       | 78            | <del>87</del> | 99            | 90            |
|                            | 88 | 70 | 93             | 104 | 108 | 95 | 80 | 103           | 79            | 92            | 98        | 84            | 106           | 98            | 101           |

Don't forget key and label!

a) Create back-to-back stem and leaf

Number of customers in a restaurant

| Before  | Stem | After Ads |
|---------|------|-----------|
| 9, 7, 6 | 5    |           |
|         | 6    | 7, 9      |
|         | 7    |           |
|         | 8    |           |
|         | 9    |           |
|         | 10   |           |

key  
4|9|2  
means  
94 customers  
before  
92 after  
ads

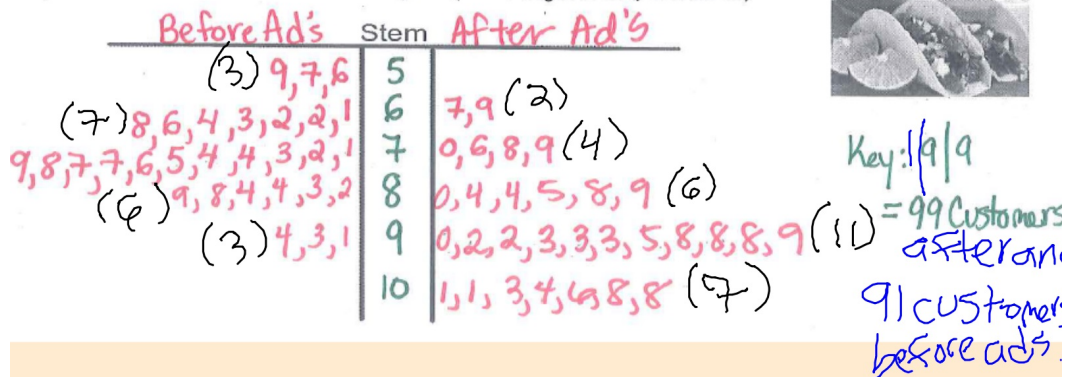




|                            |   |
|----------------------------|---|
| <b>Before advertising:</b> | 74 82 63 77 89 91 74 71 57 62 83 79 75 62 59      |
| <b>After advertising:</b>  | 84 93 78 68 94 73 77 84 66 72 61 56 76 88 64      |
| <b>Before advertising:</b> | 93 98 108 84 89 76 92 69 93 85 101 78 67 99 90    |
| <b>After advertising:</b>  | 88 70 93 104 108 95 80 103 79 92 98 84 106 98 101 |

## a) Create back-to-back stem and leaf Number of customers in a restaurant

a) Construct back-to-back stem and leaf plot. (Don't forget the key and label!!)



|                     |    |    |     |     |     |    |    |     |    |    |     |    |     |    |     |
|---------------------|----|----|-----|-----|-----|----|----|-----|----|----|-----|----|-----|----|-----|
| <b>Before</b>       | 74 | 82 | 63  | 77  | 89  | 91 | 74 | 71  | 57 | 62 | 83  | 79 | 75  | 62 | 59  |
| <b>advertising:</b> | 84 | 93 | 78  | 68  | 94  | 73 | 77 | 84  | 66 | 72 | 61  | 56 | 76  | 88 | 64  |
| <b>After</b>        | 93 | 98 | 108 | 84  | 89  | 76 | 92 | 69  | 93 | 85 | 101 | 78 | 67  | 99 | 90  |
| <b>advertising:</b> | 88 | 70 | 93  | 104 | 108 | 95 | 80 | 103 | 79 | 92 | 98  | 84 | 106 | 98 | 101 |

b) Find the mean of each data set

c) Discuss the effect of advertising



|                            |    |    |     |     |     |    |    |     |    |    |     |    |     |    |     |
|----------------------------|----|----|-----|-----|-----|----|----|-----|----|----|-----|----|-----|----|-----|
| <b>Before advertising:</b> | 74 | 82 | 63  | 77  | 89  | 91 | 74 | 71  | 57 | 62 | 83  | 79 | 75  | 62 | 59  |
| <b>After advertising:</b>  | 84 | 93 | 78  | 68  | 94  | 73 | 77 | 84  | 66 | 72 | 61  | 56 | 76  | 88 | 64  |
| <b>Before advertising:</b> | 93 | 98 | 108 | 84  | 89  | 76 | 92 | 69  | 93 | 85 | 101 | 78 | 67  | 99 | 90  |
| <b>After advertising:</b>  | 88 | 70 | 93  | 104 | 108 | 95 | 80 | 103 | 79 | 92 | 98  | 84 | 106 | 98 | 101 |

- b) Find the mean of each data set  
 c) Discuss the effect of advertising

b) Find the mean of each data set:

Mean before Advertising: 74.4 customers      Mean after Advertising: 90.7 customers

c) Discuss the effects of advertising

The number of customers increases after the new advertising campaigns. Personally, I am influenced by advertisements.

