Department of Education

The Mathematical Association of Western Australia Inc.

Year 7 Mathematics

Statistics & Probability Tasks

TASK LIST

Department of Education

The Mathematical Association of Western Australia Inc.

Year 7 Mathematics

Statistics & Probability Activity

Readability

Produced by a Department of Education - MAWA partnership project

written for the Year 7 Australian Curriculum

TASK 211: READABILITY

Overview

In this task, students read two pieces of text and calculate their readability scores. (It is assumed that students are already familiar with calculating measures of central tendency and the range). Students then go on to collect data for 10 of their own pieces of text and prepare a bar graph of this information. Students then collate their data with the rest of the class, and create a bar graph of the class data before comparing their results with the class's results.

Students will need

- calculators
- access to the internet

Relevant content descriptions from the Western Australian Curriculum

- Identify and investigate issues involving numerical data collected from primary and secondary sources (ASMSP169)
- Construct and compare a range of data displays including stem-and-leaf plots and dot plots (ACMSP170)
- Calculate mean median, mode, and range for sets of data. Interpret these statistics in the context of data (ACMSP171)

Students can demonstrate

- *fluency* when they
  - calculate mean, median, mode and range accurately
- *understanding* when they
  - determine which text is the most difficult based on its readability score
- *reasoning* when they
  - compare individual data to class data and explain similarities and differences between them

This task is designed to introduce students to the idea that different texts have varying levels of difficulty and that this difficulty can be measured.

Activity 1

1. Read the excerpt from “Bill, the Ventriloquial Rooster” provided below.

2. Read the excerpt from “Moby Dick” provided below.

3. Which of the two paragraphs were harder to read. Why?

   Ask students to write down which of the two paragraphs was harder for them to read and ask them to write a few sentences explaining what made it more difficult.

4. Is “Bill, the Ventriloquial Rooster” more or less difficult to read than your science textbook? Is it more or less difficult than your latest English novel?

   Allow students to discuss which books are harder and which ones are easier. Have the students explain their thinking

5. How could we measure the reading difficulty of different types of text so that we could compare different texts quickly?

   Various suggestions

6. What things could we measure? Which measures would be most useful?

   Ask the class to brainstorm ideas about how you could measure the reading difficulty of a given book.

   Introduce the concept of readability formulas, which analyse texts based on their number of words, sentences, syllables, and/or characters. ICT assistance for Syllables: note different results from http://www.wordcalc.com/ and http://www.poetrysoup.com/poetry_resources/syllable_counter.aspx

   Let students know that although there are many different formulas, we are going to use one called the “Flesch Reading Ease Score”

Excerpt from Bill, the Ventriloquial Rooster by Henry Lawson

"And pretty soon we could see that Bill was in great trouble about it himself. You see, he didn’t know it was himself, thought it was another rooster challenging him, and he wanted badly to find that other bird. He would get up on the wood-heap, and crow and listen, crow and listen again, crow and listen, and then he’d go up to the top of the paddock, and get up on the stack, and crow and listen there. Then down to the other end of the paddock, and get up on a mullock-heap, and crow and listen there. Then across to the other side and up on a log among the saplings, and crow ‘n’ listen some more. He searched all over the place for that other rooster, but, of course, couldn’t find him. Sometimes he’d be out all day crowing and listening all over the country, and then come home dead tired, and rest and cool off in a hole that the hens had scratched for him in a damp place under the water-cask sledge."

www.telelib.com/authors/L/LawsonHenry/prose/onthetrack/billventriloquial.html

Excerpt from Moby Dick by Herman Melville

Call me Ishmael. Some years ago—never mind how long precisely—having little or no money in my purse, and nothing particular to interest me on shore, I thought I would sail about a little and see the watery part of the world. It is a way I have of driving off the spleen and regulating the circulation. Whenever I find myself growing grim about the mouth; whenever it is a damp, drizzly November in my soul; whenever I find myself involuntarily pausing before coffin warehouses, and bringing up the rear of every funeral I meet; and especially whenever my hypos get such an upper hand of me, that it requires a strong moral principle to prevent me from deliberately stepping into the street, and methodically knocking people's hats off—then, I account it high time to get to sea as soon as I can. This is my substitute for pistol and ball. With a philosophical flourish Cato throws himself upon his sword; I quietly take to the ship.

www.gutenberg.org/files/2701/2701-h/2701-h.htm#link2HCH0001

Activity 2

We are going to calculate the Flesch Reading Ease Score for "Bill, the Ventriloquial Rooster".
First, answer the following questions.

1. How many words are in the excerpt from "Bill, the Ventriloquial Rooster"?
   177 (note: Counts the hyphenated words as 2 words, as per Word. Discussion point.)

2. How many sentences are there?
   7

3. Work out the **ASL** (average sentence length) by using the formula $\frac{\text{Number of Words}}{\text{Number of Sentences}}$
   177 ÷ 7 = 25.286

4. How many syllables are there? ICT: depends on counter used - range198 to 221!
   Manual count from local pronunciation : 210
   How many words are there? 177

5. Work out the **ASW** (average syllables per word) by using the formula $\frac{\text{Number of Syllables}}{\text{Number of Words}}$
   210 ÷ 177 = 1.186

6. The Flesch Reading Ease Formula is: 206.835 – (1.015 x **ASL**) – (84.6 x **ASW**)
   Use substitution to calculate the reading ease of "Bill, the Ventriloquial Rooster".
   206.835 – (1.015 x 25.286) – (84.6 x 1.186) = 80.834

7. Compare your answer to the table provided below. How difficult is "Bill, the Ventriloquial Rooster"?
   Easy

Flesch Score	Difficulty Rating
90-100	Very Easy
80-89	Easy

70-79	Fairly Easy
60-69	Standard
50-59	Fairly Difficult
30-49	Difficult
0-29	Very Confusing

8. Using the process above, calculate the Flesch Reading Ease Formula for Moby Dick.
   ASL = 169 ÷ 6 = 28.167
   ASW = 263 ÷ 169 = 1.556
   FSR = 206.835 – (1.015 x 28.167) – (84.6 x 1.556) = 46.6 → Difficult

9. Which piece of writing is more difficult? How does this agree with your answer from the previous activity?
   Moby Dick is more difficult to read. Various comparisons with previous estimates.

Activity 3

You are going to investigate the reading ease of 10 different texts of your choosing. You can use school textbooks, books from home, newspapers, magazines or anything else you can think of. Answers will vary for questions in this activity.

1. Collect 10 samples of text from 10 different sources. You will need to make sure that you have at least 150 words in each sample.

2. Complete the table below.

Name of Text	Number of Words	Number of Sentences	Average Sentence Length (ASL)	Number of Syllables	Average Syllables per Word (ASW)
Answers will vary					

Using the information you collected from Question 2, determine the Flesch Reading Ease Score for each text.

Name of Text	Calculations	Flesch Reading Ease Score
Answers will vary		

4. Which book had the lowest score? What was that score

5. Which book had the highest score? What was the score?

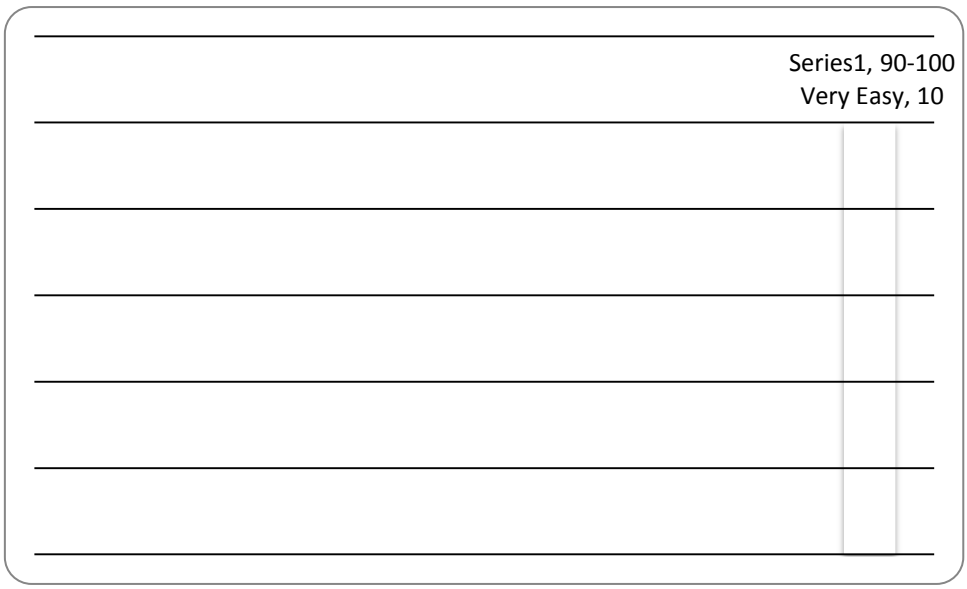
6. What was the range of scores?

7. What was the median Flesch Reading Ease score?

8. Was there one score that was more common than the others? If so, what was the score? Which books had this score?

9. What was the mean score for your set of books?

10. Create a graph of your data below.



Activity 4 – Teacher-led Activity

1. You are to log on to the computer and create a new spreadsheet.

2. You should set up table that looks like the one below.

Text Name	Flesch Reading Ease Score

3. Each student reads out the name of each of their texts and its Flesch Reading Ease score (The data could be collected using an online collaboration tool, such as Google Drive)

4. Make sure you save your work!

Answers as appropriate for Activity 4 & Activity 5

Activity 5

Using the class data, answer the following questions. (You could use Excel to help you!)

1. Which book had the lowest score? What was this score?

2. Which book had the highest score? What was this score?

3. What was the range of scores?

4. How does the range compare to your answer to Question 5 in Activity 3? Why do you think this is?

5. What was the median score of all the books?

6. How does the range compare to your answer to Question 6 in Activity 3? Why do you think this is?

7. What was the mean score for the class's set of books?

8. How does the range compare to your answer to Question 8 in Activity 3? Why do you think this is?

9. Create a frequency table, showing how many books are in each category (Very Easy, Easy, Fairly Easy, Standard, Difficult, Very Confusing)

10. Which category do most books fall into?

11. Create a bar graph of your summarised data.

12. Compare the graph you created in Question 8 to the bar graph you created in Activity 3.

    a. What is the same about your graphs?

    b. What is different about the two bar graphs?

    c. What can you conclude about the difficulty of the texts that you chose, compared to the difficulty of the texts chosen by the rest of the class

Activity 1

1. Read the excerpt from “Bill, the Ventriloquial Rooster” provided below.

2. Read the excerpt from “Moby Dick” below.

3. Which of the two paragraphs were harder to read. Why?

4. Is “Bill, the Ventriloquial Rooster” more or less difficult to read than your science textbook? Is it more or less difficult than your latest English novel?

5. How could we measure the reading difficulty of different types of text so that we could compare different texts quickly?

6. What things could we measure? Which measures would be most useful?

Excerpt from Bill, the Ventriloquial Rooster by Henry Lawson

" And pretty soon we could see that Bill was in great trouble about it himself. You see, he didn’t know it was himself, thought it was another rooster challenging him, and he wanted badly to find that other bird. He would get up on the wood-heap, and crow and listen, crow and listen again, crow and listen, and then he’d go up to the top of the paddock, and get up on the stack, and crow and listen there. Then down to the other end of the paddock, and get up on a mullock-heap, and crow and listen there. Then across to the other side and up on a log among the saplings, and crow ‘n’ listen some more. He searched all over the place for that other rooster, but, of course, couldn’t find him. Sometimes he’d be out all day crowing and listening all over the country, and then come home dead tired, and rest and cool off in a hole that the hens had scratched for him in a damp place under the water-cask sledge."

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Excerpt from Moby Dick by Herman Melville

Call me Ishmael. Some years ago—never mind how long precisely—having little or no money in my purse, and nothing particular to interest me on shore, I thought I would sail about a little and see the watery part of the world. It is a way I have of driving off the spleen and regulating the circulation. Whenever I find myself growing grim about the mouth; whenever it is a damp, drizzly November in my soul; whenever I find myself involuntarily pausing before coffin warehouses, and bringing up the rear of every funeral I meet; and especially whenever my hypos get such an upper hand of me, that it requires a strong moral principle to prevent me from deliberately stepping into the street, and methodically knocking people's hats off—then, I account it high time to get to sea as soon as I can. This is my substitute for pistol and ball. With a philosophical flourish Cato throws himself upon his sword; I quietly take to the ship.

www.gutenberg.org/files/2701/2701-h/2701-h.htm#link2HCH0001

Activity 2

We are going to calculate the Flesch Reading Ease Score for "Bill, the Ventriloquial Rooster".
First, answer the following questions.

1. How many words are in the excerpt from "Bill, the Ventriloquial Rooster"

2. How many sentences are there?

3. Work out the **ASL** (average sentence length) by using the formula _____

4. How many syllables are there?

5. How many words are there?

6. Work out the **ASW** (average syllables per word) by using the formula _____

7. The Flesch Reading Ease Formula is: 206.835 – (1.015 x **ASL**) – (84.6 x **ASW**)
   Use substitution to calculate the reading ease of "Bill, the Ventriloquial Rooster".

8. Compare your answer to the table provided below. How difficult is"Bill, the Ventriloquial Rooster"?

Flesch Score	Difficulty Rating
90-100	Very Easy
80-89	Easy
70-79	Fairly Easy
60-69	Standard
50-59	Fairly Difficult
30-49	Difficult
0-29	Very Confusing

9. Using the process above, calculate the Flesch Reading Ease Formula for Moby Dick.

10. Which piece of writing is more difficult? How does this agree with your answer from the previous activity?

Activity 3

You are going to investigate the reading ease of 10 different texts of your choosing. You can use school textbooks, books from home, newspapers, magazines or anything else you can think of.

1. Collect 10 samples of text from 10 different sources. You will need to make sure that you have at least 150 words in each sample.

2. Complete the table below.

Name of Text	Number of Words	Number of Sentences	Average Sentence Length (ASL)	Number of Syllables	Average Syllables per Word (ASW)

3. Using the information you collected from Question2, determine the Flesch Reading Ease Score for each text.

Name of Text	Calculations	Flesch Reading Ease Score

4. Which book had the lowest score? What was that score

5. Which book had the highest score? What was the score?

6. What was the range of scores?

7. What was the median Flesch Reading Ease score?

8. Was there one score that was more common than the others? If so, what was the score? Which books had this score?

9. What was the mean score for your set of books?

10. Create a graph of your data below

Activity 4 – Teacher-led Activity

1. Log on to the computers and create a new spreadsheet.

2. You should set up table that looks like the one below.

Text Name	Flesch Reading Ease Score

3. Each student reads out the name of each of their texts and its Flesch Reading Ease score. (The data could be collected using an online collaboration tool, such as Google Drive.) Enter the information into the table.

4. Make sure you save your work!

Activity 5

Using the class data, answer the following questions. (You could use Excel to help you!)

1. Which book had the lowest score? What was this score?

2. Which book had the highest score? What was this score?

3. What was the range of scores?

4. How does the range compare to your answer to question 5 in Activity 3? Why do you think this is?

5. What was the median score of all the books?

6. How does the range compare to your answer to question 6 in Activity 3? Why do you think this is?

7. What was the mean score for the class' set of books?

8. How does the range compare to your answer to question 8 in Activity 3? Why do you think this is?

9. Create a frequency table, showing how many books are in each category (Very Easy, Easy, Fairly Easy, Standard, Difficult, Very Confusing)

10. Which category do most books fall into?

11. Create a bar graph of your summarised data.

12. Compare the graph you created in Question 8 to the bar graph you created in Activity 3

    a. What is the same about your graphs?

    b. What is different about the two bar graphs?

    c. What can you conclude about the difficulty of the texts that you chose, compared to the difficulty of the texts chosen by the rest of the class?

Department of Education

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Year 7 Mathematics

Statistics & Probability Activity

Viral Videos

Produced by a Department of Education - MAWA partnership project

written for the Year 7 Australian curriculum

TASK 216: VIRAL VIDEOS

Overview

This task is designed to introduce students to the concept of mean, median, mode and range. Students are given the opportunity to practise calculating these statistical measures in Activity 2, while Activity 3 encourages students to apply what they have learnt by collecting their own data.

Students will need

- connector blocks
- calculator
- access to the internet (Activity 3 only)

Relevant content descriptions from the Western Australian Curriculum

- Identify and investigate issues involving numerical data collected from primary and secondary sources (ACMSP169)
- Calculate mean, median, mode and range for sets of data. Interpret these statistics in the context of data (ACMSP171)

Students can demonstrate

- *fluency* when they
  - calculate accurately with integers
  - find measures of central tendency
- *understanding* when they
  - explain the definition of mean, median, mode and range in their own words.
- *problem solving* when they
  - interpret the data they collect

Activity 1 – Teacher-led activity.

A group of friends shared a packet of lollies:

Anne had 8 lollies
Beatrice had 7 lollies
Catherine had 6 lollies
Daniel and Eric had 2 lollies each

Use the connector blocks to represent this situation.
Encourage students to make towers of connector blocks to show how many lollies each person received.

1. What was the biggest number of lollies anyone had? What was the smallest?
   Biggest – 8, Smallest – 2

2. What is difference between the biggest and smallest amounts?
   6

3. The difference between the biggest and smallest number in a set of data is called the "range". Write a short explanation of the range on the sheet provided. Include an example or illustration.

4. Were there any people who had the same number of lollies? Who were they? How many lollies did they each get?
   Yes, Daniel and Eric had 2 lollies each

   This idea; i.e., the most common score, is called the "mode"

5. Write a short explanation of the mode on the sheet provided and include an illustration.
   Appropriate answers.

6. Arrange the scores in order from smallest to largest. Which score is in the middle?
   2, 2, 6, 7, 8. The 6 is in the middle.

   This middle score is the "median" like a median strip on the road. Write a short explanation of the median on the sheet provided and include an example or illustration.

7. How many lollies were there in total? How many lollies should each person have received if the lollies had been shared equally?
   25. They should have received 5 lollies each.

8. How did you work this out?
   Split all the blocks into 5 equal parts. Add all the scores, then divide by how many people there are.

   This is called the “mean”. On the sheet provided, write a short explanation of the mean and include an example.

9. To help you remember the these terms, here’s a little poem:

   Hey diddle diddle
   The median’s in the middle
   Add and divide for the mean
   Mode is one that occurs the most
   And range is the difference between

   Write this poem down in the centre of the sheet provided

RANGE

MODE

MEDIAN

MEAN

Activity 2

For each of the sets of data below,

a. Arrange the data in order from smallest to largest
b. Find the range
c. Find the mode (if there is one)
d. Find the median
e. Find the mean

1. {1, 0, 1, 5, 6}
Sorted: 0, 1, 1, 5, 6
Range: 6
Mode: 1
Median: 1
Mean: 2.6

2. {5, 4, 3, 6, 1, 5, 2}
Sorted: 1, 2, 3, 4, 5, 5, 6
Range: 5
Mode: 5
Median: 4
Mean: 3.7

3. {2, 5, 1, 2, 3, 1, 6, 5, 1}
Sorted: 1, 1, 1, 2, 2, 3, 5, 5, 6
Range: 5
Mode: 1
Median: 2
Mean: 2.9

4. {2, 5, 1, 2, 3, 1, 6, 2, 1}
Sorted: 1, 1, 1, 2, 2, 2, 3, 5, 6
Range: 5
Mode: 1 and 2
Median: 2
Mean: 2.6

5. (2, 7, 3, 3, 7, 8, 6, 7, 2, 1, 9}
Sorted: 1, 2, 2, 3, 3, 6, 7, 7, 7, 8, 9,
Range: 8
Mode: 7
Median: 6
Mean: 5

6. {66, 38, 11, 61, 4, 22, 57, 40, 2, 3}
Sorted: 2, 3, 4, 11, 22, 38, 40, 57, 61, 66
Range: 64
Mode: (none)
Median: 30
Mean: 30.4

7. DISCUSSION QUESTIONS:

   a. What did you notice about the mode in Question 4?
      It had two modes.

   b. Can you guess the term for data that has two modes?
      Bi-modal

   c. If a set of data has lots of modes, it stops becoming a useful measure. How many modes do we record for a set of data before we decide that there are too many?
      If a set of data has 3 or more modes, we say that it has no mode.

   d. What was the median for the data in Question 6? How did you come up with this answer?
      The middle number is 30, as there are two numbers in the middle (22 & 38) and 30 is the mean of those two numbers.

Activity 3

1. Go to the following link https://www.youtube.com/ and type in a search for "Music".

2. Using the filter select "video" and sort by "view count", list the top 10 songs and the number of views for each count in the table below.

Song	Number of Views
Justin Bieber - Baby ft Ludacris	1 203 027 015
Katy Perry -Roar	1 033 011 656
Taylor Swift - Shake it Off	999 577 755
Meghan Trainor - All About That Bass	988 243 723
Mark Ronson - Uptown Funk ft Bruno Mars	944 287 890
LMFAO - Party Rock Anthem ft Lauren Bennett	924 848 490
Eminim - Love the Way You Lie ft Rihanna	912 512 246
OneRepublic - Counting Stars	904 485 383
Jennifer Lopez - On the Floor ft Pitbull.	853 196 242
Miley Cyrus - Wrecking Ball	791 541 783

3. What is the range of views?
   411 485 232

4. Is there a mode for this data? If so, what is it?
   None

5. What is the median number of views for the top 10 songs?
   934 568 194

6. What is the average number of views for each song?
   955 473 219

7. EXTENSION QUESTION: By clicking on each video, you can find the video's upload date. Use this to calculate the mean number of views per day.

Song	Average Number of Views
Justin Bieber - Baby ft Ludacris	598 223
Katy Perry -Roar	1 440 741
Taylor Swift - Shake it Off	2 701 561
Meghan Trainor - All About That Bass	2,256 264
Mark Ronson - Uptown Funk ft Bruno Mars	3 408 982
LMFAO - Party Rock Anthem ft Lauren Bennett	567 740
Eminim - Love the Way You Lie ft Rihanna	494 855
OneRepublic - Counting Stars	1 111 161
Jennifer Lopez - On the Floor ft Pitbull.	522 152
Miley Cyrus - Wrecking Ball	1 110 157

a. Using the mean views per day, list the songs in order from highest to lowest.
Uptown Funk,
Shake it Off,
All About That Bass,
Roar,
Counting Stars,
Wrecing Ball, Baby ft Ludacris,
Party Rock Anthem ft Lauren Bennett,
On the Floor ft Pitbull,
Love the Way You Lie ft Rihanna

b. Is the order the same as before? Why do you think this is?
No. The order is not the same. Videos that are more recent are more likely to have more views today than older videos, but less views overall than the older videos.

Activity 1 – Teacher-led activity.

A group of friends shared a packet of lollies:

Anne had 8 lollies
Beatrice had 7 lollies
Catherine had 6 lollies
Daniel and Eric had 2 lollies each

Use the connector blocks to represent this situation.

1. What was the biggest number of lollies anyone had? What was the smallest?

2. What is difference between the biggest and smallest amounts?

3. The difference between the biggest and smallest number in a set of data is called the "range". Write a short explanation of the range on the sheet provided. Include an example or illustration.

4. Were there any people who had the same number of lollies? Who were they? How many lollies did they each get?

   This idea; i.e., the most common score, is called the "mode"

5. Write a short explanation of the mode on the sheet provided and include an illustration.

6. Arrange the scores in order from smallest to largest. Which score is in the middle?

   This middle score is the "median" like a median strip on the road. Write a short explanation of the median on the sheet provided and include an example or illustration.

7. How many lollies were there in total? How many lollies should each person have received if the lollies had been shared equally?

8. How did you work this out?

This is called the “mean”. On the sheet provided, write a short explanation of the mean and include an example.

9. To help you remember the these terms, here’s a little poem:

Hey diddle diddle
The median’s in the middle
Add and divide for the mean
Mode is one that occurs the most
And range is the difference between

Write this poem down in the centre of the sheet provided

RANGE

MODE

MEDIAN

MEAN

Activity 2

For each of the sets of data below,

f. Arrange the data in order from smallest to largest
g. Find the range
h. Find the mode (if there is one)
i. Find the median
j. Find the mean

1. {1, 0, 1, 5, 6}

2. {5, 4, 3, 6, 1, 5, 2}

3. {2, 5, 1, 2, 3, 1, 6, 5, 1}

4. {2, 5, 1, 2, 3, 1, 6, 2, 1}

5. {2, 7, 3, 3, 7, 8, 6, 7, 2, 1, 9}

6. {66, 38, 11, 61, 4, 22, 57, 40, 2, 3}

7. DISCUSSION QUESTIONS:

a. What did you notice about the mode in Question 4?

b. Can you guess the term for data that has two modes?

c. If a set of data has lots of modes, it stops becoming a useful measure. How many modes do we record for a set of data before we decide that there are too many?

d. What was the median for the data in Question 6? How did you come up with this answer?

Activity 3

1. Go to the following link https://www.youtube.com/ and type in a search for “Music”.

2. Using the filter select “video” and sort by “view count”, list the top 10 songs and the number of views for each count in the table below.

Song	Number of Views

3. What is the range of views?

4. Is there a mode for this data? If so, what is it?

5. What is the median number of views for the top 10 songs?

6. What is the average number of views for each song?

7. EXTENSION QUESTION: By clicking on each video, you can find the video's upload date. Use this to calculate the mean number of views per day.

   a. Using the mean views per day, list the songs in order from highest to lowest.

   b. Is the order the same as before? Why do you think this is?

Department of Education

The Mathematical Association of Western Australia Inc.

Year 7 Mathematics

Statistics & Probability Activity

Mean, Median, Mode and Range

Produced by a Department of Education - MAWA partnership project

written for the Year 7 Australian curriculum

TASK 222: MEAN, MEDIAN, MODE AND RANGE

Overview

This task is designed to introduce the concept of mean, median, mode and range. The first activity gives students an opportunity to represent data with manipulatives. The second gives students the opportunity to collect data and find measures of central tendency (preferably as a class activity), and finally students calculate the mean, median, mode and range by themselves and are exposed to some problem-solving questions.

Students will need

- calculators
- coloured centicubes or connector blocks

Relevant content descriptions from the Western Australian Curriculum

- Calculate mean, median, mode and range for sets of data. Interpret these statistics in the context of data (ACMSP171)

Students can demonstrate

- fluency when they
  - calculate measures of central tendency
- understanding when they
  - can define the range and each measure of central tendency (mean, median and mode)
- reasoning when they
  - predict the effect of a new score on the measures of central tendency for a set of data
- problem solving when they
  - find a missing score, given the mean
  - find a set of data, given the measures of central tendency.

Activity 1 (Teacher led activity)

Hand students the student answer sheet and give students the following scenario:

"Ellen, John, Riley, Max and Rita all shared a packet of jellybeans. The children agreed that, instead of sharing the packet evenly, they would each get their favourite colour.

Ellen got 7 green jelly beans, John had 5 red jellybean, Max and Rita had to share the black jelly beans and got three each, while Riley got all four yellow jelly beans"

Ask students to use their different coloured connector blocks to model how many jellybeans each student received. Students should create a tower to represent the number of jellybeans each student received.

Ask students;

- "Who got the most jellybeans?"
- "Who got the fewest jellybeans?"
- "Find the difference between the most and least number of jellybeans"
- "What was the most common number of jellybeans that people received?"

Have students arrange their block towers in order from the smallest to the biggest.

Ask students

- "When the blocks are arranged like this, who is in the middle? How many jellybeans did they get?"
- "If each student had received the same number of jellybeans, how many would they have received?"
- "How did you work this out?"

*** You may want to repeat this activity with a slightly different scenario before moving on, so students can practice finding these answers whilst manipulating the connector block***

Give students the following meanings (see below) and ask them to copy them in their tables.

After each definition, discuss with students how that measure was calculated for the situation above. Have students write an example for each measure (they can use the numbers from the scenario above, if they like).

Range: the difference between the highest score and the lowest score

Mode: the most common score in a set of data.

Median: the middle number, when a set of data is arranged in order

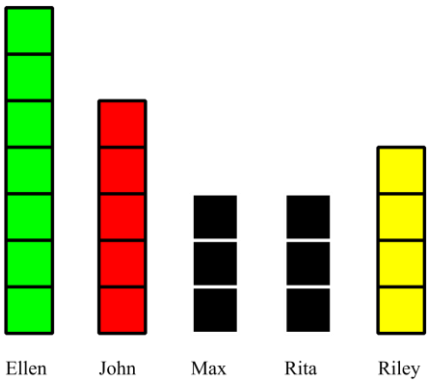
Mean: the "average" amount, or how much each group should have received if the scores had been shared equally.

Activity 1 – Student Sheet

Ellen, John, Riley, Max and Rita all shared a packet of jellybeans. The children agreed that, instead of sharing the packet evenly, they would each get their favourite colour.