The restaurant gained about 10 cust/day.



| Before advertising  |    | After advertising     |
|---------------------|----|-----------------------|
| 9 7 6               | 5  |                       |
| 8 6 4 3 2 2 1       | 6  | 7 9                   |
| 8 7 7 6 5 4 4 3 2 1 | 7  | 0 6 8 9               |
| 9 8 4 4 3 2         | 8  | 0 4 4 5 8 9           |
| 4 3 1               | 9  | 0 2 2 3 3 3 5 8 8 8 9 |
|                     | 10 | 1 1 3 4 6 8 8         |
|                     |    | 6   7 = 67 customers  |

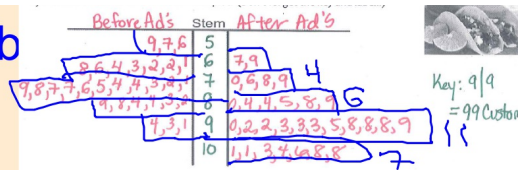


**Before advertising:**  $\text{mean} = \frac{74 + 82 + 63 + \dots + 88 + 64}{30} = 74.4$  customers

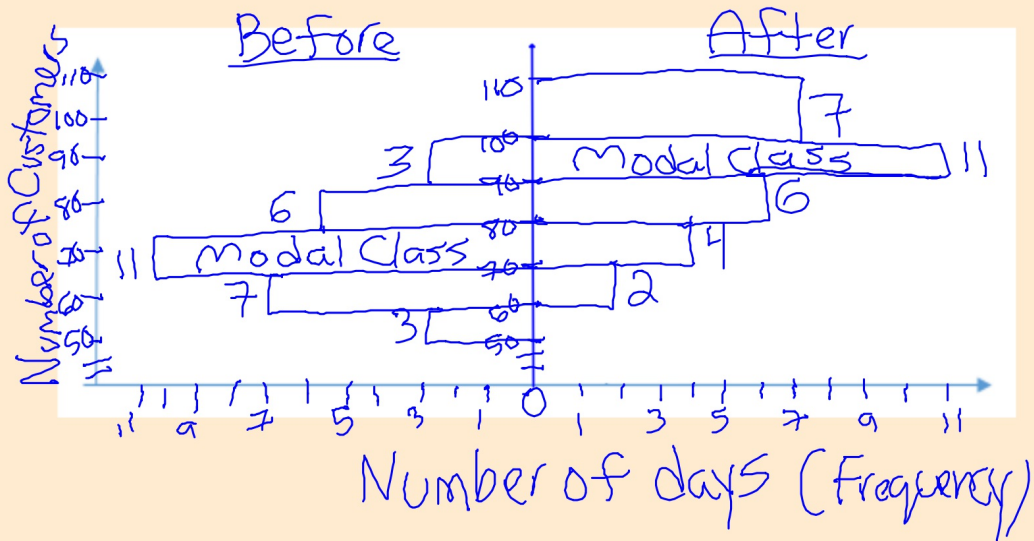
**After advertising:**  $\text{mean} = \frac{93 + 98 + 108 + \dots + 98 + 101}{30} = 90.7$  customers

The number of customers has *increased* by approximately 16 customers per night as a result of the advertising.