Ellen got 7 green jelly beans, John had 5 red jellybean, Max and Rita had to share the black jelly beans and got three each, while Riley got all four yellow jelly beans

1. Use your connector blocks to represent this situation. You should create a tower to show the number of jellybeans each person received



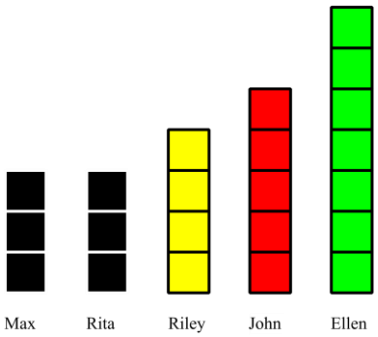
2. Who had the most jellybeans? How many did they get?
   Ellen got 7 jelly beans

3. Who received the least number of jellybeans? How many did they get?
   Max and Rita only received 3 each.

4. Find the difference between the two amounts you found in question 2 and 3.
   4 jellybeans.

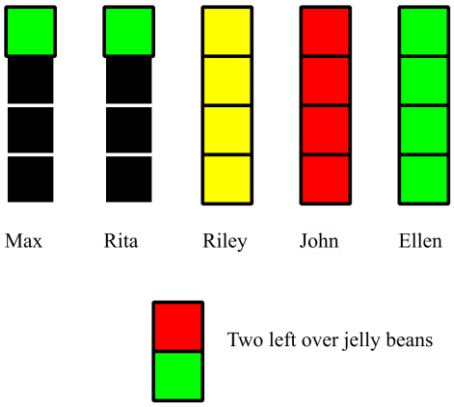
5. What was the most common number of jellybeans that people received?
   3 jellybeans. Two people, Max and Rita, received 3 jellybeans each.

6. Arrange your blocks in order from the smallest tower to the largest



7. Who is in the middle of this arrangement? How many jellybeans did they receive?
   Riley. He received 4 jelly beans.

8. If they students had shared the jellybeans evenly, how many jellybeans would they have each received?
4 each and 2 left over (or 4 and 2/5)



Word	Definition	Example
Range	The difference between the highest score and the lowest score	Answers will vary
Mode	The most common score in a set of data	Answers will vary
Median	The middle score, when a set of data is arranged in order	Answers will vary
Mean	When all items are shared equally. You find the mean by adding all the scores and dividing by how many scores there are.	Answers will vary

Activity 2 – Class Activity

How many people did you send text messages to yesterday?

Answers will vary for all these items

1. How many people did you send text messages to yesterday? Write your answer below.

2. Do you think this is more or less than everyone else in the class?

3. Find out how many people each of your classmates sent text messages to yesterday. Record your results in the table below.

Name	Number of People messaged	Name	Number of People messaged
Answers will vary			

4. Arrange the each of the scores above in order from smallest to largest.

5. What is the range for this data?

6. Is there a mode for this data? If so what is it?

7. What is the median number of people messaged yesterday?

8. What is the mean number of people messaged yesterday?

9. How does the number of people you messaged yesterday compare to the rest of the class? (Hint: compare your score to the mode, median and mean)

10. Based on your answers above did you message more or less people than the average?

Activity 3

1. Calculate the mean, median, mode and range for each of the following sets of data.

   a. 5, 10, 19, 20, 20, 16, 17
   mean: 15.3
   median: 17
   mode: 20
   range: 15

   b. 50, 30, 35, 40, 35, 35, 16
   mean: 34.4
   median: 35
   mode: 35
   range: 24

   c. 1, 1, 1, 1, 2, 3, 4,
   mean: 1.9
   median: 1
   mode: 1
   range: 3

   d. 1, 0, 9, 2, 3, 4, 5,
   mean: 3.4
   median: 3
   mode: n/a
   range: 9

2. Find the mean, median, mode and range for the following set of data: 70, 50, 30, 50, 40, 60.
   mean: 50
   median: 50
   mode: 50
   range: 40

3. One score was accidentally left out of the data given in question 2. That score was 30.

   a. Will this number affect the range? Why/why not?
   No. It would only affect the range if it was lower or higher than all the other scores in the set. It isn't.

   b. Will this number affect the mode of the data? Why/why not?
   Yes. Now there will be two modes.

   c. Is this number higher or lower than original mean?

      i. Without calculating the answer, do you think including this number will make the mean increase, decrease or stay the same?
      It is lower than the original mean so the mean will decrease.

      ii. Calculate the new mean and check your prediction.
      Mean: 47.1, which is lower than it was before.

d. Is this number higher or lower than original median?

i. Without calculating the answer, do you think including this number will make the median increase, decrease or stay the same?
This number is lower than the original median.
Answers will vary.

ii. Calculate the new median and check your prediction.
Median: 50, which is the same as before.

4. Tessa has sat 5 maths tests so far this year, and her average(mean) mark is 60%.

Tessa can remember the score she got on the first four tests (55%, 70%, 73%, 45%) but she can't remember what she got for the fifth test.

Work out what mark Tessa got on her 5th test?

$(55 + 70 + 73 + 45 + x) \div 5 = 60$

$55 + 70 + 73 + 45 + x = 300$

$x = 57$

5. I am thinking of five numbers. The mode is 6, the median 7 and the mean is 8 – can you work out which 5 numbers I am thinking of?
Multiple answers are possible. One possible set is 6, 6, 7, 10, 11

Activity 1

Ellen, John, Riley, Max and Rita all shared a packet of jellybeans. The children agreed that, instead of sharing the packet evenly, they would each get their favourite colour.

Ellen got 7 green jellybeans, John had 5 red jellybeans, Max and Rita had to share the black jellybeans and got three each, while Riley got all four yellow jellybeans.

1. Use your connector blocks to represent this situation. You should create a tower to show the number of jellybeans each person received.

2. Who had the most jellybeans? How many did they get?

3. Who received the least number of jellybeans? How many did they get?

4. Find the difference between the two amounts you found in question 2 and 3.

5. What was the most common number of jellybeans that people received?

6. Arrange your blocks in order from the smallest tower to the largest

7. Who is in the middle of this arrangement? How many jellybeans did they receive?

8. If they students had shared the jellybeans evenly, how many jellybeans would they have each received?

Word	Definition	Example
Range		
Mode		
Median		
Mean		

Activity 2 – Class Activity

How many people did you send text messages to yesterday?

1. How many people did you send text messages to yesterday? Write your answer below.

2. Do you think this is more or less than everyone else in the class?

3. Find out how many people each of your classmates sent text messages to yesterday. Record your results in the table below.

Name	Number of People messaged	Name	Number of People messaged

4. Arrange the each of the scores above in order from smallest to largest.

5. What is the range for this data?

6. Is there a mode for this data? If so what is it?

7. What is the median number of people messaged yesterday?

8. What is the mean number of people messaged yesterday?

9. How does the number of people you messaged yesterday compare to the rest of the class? (Hint: compare your score to the mode, median and mean)

10. Based on your answers above did you message more or less people than the average?

Activity 3

6. Calculate the mean, median, mode and range for each of the following sets of data

a. 5, 10, 19, 20, 20, 16, 17

b. 50, 30, 35, 40, 35, 35, 16

c. 1, 1, 1, 1, 2, 3, 4,

d. 1, 0, 9, 2, 3, 4, 5,

7. Find the mean, median, mode and range for the following set of data; 70, 50, 30, 50, 40, 60,

8. One score was accidentally left out of the data given in question 2. That score was 30.

a. Will this number affect the range? Why/why not?

b. Will this number affect the mode of the data? Why/why not?

c. Is this number higher or lower than original mean?

i. Without calculating the answer, do you think including this number will make the mean increase, decrease or stay the same?

ii. Calculate the new mean and check your prediction.

d. Is this number higher or lower than original median?

i. Without calculating the answer, do you think including this number will make the median increase, decrease or stay the same?

ii. Calculate the new median and check your prediction.

9. Tessa has sat 5 math tests so far this year, and her average (mean) mark is 60%.

Tessa can remember the score she got on the first four tests (55%, 70%, 73%, 45%) but she can't remember what she got for the fifth test.

Work out what mark Tessa got on her 5th test?

10. I am thinking of five numbers. The mode is 6, the median 7 and the mean is 8 – can you work which 5 numbers I am thinking of?

Department of Education

The Mathematical Association of Western Australia Inc.

Year 7 Mathematics

Statistics & Probability Activity

Comparing Data

Produced by a Department of Education - MAWA partnership project

written for the Year 7 Australian curriculum

TASK 225: COMPARING DATA

Overview

These tasks are designed to help students compare data sets. In the first activity, students create a set of data, calculate the mean, median, mode and range, then graph the data. Students then add 3 to each data point and compare the two sets of data. The second activity requires students to work in small groups to match bar graphs to a set of summary statistics as well as the original data. Students are then encouraged to compare different sets of data and note what they see.

Students will need

- Calculators (optional)

Relevant content descriptions from the Western Australian Curriculum

- Calculate mean, median, mode and range for sets of data. Interpret these statistics in the context of data (ACSP171)
- Describe and interpret data displays using median, mean and range (ACMSP172)

Students can demonstrate

- *fluency* when they
  - calculate mean, median, mode and range
- *reasoning* when they
  - match graphs of data to the original data
  - match graphs of data their summary statistics (mean, median, mode and range)
- *problem solving* when they
  - create a set of data that meets specified criteria.

Activity 1

Students will have different answers based on the numbers they have selected. By the end of the activity, students should -

- realise that the mean, median and mode would all increase by 3
- the range will remain the same
- the graph of the first set of data has been moved 3 units along the x-axis for the graph of the of the second set of data.

1. Choose 10 numbers between 1 and 10. Write the numbers below, and also assume that numbers are chosen two or three times.

_____ _____ _____ _____ _____ _____ _____ _____ _____ _____

2. Determine the following statistics for the numbers above.

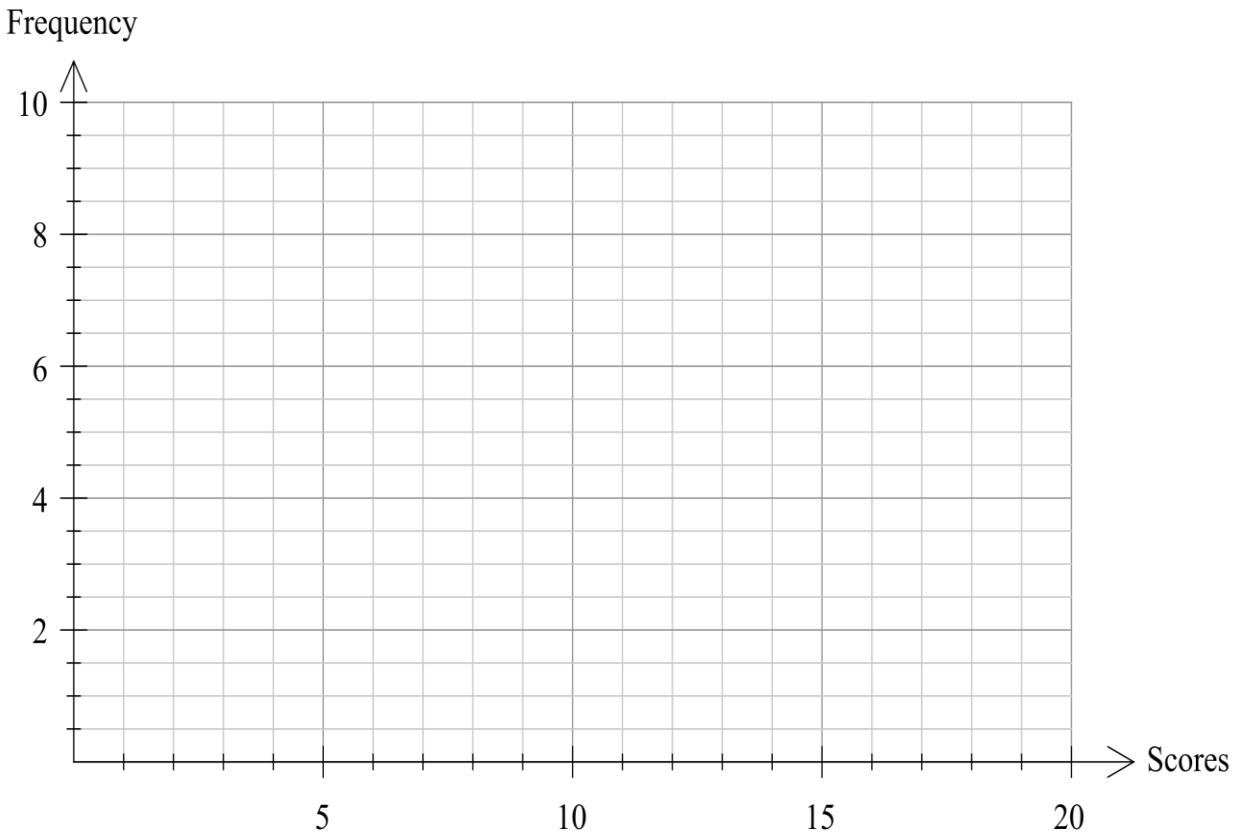
   a. Mean

   b. Median

   c. Mode

   d. Range

3. Graph your data below.



4. Add 3 to each number you wrote down in question 1. Write each of these new numbers below.

_____ _____ _____ _____ _____ _____ _____ _____ _____ ____

5. Without calculating anything, predict wether the statistics for the numbers above will be the same, higher or lower than the statistics you calculated for the numbers in Question 1. Circle your predictions below.

   a. Mean: increase stay the same decrease

   b. Median: increase stay the same decrease

   c. Mode: increase stay the same decrease

   d. Range: increase stay the same decrease

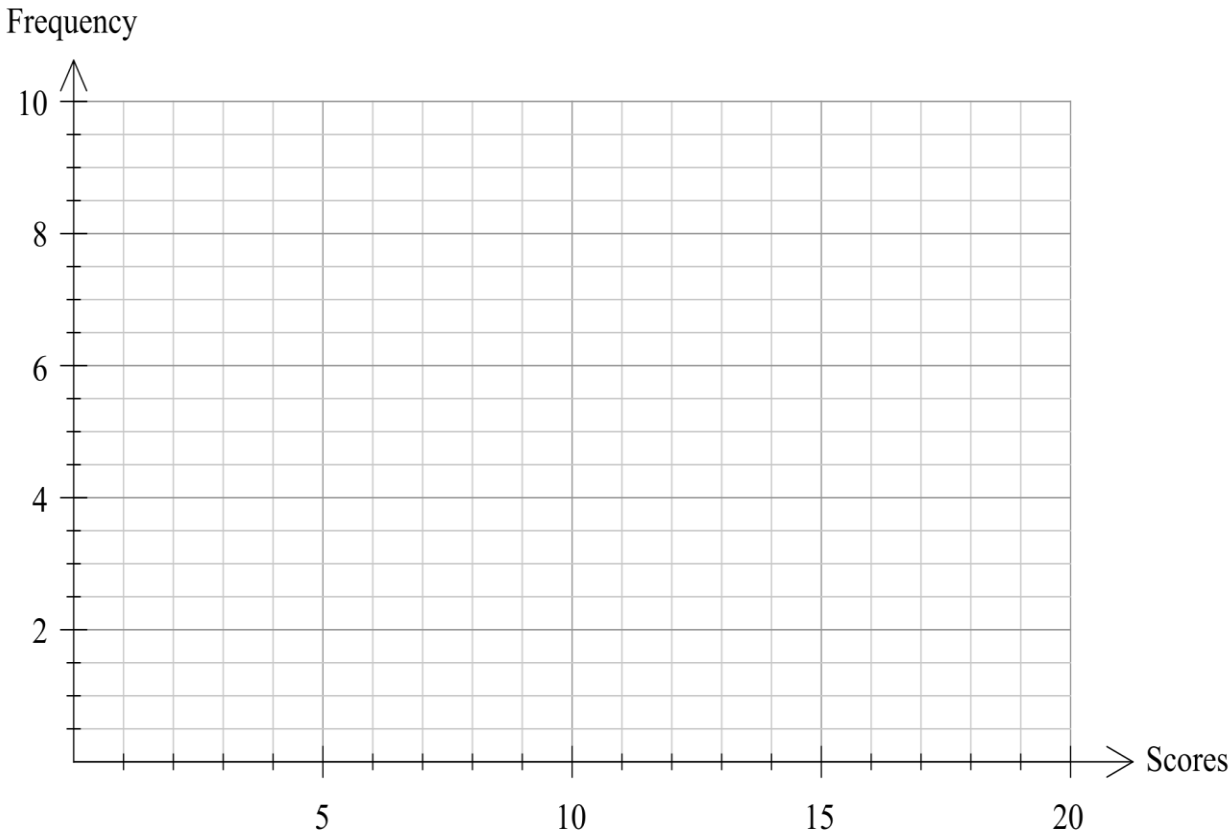
6. Calculate the mean, median, mode and range for the data you wrote down in Question 4.

   These will all increase by 3.

7. Compare your answers above to your predictions in Question 5. Were you surprised by any of your results? If so, which ones and why?

   Various answers.

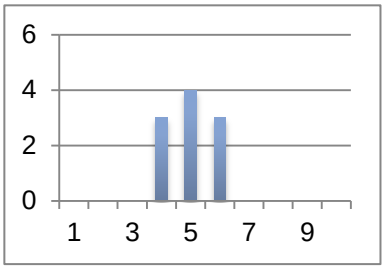
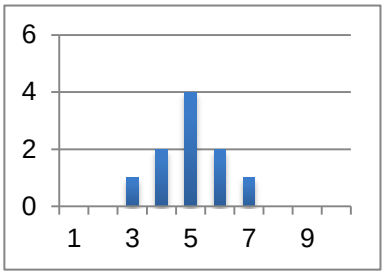
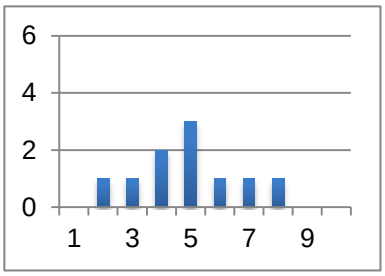
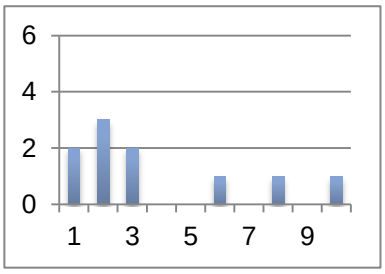
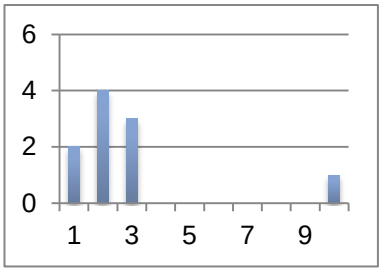
8. Graph your data below

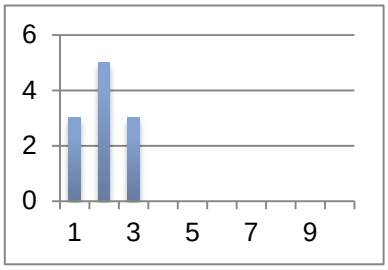
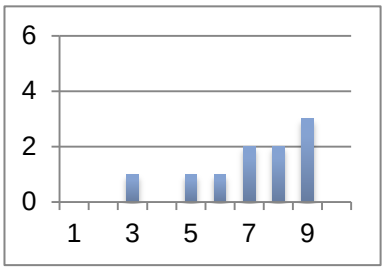
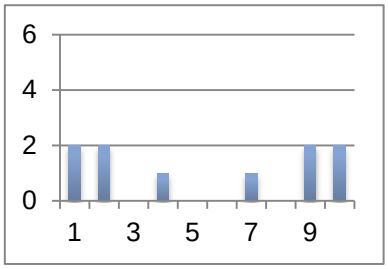
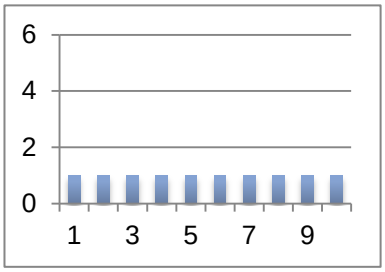
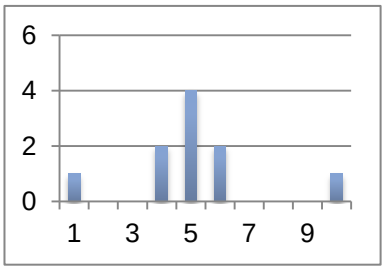


9. Compare your two graphs. How does adding a constant to a set of data change the graph of the data?
   The original graph slides 3 units to the right.

Activity 2

1. Working in a group of 2 or 3, cut out the graphs, data sets, and measures of central tendency provided. Match each graph to its data set and the measures of central tendency cards.

	5, 5, 4, 4, 5, 6, 5, 6, 6	Mean 5 Median 5 Mode 5 Range 2
	5, 3, 5, 5, 4, 4, 7, 6, 5, 6	Mean 5 Median 5 Mode 5 Range 4
	5, 6, 2, 7, 5, 4, 4, 3, 5, 8	Mean 4.9 Median 5 Mode 5 Range 6
	2, 1, 2, 1, 2, 3, 6, 3, 10, 8	Mean 3.8 Median 2.5 Mode 2 Range 9
	10,1, 2, 1, 2, 3, 3, 2, 2, 3,	Mean 2.9 Median 2 Mode 2 Range 9

	1, 2, 2, 3, 2, 2, 1, 1, 3, 3	Mean 2 Median 2 Mode 2 Range 2
	8, 5, 3, 6, 8, 9, 9, 7, 9, 7	Mean 7.1 Median 7.5 Mode 9 Range 6
	1, 2, 4, 2, 7, 10, 9, 9, 1, 10	Mean 5.5 Median 5.5 Mode None Range 9
	1, 10, 2, 5, 9, 8, 7, 3, 4, 6	Mean 5.5 Median 5.5 Mode None Range 9
	5, 5, 5, 5, 6, 4, 6, 10, 4, 1	Mean 5.1 Median 5 Mode 5 Range 9

2. Have a look at the range of each set of data.

   a. What do you notice about the graphs of data where the range is a high number?

      They are spread out.

   b. What do you notice about the graphs of data where range is a small number?

      They are more compact.

3. Is the mode usually closer to the mean or the median? Hint: look at the sets of data where the mean and the median are different.

It is usually closer to the mean

4. Have a look at the sets of data where the mean and median are the same.
What do you notice about these sets? What do the graphs of these sets have in common?

These graphs tend to be very symmetrical

5. Look at the sets of data where the mean is higher than the median.

   a. What do you notice about these sets? Do these graphs have anything in common?

      They are not symmetrical. The data is mostly grouped together with a few scores to the right of the main group.

   b. What if the mean is lower than the median? Do these graphs have anything in common?

      They are not symmetrical. The data seems to be mostly grouped together with a few scores to the right of the main group.

6. EXTENSION QUESTION: Create a set data that has the following characteristics:
   a. The set contains ten scores
   b. All scores are between 10 and 20 (inclusive)
   c. The mean is higher than the median
   d. The mean is lower than the mode

   Various answers. One example is 10, 10, 11, 11, 12, 12, 13, 19, 20, 20, 20

Activity 1

10. Choose 10 numbers between 1 and 10. Write the numbers below, and also assume that numbers are chosen two or three times.

_____ _____ _____ _____ _____ _____ _____ _____ _____ _____

1. Determine the following statistics for the numbers above.

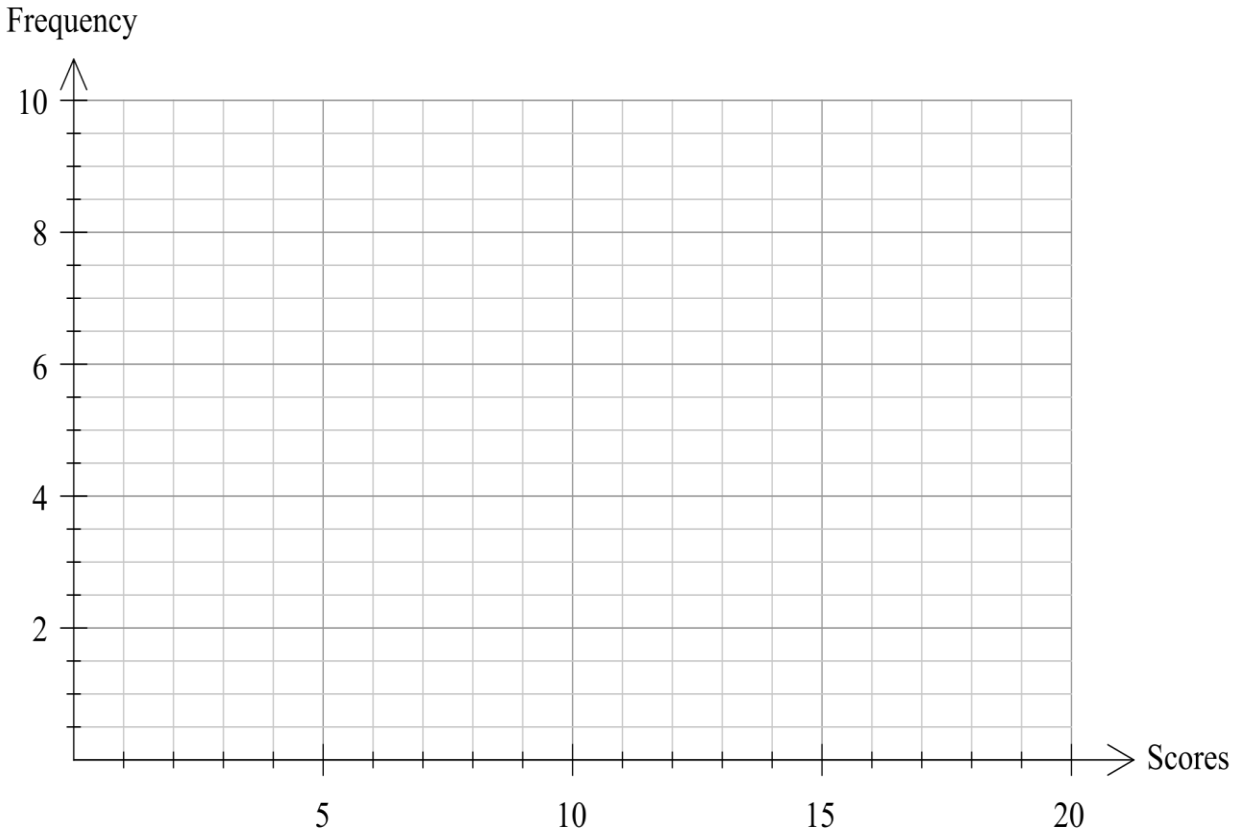
   a. Mean

   b. Median

   c. Mode

   d. Range

2. Graph your data below.



3. Add 3 to each number you wrote down in question 1. Write each of these new numbers below.

_____ _____ _____ _____ _____ _____ _____ _____ _____ _____

4. Without calculating anything, predict wether the statistics for the numbers above will be the same, higher or lower than the statistics you calculated for the numbers in Question 1. Circle your predictions below.

   a. Mean: increase stay the same decrease

   b. Median: increase stay the same decrease

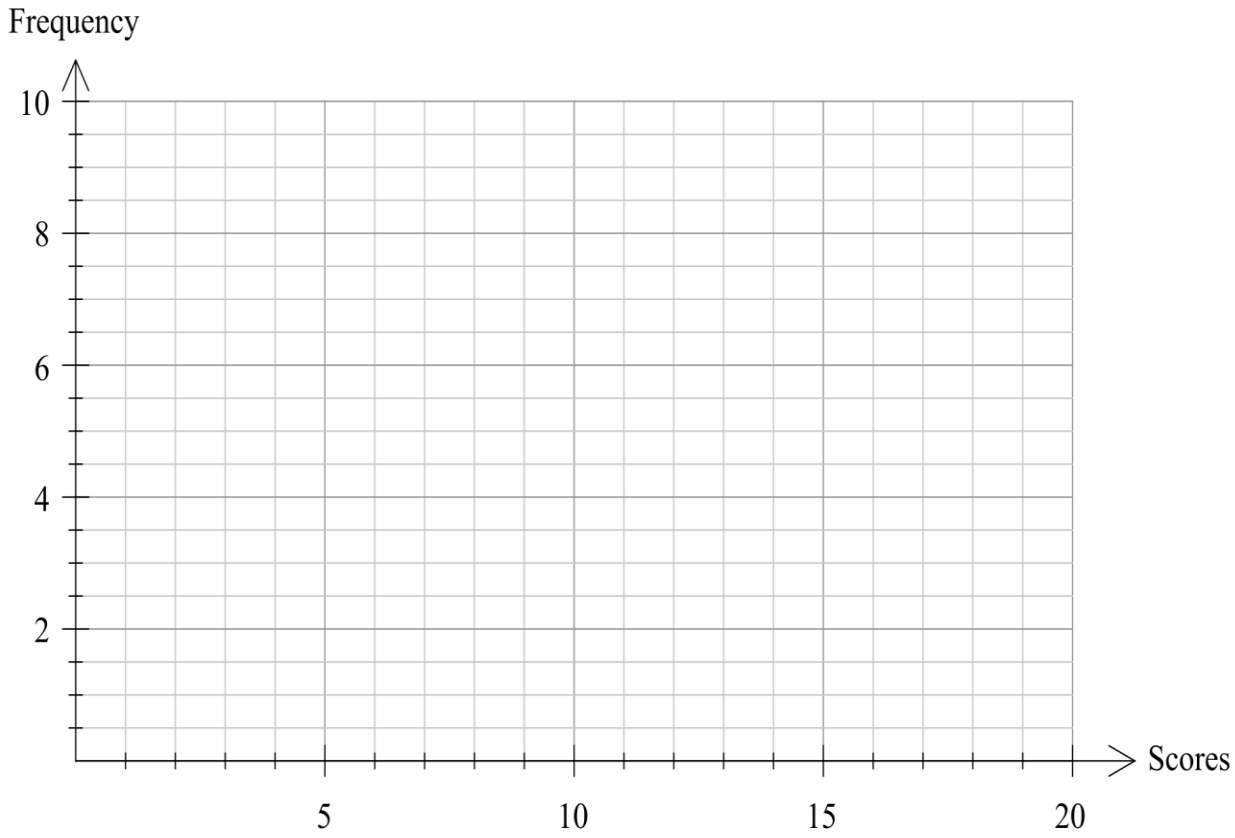
   c. Mode: increase stay the same decrease

   d. Range: increase stay the same decrease

5. Calculate the mean, median, mode and range for the data you wrote down in question 4.

6. Compare your answers above to your predictions in Question 5. Were you surprised by any of your results? If so, which ones and why?