d) Construct a Back-to-back

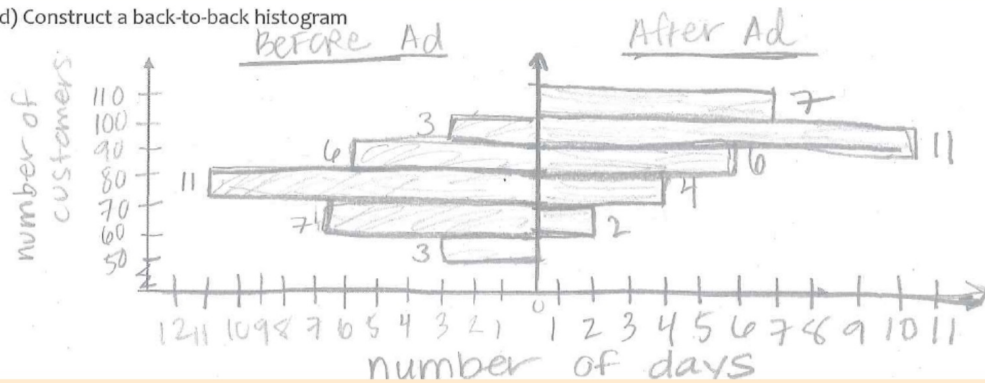


Number of customers in a restaurant



## d) Construct a Back-to-back Histogram

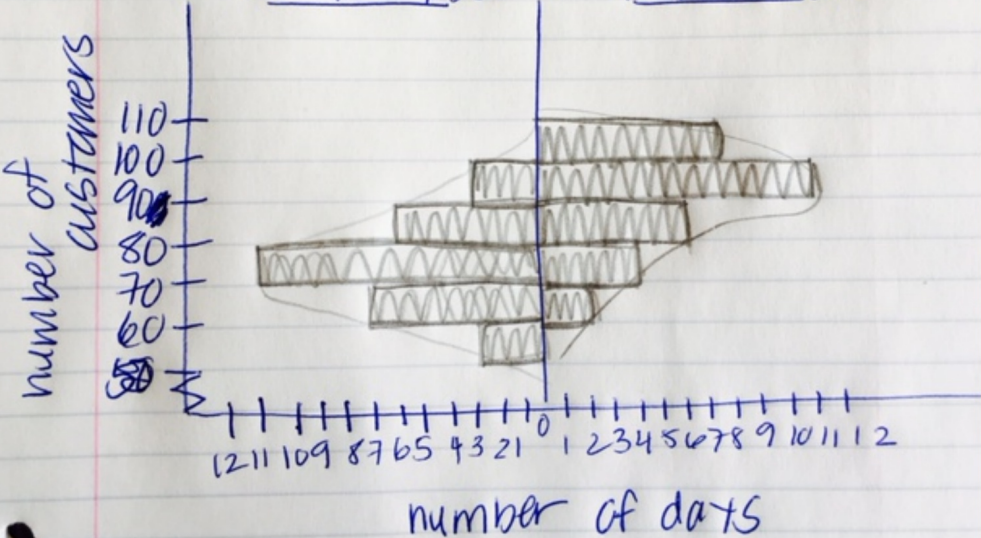
d) Construct a back-to-back histogram



PEOPLE AT RESTAURANT

BEFORE ADS

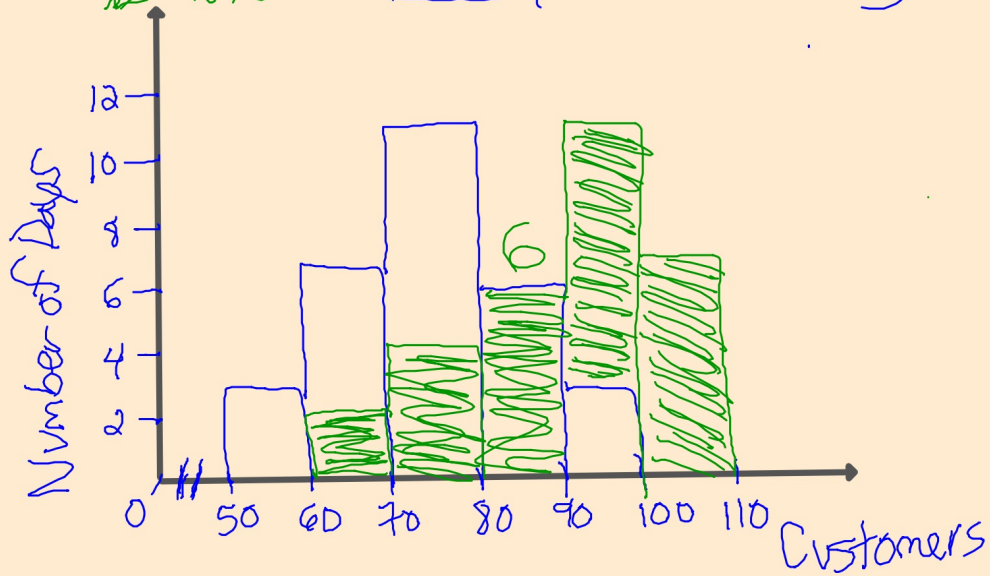
AFTER ADS



d) Construct a Back-to-back Histogram

□ Before  
▨ After

Before | After Advertising

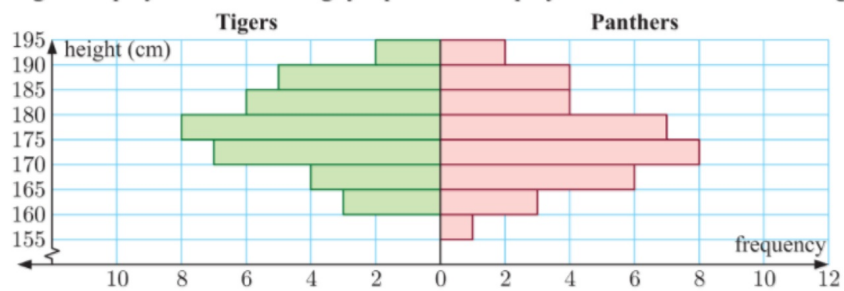




# Exercises...

## EXERCISE 17B

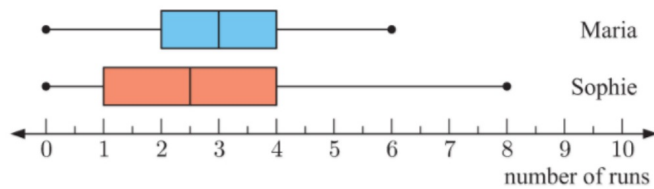
- 7 The heights of players from two rugby squads are displayed on a back-to-back histogram.



- How many players from each squad are at least 180 cm tall?
- Find the modal class for each squad.
- Describe the distribution of each data set.
- Estimate the mean of each data set.
- Which team appears to have the greater average height? Discuss the reliability of your answer.

### EXERCISE 17C

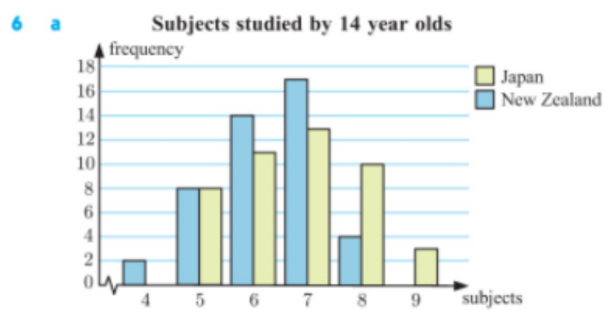
- 3 Maria and Sophie play in the same softball team. They are fierce but friendly rivals when it comes to scoring the most runs. The parallel box-and-whisker plot below shows the numbers of runs scored by each player during a season.



- Find the five-number summary for each player.
- For each player, find the:
  - range
  - interquartile range.
- Compare the performances of the players.



# Solutions 17B



- b** New Zealand: mean  $\approx 6.29$  subjects, median = 6 subjects;  