7. Graph your data below



8. Compare your two graphs. How does adding a constant to a set of data change the graph of the data?

Activity 2

1. Working in a group of 2 or 3, cut out the graphs, data sets, and measures of central tendency provided. Match each graph to its data set and measures of central tendency cards.

2. Have a look at the range of each set of data.

    a. What do you notice about the graphs of data where the range is a big number?

    b. What do you notice about the graphs of data where range is a small number?

3. Is the mode usually closer to the mean or the median?

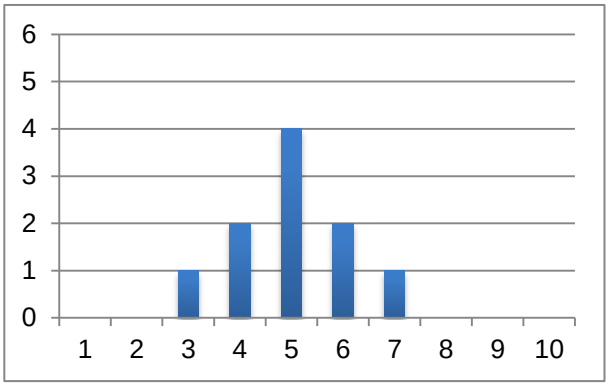
4. Have a look at the sets of data where the mean and median are the same.
   What do you notice about these sets? What do the graphs of these sets have in common?

5. Have a look at the sets of data where the mean is higher than the median.

    a. What do you notice about these sets? Do these graphs have anything in common?

    b. What if the mean is lower than the median? Do these graphs have anything in common?

6. EXTENSION QUESTION: Create a set data that has the following characteristics:
    a. The set contains ten scores
    b. All scores are between 10 and 20 (inclusive)
    c. The mean is higher than the median
    d. The mean is lower than the mode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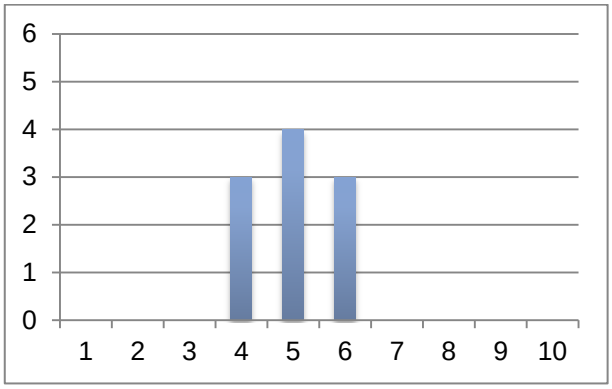
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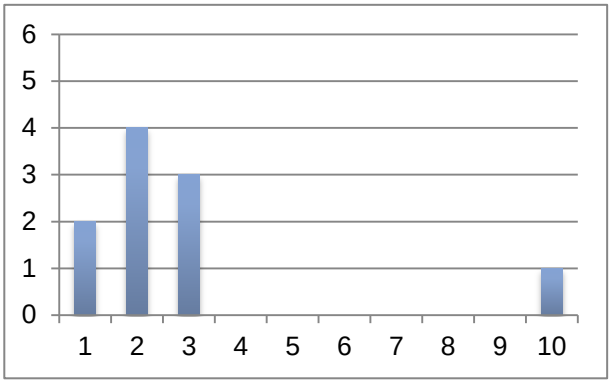
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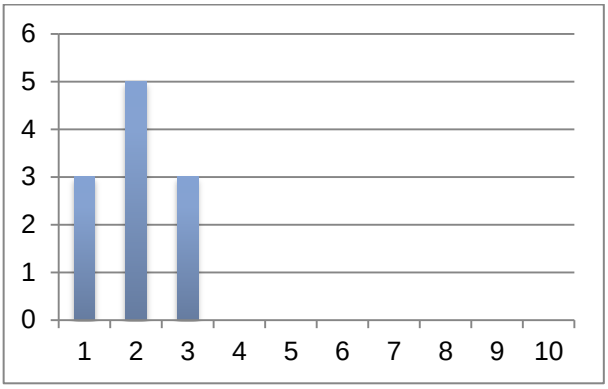
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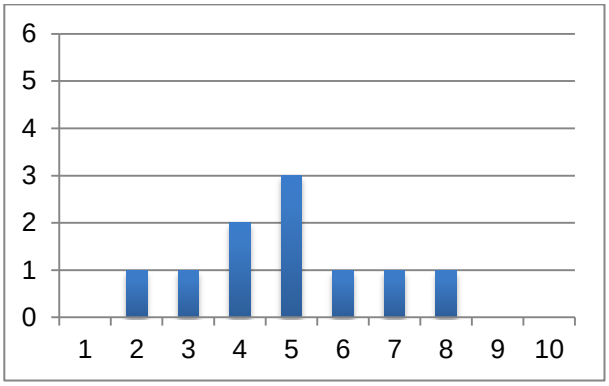
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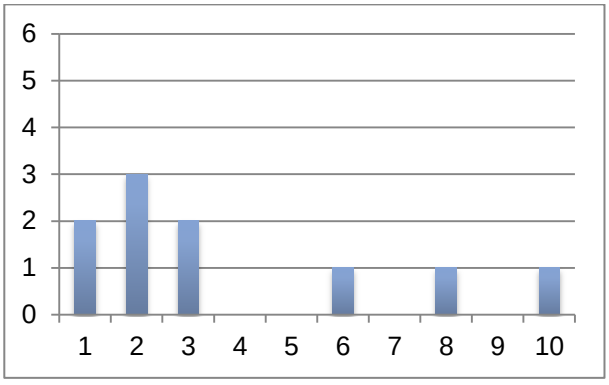
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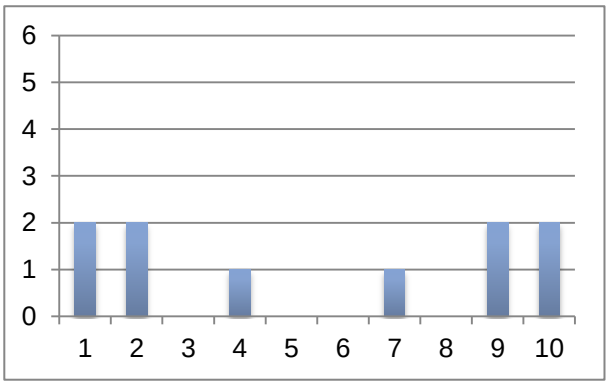
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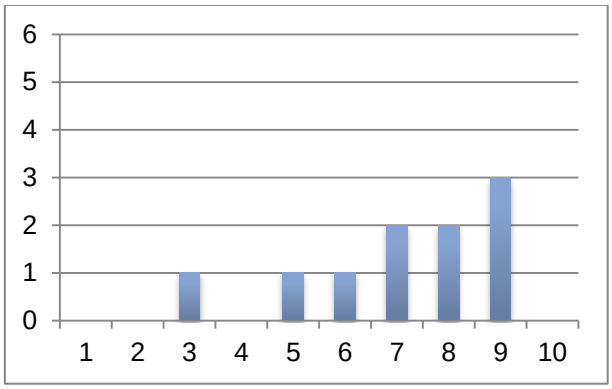
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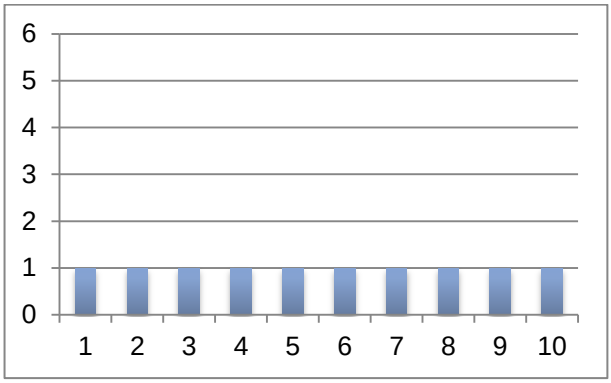
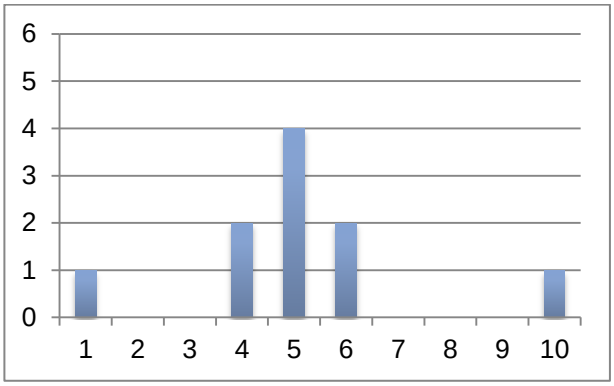
9
10





4, 5, 5, 4, 4, 5, 6, 5, 6, 6	5, 3, 5, 5, 4, 4, 7, 6, 5, 6
5, 6, 2, 7, 5, 4, 4, 3, 5, 8	10, 1, 2, 1, 2, 3, 3, 2, 2, 3
1, 2, 2, 3, 2, 2, 1, 1, 3, 3	8, 5, 3, 6, 8, 9, 9, 7, 9, 7
1, 2, 4, 2, 7, 10, 9, 9, 1, 10	1, 10, 2, 5, 9, 8, 7, 3, 4, 6

5, 5, 5, 5, 6, 4, 6, 10, 4, 1	2, 1, 2, 1, 2, 3, 6, 3, 10, 8

Mean: 3.8 Median: 2.5 Mode: 2 Range: 9	Mean: 5.5 Median: 5.5 Mode: (none) Range: 9
Mean: 7.1 Median: 7.5 Mode: 9 Range: 6	Mean: 3.8 Median: 2.5 Mode: 2 Range: 9
Mean: 5.5 Median: 5.5 Mode: 1 Range: 9	Mean: 4.9 Median: 5 Mode: 5 Range: 6

Mean: 2 Median: 2 Mode: 2 Range: 2	Mean: 5.1 Median: 5 Mode: 5 Range: 9
Mean: 5 Median: 5 Mode: 5 Range: 4	Mean: 2.9 Median: 2 Mode: 2 Range: 9

Department of Education

The Mathematical Association of Western Australia Inc.

Year 7 Mathematics

Statistics & Probability Activity

Perplexing Probability

Produced by a Department of Education - MAWA partnership project

written for the Year 7 Australian Curriculum

TASK 237: PERPLEXING PROBABILITY

Overview

This task is an investigation into probability. The students use spinners to determine probabilities and work out expected results, then they design spinners to fit given criteria. The final activity is designed to help students clarify their thinking and clear some of the misconceptions that students have about probability.

Students will need

- scissors
- glue
- split pins

Relevant content descriptions from the Western Australian Curriculum

- Construct sample spaces for single-step experiments with equally likely outcomes (ACMSP167)
- Assign probabilities to the outcomes of events and determine probabilities for events (ACMSP168)

Students can demonstrate

- *fluency* when they
  - calculate accurately with integers
- *understanding* when they
  - calculate probabilities in Activity 1
- *reasoning* when they
  - explain the errors in the statements made about probability in Activity 3.
- *problem* solving when they
  - design spinners based on given criteria in Activity 2

Activity 1

1. Look at each of the spinners provided on a page below. For each spinner, list the sample space; i.e., all the possible outcomes, in the table below.

Spinner	Sample Space
Spinner 1	Yellow, pink, blue, green
Spinner 2	Yellow, pink
Spinner 3	Yellow, blue, green
Spinner 4	Yellow, pink, blue, green

2. For each spinner, determine the probability of landing on each colour and complete the table below.

Spinner	Pink	Blue	Green	Yellow
Spinner 1	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$
Spinner 2	$\frac{3}{4}$	0	0	$\frac{1}{4}$
Spinner 3	0	$\frac{2}{6}=\frac{1}{3}$	$\frac{2}{6}=\frac{1}{3}$	$\frac{2}{6}=\frac{1}{3}$
Spinner 4	$\frac{2}{8}=\frac{1}{4}$	$\frac{2}{8}=\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{8}$

3. If you spun each spinner 30 times, how many times would you expect to land on each colour? Fill out the table below with your predictions.

Spinner	Pink	Blue	Green	Yellow
Spinner 1	7.5	7.5	7.5	7.5
Spinner 2	22.5	0	0	7.5
Spinner 3	0	10	10	10
Spinner 4	7.5	7.5	10.75	3.75

Accept any reasonable answer; e.g., “7 or 8” instead of 7.5 is acceptable for the table above.

4. Cut out each spinner and the spinner arrows. Use a split pin to create a working spinner.

5. Spin each spinner 30 times and record your results below.

Spinner	Pink		Green		Blue		Yellow	
	Tally	Total	Tally	Total	Tally	Total	Tally	Total
Spinner 1	Various Results							
Spinner 2								
Spinner 3								
Spinner 4								

6. DISCUSSION QUESTION: Did your actual results match your predicted results from Question 3? Why do you think this is?

   The probability calculated in Question 2 is what is expected to approach as the spinners are spun more and more times.

   When the students conducted the experiment they only performed a relatively small number of trials, so if they had the time to conduct lots more trials, we would expect their results to get closer to our answers in Question 2.

   To emphasise the importance of this principle, collate the class results for the experiment to see if the class data is closer to the answers given for Question 2.

<u>Activity 2</u>

Heidi spun a spinner many times. It landed on blue most of the time, on red some of the time and only once on white and once on yellow.

1. On the page provided below, draw a diagram to show what Heidi's spinner might look like.
   Answers may vary. See page below for one possible answer.

2. If you spin your spinners 10 times, will it land on white once and yellow once? Why/Why not?
   There is only a small chance that the spinner lands on white (or yellow). If you spun the spinner 10 times, you might expect to land on white (or yellow) once, but it might happen more than that or not at all.

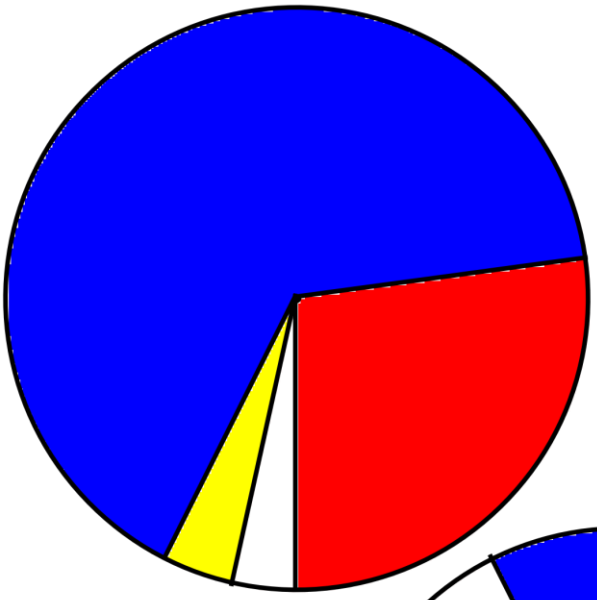
3. What if you spin it 100 times, will it land on white once and yellow once? Why/Why not?
   With a greater number of trials it is very likely that the spinner would land on the white (or yellow) at least once.

4. Draw two other spinners that could give the same result as the one you designed in Question 1.
   Answers may vary. See next page for two more possibilities.

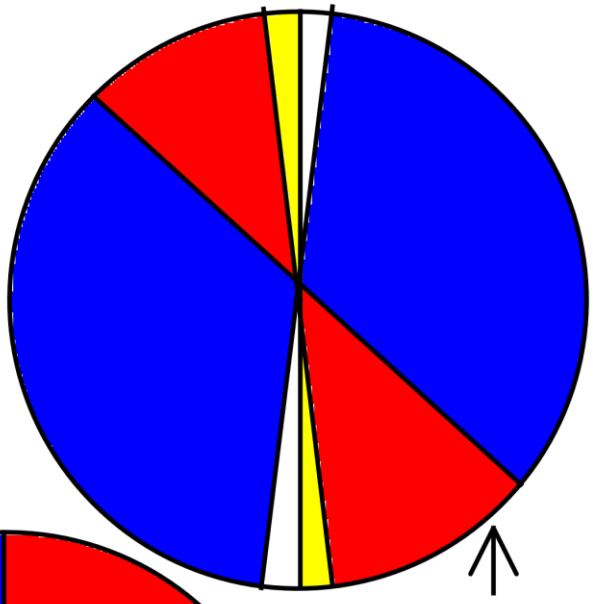
5. This time, draw a spinner that will land on blue 50% of the time, red 40% of the time, white 5% of the time, and yellow 5% of the time.
   Answers may vary. See next page for one possible answer.

6. Make the spinner you designed in question 5 and spin it 30 times. Record your results below.

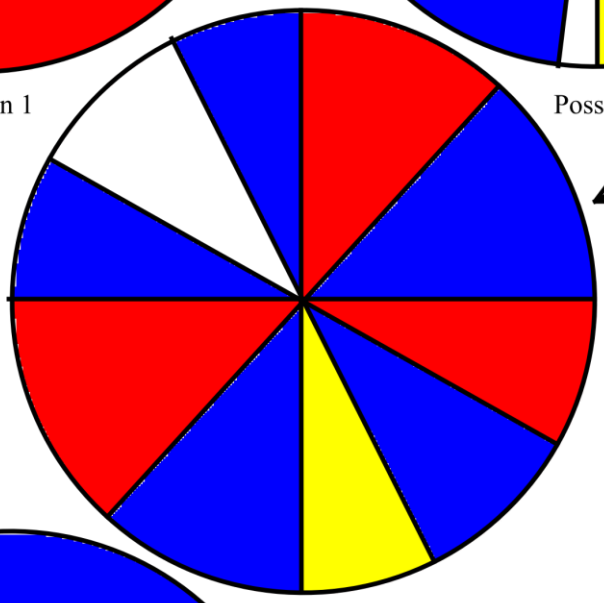
Spinner	Red		Blue		White		Yellow	
	Tally	% of Total	Tally	% of Total	Tally	% of Total	Tally	% of Total
Spinner 1	Various answers							
Spinner 2								
Spinner 3								
Spinner 4								

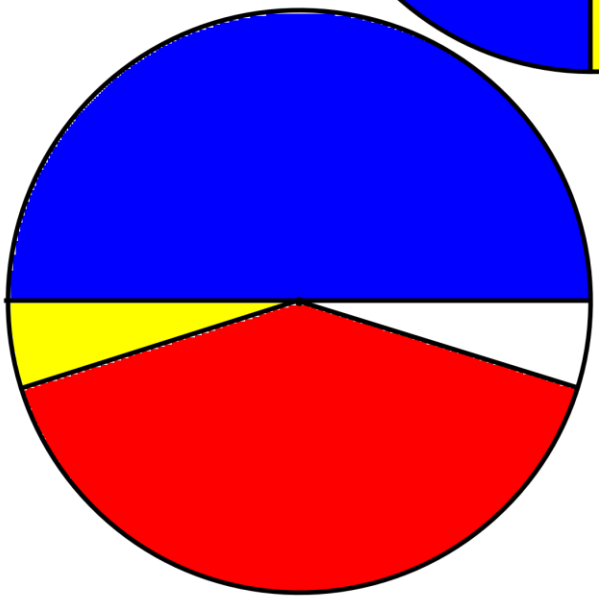


Possible Answer - Question 1



Possible Answers - Question 4





Possible Answer – Question 5

Activity 3

1. Working with a partner, cut out the cards on the following page.

2. Discuss each of the 8 cards with your partner, decide if the statement is true or false, and write reasons for your answer.

3. Discuss the answers as a class.

I've flipped a coin 3 times and got 3 heads. If I flip the coin again, it will be more likely that I will get a tail. It doesn't matter what the previous outcomes were, there is still a 50/50 chance of getting tails.	There are 5 red beads and 9 green beads in a bag. I pick a bead at random. The probability that the bead I pick is red is – The probability is —
It is easier to throw a 1 than to throw a 6 with a normal dice. Throwing any number on a normal dice has the same chance as throwing any other number	Tomorrow it will either be sunny or not be sunny. The probability that it will be sunny is – There are two outcomes, but they are not equally likely. If it is summer for instance, there would be more than a 50% chance that it will be sunny tomorrow.
The Dockers are going to play the West Coast Eagles. The Dockers can win, lose or draw. The probability The Dockers will win is – There are only 3 outcomes, but they are not equally likely. A draw is unlikely, and the probability of a win will depend on the skill of the players, etc.	If I throw a normal dice 3 times. I am more likely to get 5, 1, 3 than 2, 2, 2. Any combination of numbers is as likely as any other combination.
Container A has 4 red balls and 6 blue balls. Container B has 40 red balls and 60 blue balls. You want a blue ball, but can't see into the containers. You should pick from container B because it has more blue balls than container A. Each box has the same percentage of blue balls, so it doesn't matter which container you choose from.	13 is an unlucky number. You buy a raffle ticket with the number 13 on it. You are less likely to win the raffle because you have an unlucky number. One ticket has as much chance of being selected as any other ticket, it doesn't matter whether the number on it is considered "unlucky" or not.

Activity 1

1. Look at each of the spinners provided. For each spinner, list the sample space; i.e., all the possible outcomes, in the table below.

Spinner	Sample Space
Spinner 1	
Spinner 2	
Spinner 3	
Spinner 4	

2. For each spinner, determine the probability of landing on each colour and complete the table below.

Spinner	Pink	Blue	Green	Yellow
Spinner 1				
Spinner 2				
Spinner 3				
Spinner 4				

3. If you spun each spinner 30 times, how many times would you expect to land on each colour? Fill out the table below with your predictions.

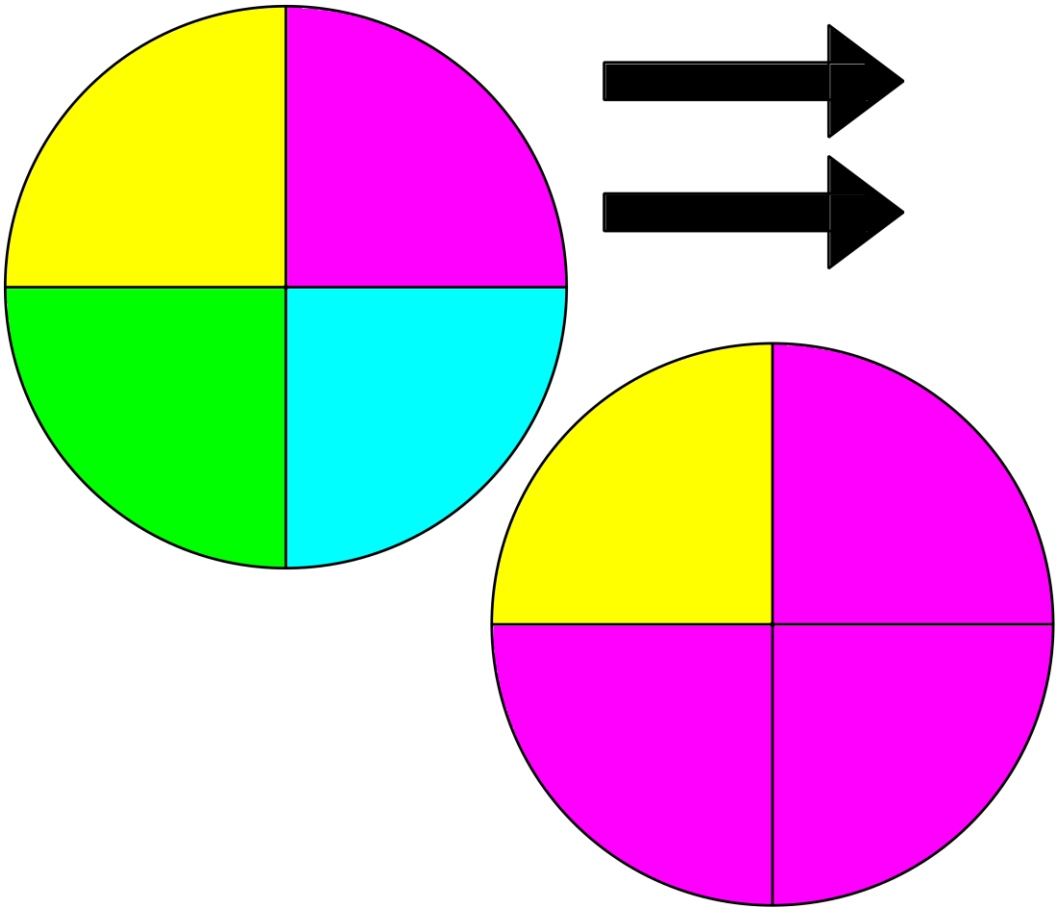
Spinner	Pink	Blue	Green	Yellow
Spinner 1				
Spinner 2				
Spinner 3				
Spinner 4				

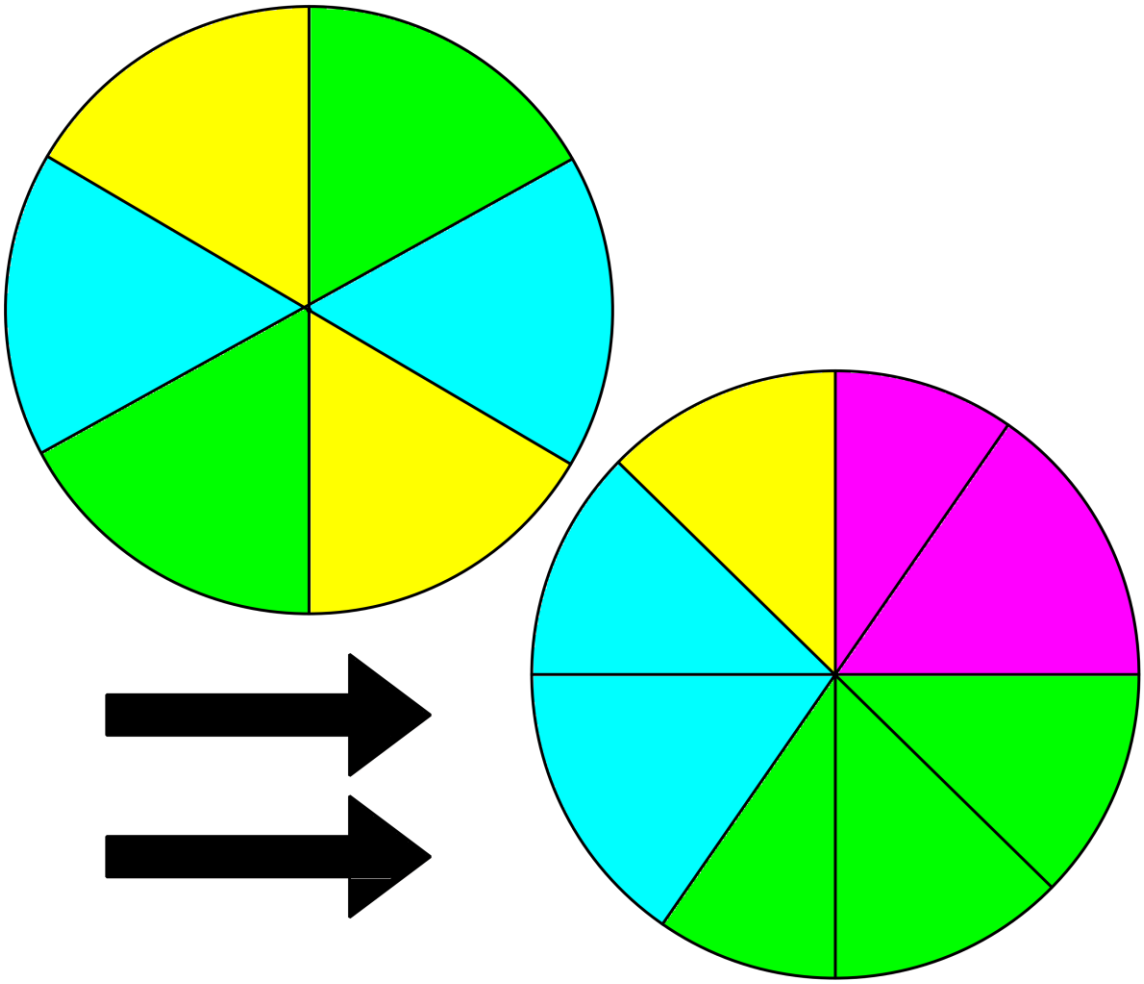
4. Cut out each spinner and the spinner arrows. Use a split pin to create a working spinner.

5. Spin each spinner 30 times and record your results below.

Spinner	Pink		Green		Blue		Yellow	
	Tally	Total	Tally	Total	Tally	Total	Tally	Total
Spinner 1								
Spinner 2								
Spinner 3								
Spinner 4								

6. DISCUSSION QUESTION: Did your actual results match your predicted results from Question 3? Why do you think this is?





Activity 2

Heidi spun a spinner many times. It landed on blue most of the time, on red some of the time and only once on white and once on yellow.