 Japan: mean  $\approx 6.76$  subjects, median = 7 subjects
- c** New Zealand: 4 subjects; Japan: 4 subjects
- d** "The selected students from *Japan* generally studied more subjects."
- 7 a** Tigers: 13 players; Panthers: 10 players
- b** Tigers:  $175 \leq h < 180$  cm;  
 Panthers:  $170 \leq h < 175$  cm
- c** Tigers: approximately symmetric;  
 Panthers: approximately symmetric
- d** Tigers:  $\approx 177$  cm; Panthers:  $\approx 175$  cm
- e** The Tigers appear to have a slightly greater average height. This conclusion may be unreliable as we can only estimate the means.

# Solutions 17C

## EXERCISE 17C

- 1 a i Set B, as the box-and-whisker plot is further to the right.  
ii Set A, as the box-and-whisker plot covers a greater spread of values.
- b i Set B, as the box-and-whisker plot is further to the right.  
ii Set B, as the box-and-whisker plot covers a greater spread of values.
- 2 a i 50%      ii 75%      b bus B

3 a

|                | Maria | Sophie |
|----------------|-------|--------|
| min.           | 0     | 0      |
| Q <sub>1</sub> | 2     | 1      |
| med.           | 3     | 2.5    |
| Q <sub>3</sub> | 4     | 4      |
| max.           | 6     | 8      |

- b Maria: range = 6 runs, IQR = 2 runs;  
Sophie: range = 8 runs, IQR = 3 runs
- c Maria was more consistent (her scores had less spread) and had a higher median than Sophie. Sophie had a higher maximum but her scores were positively skewed.