1. On the page provided below, draw a diagram to show what Heidi's spinner might look like.

2. If you spin your spinners 10 times, will it land on white once and yellow once? Why/Why not?

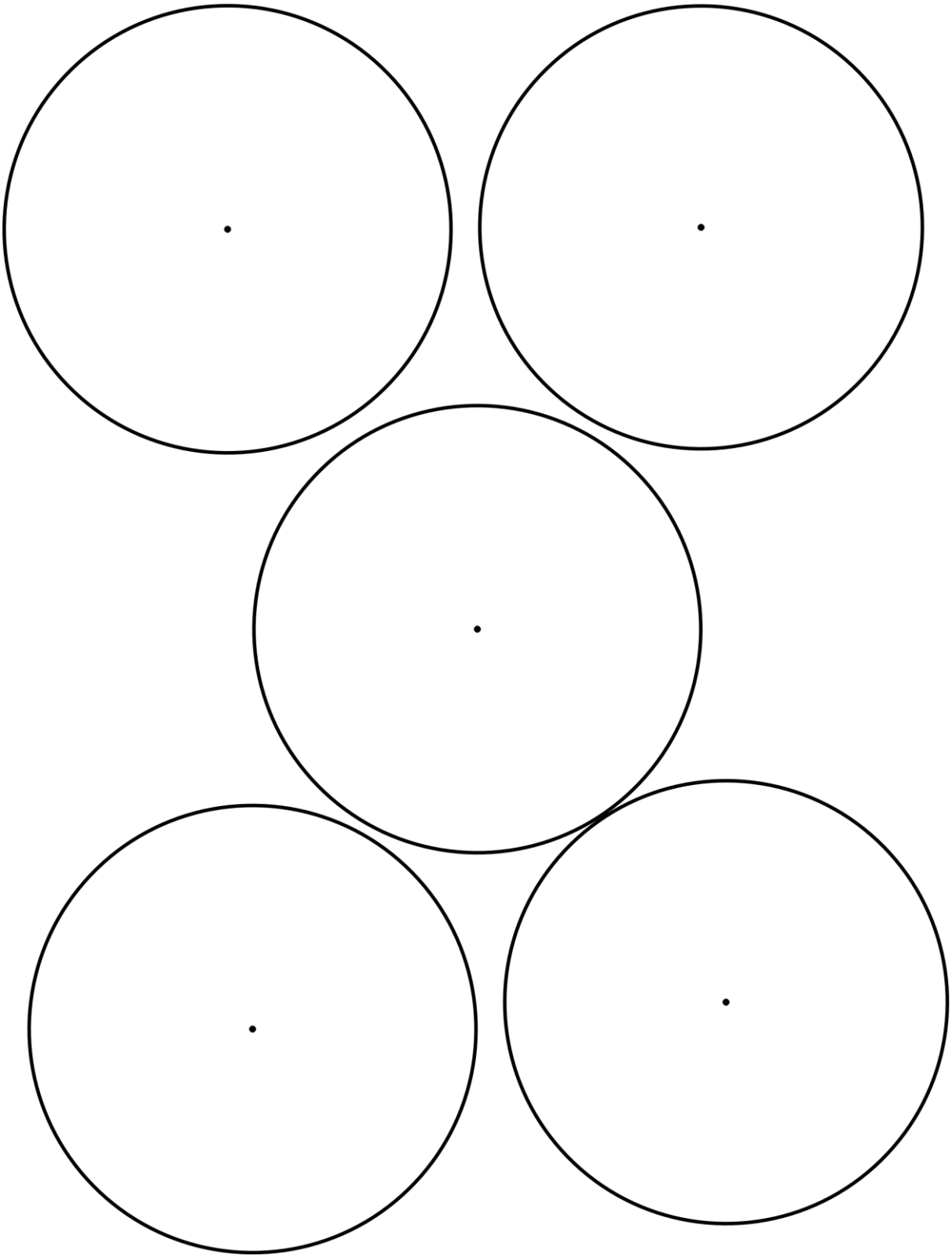
3. What if you spin it 100 times, will it land on white once and yellow once? Why/Why not?

4. Draw two other spinners that could give the same result as the one you designed in Question 1.

5. This time, draw a spinner that will land on blue 50% of the time, red 40% of the time, white 5% of the time, and yellow 5% of the time.

6. Make the spinner you designed in Question 5 and spin it 30 times. Record your results below.

Spinner	Red		Blue		White		Yellow	
	Tally	% of Total	Tally	% of Total	Tally	% of Total	Tally	% of Total
Spinner 1								
Spinner 2								
Spinner 3								
Spinner 4								



Activity 3

1. Working with a partner, cut out the cards on the following page.

2. Discuss each of the 8 cards with your partner, decide if the statement is true or false, and write reasons for your answer.

(i)

(ii)

(iii)

(iv)

(v)

(vi)

(vii)

(viii)

3. Discuss the answers as a class.

I've flipped a coin 3 times and got 3 heads. If I flip the coin again, it will be more likely that I will get a tail.	There are 5 red beads and 9 green beads in a bag. I pick a bead at random. The probability that the bead I pick is red is –
It is easier to throw a 1 than to throw a 6 with a normal dice.	Tomorrow it will either be sunny or not be sunny. The probability that it will be sunny is –
The Dockers are going to play the West Coast Eagles. The Dockers can win, lose or draw. The probability The Dockers will win is –	If I throw a normal dice 3 times. I am more likely to get 5, 1, 3 than 2, 2, 2.
Container A has 4 red balls and 6 blue balls. Container B has 40 red balls and 60 blue balls. You want a blue ball, but can't see into the containers. You should pick from container B because it has more blue balls than container A.	13 is an unlucky number. You buy a raffle ticket with the number 13 on it. You are less likely to win the raffle because you have an unlucky number.

Department of Education

The Mathematical Association of Western Australia Inc.

Year 7 Mathematics

Statistics & Probability Activity

About Our Class

Produced by a Department of Education - MAWA partnership project

written for the Year 7 Australian Curriculum

TASK 2: ABOUT OUR CLASS

Overview

This task focuses on collecting and analysing data. The first activity involves the *whole class* working on the same problem, following the given instructions.
The second activity provides an opportunity for *small groups* of students to work independently on a similar activity. Students' answers should be consistent between groups.
In the third activity the students should be encouraged to work independently to follow a similar process, without scaffolding if possible. Groups of students could present the results of their investigations for Activity 3 to the whole class and/or display their findings in poster format. These three activities could take 2-3 lessons in total.
Activity 4 offers an opportunity for students to review their terminology of statistical terms.

Students will need

- calculators

Relevant content descriptors from the Western Australian Curriculum

- Identify and investigate issues involving numerical data collected from primary and secondary sources (ACSP169)
- Construct and compare a range of data displays including stem-and-leaf plots and dot plots (ACSP170)
- Calculate mean, median, mode and range for sets of data. Interpret these statistics in the context of data (ACSP171)

Students can demonstrate

- *fluency* when they
    - calculate measures of central tendency
    - draw dot plots
- *reasoning* when they
    - interpret dot plots
    - determine which data to collect to answer the question for Activity 3
    - clarify the question posed in Activity 3

Introduction

In this task there are a series of activities each involving a statistical investigation.
Each investigation is done as a series of steps:

- a question is asked or a problem is posed
- the wording of the task needs to be checked so that it is clear what is meant
- data are collected
- data are recorded
- a table of data is created
- statistical measures are calculated
- a suitable graph is drawn to represent the data

The investigations are for -

1. The whole class;
2. A group of students with each group working on the same task; and
3. A group of students with each group working on a different task.

Activity 1: Class Sports

In this investigation we are interested in finding out about the extent to which students in our class have been involved in team sports.

1. The question posed is -

   How many different sporting teams have you been in since 1 January 2015?

2. Check that we understand the question.
   - Sporting teams include cricket, tennis, athletics, netball, hockey etc., but not chess or debating.
   - If you were in the Under 14 team in 2015 and an Under 14 team in 2016, that is 2 different teams.
   - If the team changed during the season because a player is injured and then replaced, it is still the same team and only counts as 1.
   - Write down other questions asked by members of our class and the answers provided.

Other questions possible:

(a) Do I count the team if I was a reserve and did not play a game? NO

(b) I only played one game for the team because they were short but I was in a team in a lower division. Does that make two teams or 1? 1

3. Collect data. Write down all the scores we collect from students in our class.

Here are some scores from a prior investigation.

3 2 1 2 2 1 4 5 0 2

3 0 2 2 7 1 2 1 5 1

0 2 3 3 1 2 2 2 1 4

4. Write all of these scores in ascending order.

0 0 0 1 1 1 1 1 1 1 2 2 2 2 2

2 2 2 2 2 2 3 3 3 3 4 4 5 5 7

5. Make a table of our scores.

Score	Tally	Frequency
0	III	3
1	~~IIII~~ II	7
2	~~IIII~~ ~~IIII~~ I	11
3	IIII	4
4	II	2
5	II	2
6		0
7	I	1

6. Why do we make a table of our scores?

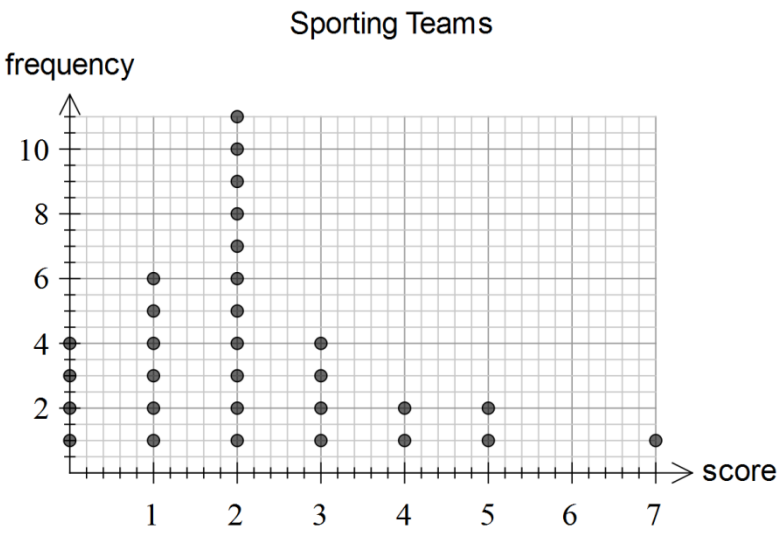
It gives a clearer picture of how spread out they are, and the different numbers of each score.

7. Calculate statistical measures.

Statistical measure	Calculation.	Show working	Answer
Minimum	Lowest score of all		0
Maximum	Highest score of all		7
Range	Maximum score – minimum score.	7 – 0 = 7	7
Mean	Add up all the scores then divide by the number of scores	(0 + 0 + 0 + 0 + 1 + 1 + 1 + 1 + 1 + 1 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 3 + 3 + 3 + 3 + 4 + 4 + 5 + 5 + 7) ÷ 30 =65 ÷ 30	2.2
Mode	The score that occurs most often.		2
Median	The middle score when scores are in order. If there isn't just one middle score, then take the two in the middle and average them.	The average of 2 and 2 is 2	2

8. Draw a dot plot of the scores.

<u>Number of sporting teams this year for our class</u>



Activity 2: Small group investigation

Topic: How often have the students in our class been to the shops in the last fortnight?

1. The question posed is:

   How many times have you been to the shops in the last two weeks?

2. Check that you understand the question. Discuss these questions as a class and write down the answers.

   - What do we mean by shops?
   - If a student goes from home to the supermarket then to the chemist then back home, it is 1 trip.
   - When exactly did the last two weeks begin?
   - Do I include the trip if I went to the shops and did not buy anything?
   - Do I include the trip if we stopped at the shops on the way home from school?

Answers resulting from class discussion.

3. Are there any other questions to be asked so that it is clear what data should be collected from the class? Write down these questions and the answers provided.

Clarify any questions etc.

4. Collect data. Write down all the scores collected from students in the class.

Assist with the data collection.

5. Write these scores in ascending order.

6. Make a table of the scores. Various answers.

Score	Tally	Frequency

7. Determine the following statistical measures and show working where possible.

Check for relevant answers based on collected data.

(a) minimum score

(b) maximum score

(c) range

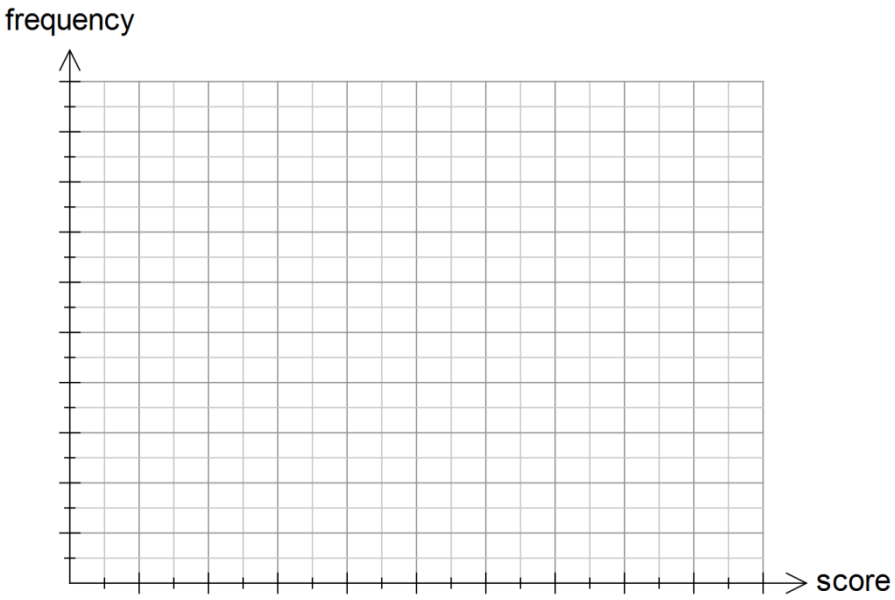
(d) mode

(e) median

(f) mean

8. Draw a dot plot of the scores.

Number of shopping trips in the last fortnight



9. Summarise what we can learn about the shopping habits of people in our class. Use the following questions to guide your conclusions.

(a) What was the greatest number of times any student(s) went shopping?
Various answers.

(b) What other type(s) of graph could have been used to represent these results? Draw a sketch of one graph that could be used.
A bar graph.

(c) Does our graph suggest that students in our class like going shopping? Explain.

Various responses.

(d) Are there any unusual results; e.g., very low or very high number of shopping trips, in our class? How are these unusual results recognised from the graph?

Changes in the shape of the graph.

(e) What might cause results such as these to be inaccurate?

Lack of records, certain amount of estimation, and differing interpretations

(f) Would the results be the same for Year 8 students?
Suggest reasons for your conclusion.

More pocket money; more independence

Activity 3

Using a similar process to answering the questions in Activities 1 and 2, work in groups to answer one of the questions provided below. Alternatively, you might like to devise your own question but seek the teacher's approval before proceeding with your investigation.

1. How many hours of homework did the students in our class do in the past week?
2. How many different sporting events were attended by the students in our class even thought they were not participants?
3. How many favourite television shows do the students in our class have?
4. How many times did the students in our class go to the beach in the last month?
5. How many times did the students in our class spend money at the canteen at recess during the last fortnight?
6. How many different sports do the students in our class like to watch on television?
7. How many different events did the students in our class participate in during the school swimming carnival?
8. How many different events did the students in our class participate in during the school athletics carnival?
9. How many times have the students in our class used public transport in the last month?
10. How many different non-sporting hobbies do the students in our class have?

For your chosen question -

- check you understand the task
- collect data
- record data
- tabulate data
- calculate statistical measures
- represent the data as a suitable graph
- write a paragraph summarising what you have discovered about your class
- prepare a display of your findings to share with the rest of the class.

Students will often get confused between the mode and the maximum score when working in context. This is particularly evident when working from a dot graph when they identify the highest column as the maximum score rather than the mode.

Activity 4

KEYWORDS: Write a clear meaning for each of these words.

WORD	MEANING
data	A general term which describes the measurements, counts or features of the items, people or organisms that we are investigating.
score	The value of what is being measured.
ascending	Scores increase in magnitude when they are in ascending order.
descending	Scores decrease in magnitude when they are in descending order.
tally	Usually refers to a method of recording scores by using strokes; e.g., |||
frequency	Describes how often a score occurs.
mean	Often referred to as the average score but the average can be one of the three scores – mean, mode, median. The mean would be the same average for all scores if the scores were equally distributed. It is calculated by adding all the scores and dividing by the number of scores.
median	The middle score when the scores are in ascending order. If there is an even number of scores, it is calculated by adding the two middle scores and dividing that total by 2.
mode	The score with the highest frequency.
maximum	The highest score.
minimum	The lowest score.
range	Maximum score – minimum score.
population**	All the individuals in the group for which we are seeking information; e. g., the whole class, all the people in WA, all the people in our town;
sample**	A subset of a population.
census **	Collection of data from a whole population.

Introduction

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2. Check that we understand the question.
   - Sporting teams include cricket, tennis, athletics, netball, hockey etc., but not chess or debating.
   - If you were in the Under 14 team in 2015 and an Under 14 team in 2016, that is two different teams.
   - If the team changed during the season because a player is injured and then replaced, it is still the same team and only counts as 1.
   - Write down other questions asked by members of our class and the answers provided.

3. Collect data. Write down all the scores we collect from students in our class.

4. Write all of these scores in ascending order

5. Make a table of our scores.

Score	Tally	Frequency

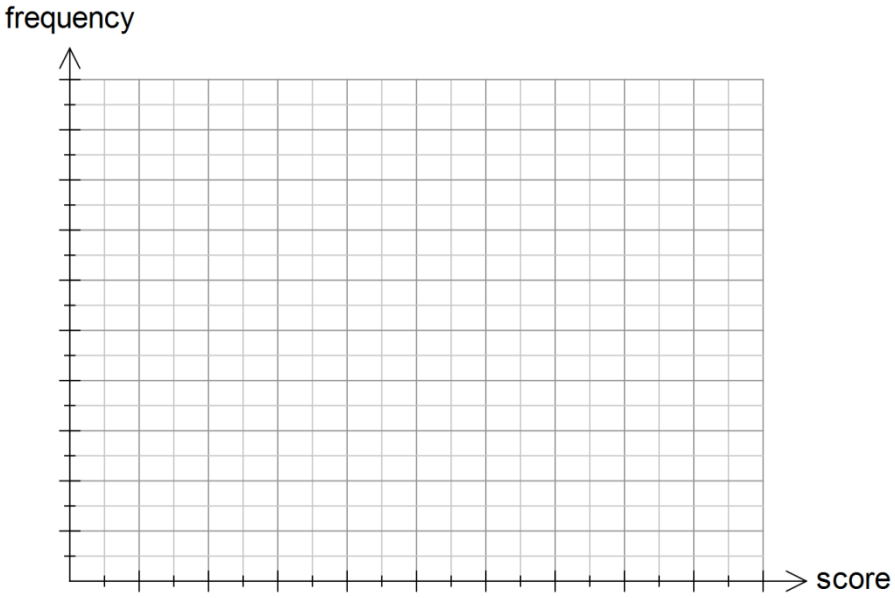
6. Why do we make a table of our scores?

7. Calculate statistical measures

Statistical measure	Calculation	Show working	Answer
Minimum	Lowest score of all		
Maximum	Highest score of all		
Range	Maximum score – minimum score.		
Mean	Add up all the scores then divide by the number of scores		
Mode	The score that occurs most often.		
Median	The middle score when scores are in order. If there isn't just one middle score, then take the two in the middle and average them.		

8. Draw a dot plot of the scores.

Number of sporting teams this year for our class



Activity 2: Small group investigation

Topic: How often have the students in our class been to the shops in the last fortnight?

1. The question posed is:

   How many times have you been to the shops in the last two weeks?

2. Check that you understand the question. Discuss these questions as a class and write down the answers.

   - What do we mean by shops?

   - If a student goes from home to the supermarket then to the chemist then back home, it is 1 trip.

   - When exactly did the last two weeks begin?

   - Do I include the trip if I went to the shops and did not buy anything?

   - Do I include the trip if we stopped at the shops on the way home from school?

3. Are there any other questions to be asked so that it is clear what data should be collected from the class? Write down these questions and the answers provided.

4. Collect data. Write down all the scores collected from students in the class.

5. Write these scores in ascending order

6. Make a table of the scores.

Score	Tally	Frequency

7. Determine the following statistical measures and show working where possible.

(a) minimum score

(b) maximum score

(c) range

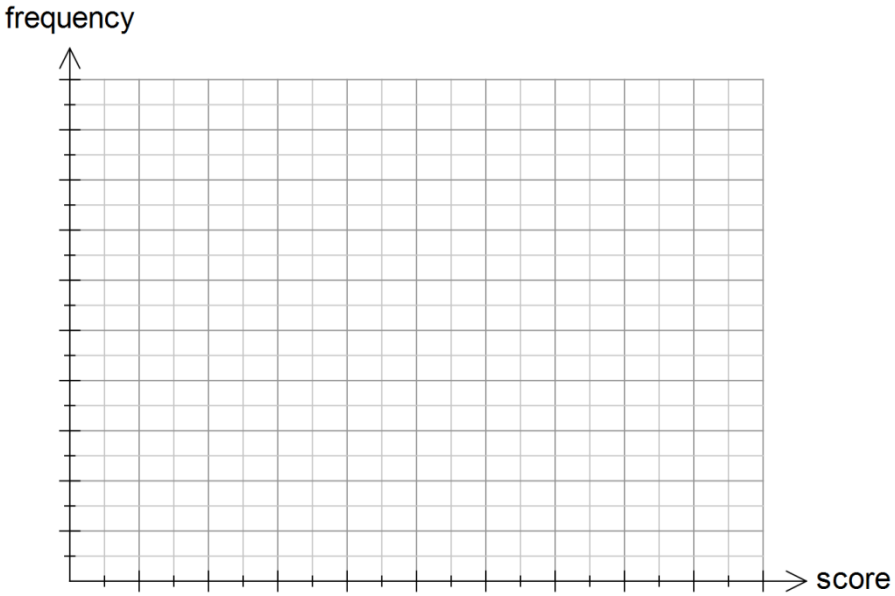
(d) mode

(e) median

(f) mean

8. Draw a dot plot of the scores.

Number of shopping trips in the last fortnight



9. Summarise what we can learn about the shopping habits of people in our class. Use the following questions to guide your conclusions.

(a) What was the greatest number of times any student(s) went shopping?

(b) What other type(s) of graph could have been used to represent these results? Draw a sketch of one graph that could be used.

(c) Does our graph suggest that students in our class like going shopping? Explain.

(d) Are there any unusual results (e.g., very low or very high number of shopping trips) in our class? How are these unusual results recognised from the graph?

(e) What might cause results such as these to be inaccurate?

(f) Would the results be the same for Year 8 students?
Suggest reasons for your conclusion.

Activity 3

Using a similar process to answering the questions in Activities 1 and 2, work in groups to answer one of the questions provided below. Alternatively, you might like to devise your own question but seek the teacher's approval before proceeding with your investigation.

1. How many hours of homework did the students in our class do in the past week?
2. How many different sporting events were attended by the students in our class, even thought they were not participants?
3. How many favourite television shows do the students in our class have?
4. How many times did the students in our class go to the beach in the last month?
5. How many times did the students in our class spend money at the canteen at recess during the last fortnight?
6. How many different sports do the students in our class like to watch on television?
7. How many different events did the students in our class participate in during the school swimming carnival?
8. How many different events did the students in our class participate in during the school athletics carnival?
9. How many times have the students in our class used public transport in the last month?
10. How many different non-sporting hobbies do the students in our class have?

For your chosen question -

- check you understand the task
- collect data
- record data
- tabulate data
- calculate statistical measures
- represent the data as a suitable graph
- write a paragraph summarising what you have discovered about your class
- prepare a display of your findings to share with the rest of the class

Activity 4: KEYWORDS: Write a clear meaning for each of these words.

WORD	MEANING
data	
score	
ascending	
descending	
tally	
frequency	
mean	
median	
mode	
maximum	
minimum	
range	
population**	
sample**	
census **	

Department of Education

The Mathematical Association of Western Australia Inc.

Year 7 Mathematics

Statistics & Probability Activity

Board Game

Produced by a Department of Education - MAWA partnership project

written for the Year 7 Australian curriculum

TASK 31: BOARD GAME

Overview

This task involves playing a game with dice and a board. Students are asked to devise and trial a winning strategy then to explain if and why their strategy works. The students then design their own board for a similar game.

Students will need

- copy of the “game board”
- dice
- 5 coloured counters

Relevant content descriptions from the Western Australian Curriculum

- Assign probabilities to the outcomes of events and determine probabilities for events (ACMSP168)
- Construct sample spaces for single-step experiments with equally likely outcomes (ACMSP167)

Students can demonstrate

- fluency when they
  - calculate accurately with integers without using technology
- understanding when they
  - use the knowledge that they have learned in the first game to determine a strategy to win for the second game
- reasoning when they
  - explain why some outcomes are more likely than others

The basis of this task is a game that can be played by students of a variety of ages and the chances of the events occurring can be understood at many levels. Most students should be able to recognise that some outcomes occur more often than others and be able to give reasons for their conclusions. Other students should be able to determine the probability of the various outcomes and provide evidence for their conclusions.

For this activity, two 6-faced dice can be shared between two students and each student needs five coloured counters. The game can be easily played between two players and each player should have different coloured counters from their playing partner.

To play the game:

- Each person places their 5 counters on any of the rectangles on the game board.
- It is permissible to place all counters on just one rectangle.
- Determine a fair way to decide who goes first.
- The first person rolls the 2 dice and determines the **sum** of the numbers that face up.
- The first person takes 1 counter off that numbered rectangle (if they have a counter on the rectangle). There is no second turn.
- The second person rolls the 2 dice, determines the sum of the numbers that face up and if they have counters on the rectangle with that number, they take 1 counter off.
- Players continue in turn until one player has all their counters off the board.
- The first player to remove all their counters is the winner.

1. Play the game several times to become familiar with the rules.

Can you think of a strategy that will guarantee that you will lose the game?

Placing any counters on 1 will guarantee you lose unless your opponent also has counters on 1, in which case it will be a draw. You cannot get a sum of 1 when you toss two dice and add the numbers on the faces.

2. Think of a strategy to use to win the game. Describe the strategy. Give reasons why you think it will help you win the game.

Possible strategies include

- Don't put too many counters on 2 or 12 because there is only one way of getting these two numbers (1 + 1, 6 + 6).
- Put 3 or 4 counters on the numbers 6 to 8 because they come up more often than 9, 10, 11, 3, 4, or 5; e.g., 6 = 1 + 5, 5 + 1, 2 + 4, 4 + 2, 3 + 3, but 11 is only 5 + 6 or 6 + 5.
- The possibilities can be shown in the table below – with 5 counters it is not possible to share them out according to the probabilities of the different numbers.

3. Try your strategy, playing 5 games with your playing partner. Record the position of both players' counters in each game.

Encourage systematic display of how the game is played between the two players.

4. Did your strategy work? Explain.

Answers will vary according to strategies suggested. Strategies can help depending on your partner's understanding of likely outcomes. However, the outcomes are still due to chance so strategies can never be 100% reliable.

Dice 1 Dice 2	**1**	**2**	**3**	**4**	**5**	**6**
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

From the table it can be determined that the probabilities are as follows

Outcome	2	3	4	5	6	7	8	9	10	11	12
Probability	—	—	—	—	—	—	—	—	—	—	—

5. Design a similar game board for the result of tossing two different dice numbered Dice 1 and Dice 2. The counter is removed from the board according to the result of Dice 1 - Dice 2. Game Board 2 is available for this game.

1	2	3	4	5	0
-1	-2	-3	-4	-5	6

Determine a possible winning strategy. Describe your strategy.

Place more counters on or close to 0.
Don't place too many counters on 5 or -5.
Don't place any counters on 6.
Answers will vary according to the numbers placed on the board.
Good opportunity to see how students are reasoning, so look at the numbers they select for their board.

6. Try your strategy with a playing partner. Record your results. Did your strategy work?

Answers will vary

Number on Dice 1 – number on Dice 2

Die 1 Die 2	**1**	**2**	**3**	**4**	**5**	**6**
1	0	1	2	3	4	5
2	-1	0	1	2	3	4
3	-2	-1	0	1	2	3
4	-3	-2	-1	0	1	2
5	-4	-3	-2	-1	0	1
6	-5	-4	-3	-2	-1	0

From the table it can be determined that the probabilities are as follows

Outcome	-5	-4	-3	-2	-1	0	1	2	3	4	5
Probability	—	—	—	—	—	—	—	—	—	—	—

<u>Reflection</u>

Is it possible to develop a certain winning strategy? Justify your decision.

The results are always due to chance and can never be guaranteed.
Placing more counters on the more likely numbers is important.
Students might consider having 36 counters and putting them on the board in the proportions in which the numbers are likely to come up.

GAME BOARD 1

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

GAME BOARD 2

For this activity, two 6-faced dice can be shared between two students and each student needs five coloured counters. The game can be easily played between two players and each player should have different coloured counters from their playing partner.

To play the game:

- Each person places their 5 counters on any of the rectangles on the game board.
- It is permissible to place all counters on just one rectangle.
- Determine a fair way to decide who goes first.
- The first person rolls the 2 dice and determines the **sum** of the numbers that face up.
- The first person takes 1 counter off that numbered rectangle (if they have a counter on the rectangle). There is no second turn.
- The second person rolls the 2 dice, determines the sum of the numbers that face up and if they have counters on the rectangle with that number, they take 1 counter off.
- Players continue in turn until one player has all their counters off the board.
- The first player to remove all their counters is the winner.

1. Play the game a couple of times to become familiar with the rules.

Can you think of a strategy that will guarantee that you will lose the game?

2. Think of a strategy to use to win the game. Describe the strategy. Give reasons why you think it will help you win the game.

3. Try your strategy, playing 5 games with your playing partner. Record the position of both players' counters in each game.

4.Did your strategy work? Explain

5. Design a similar game board for the result of tossing two different dice numbered Dice 1 and Dice 2. The counter is removed from the board according to the result of Dice 1 - Dice 2. Game Board 2 is available for this game.

Determine a possible winning strategy. Describe your strategy.

6. Try your strategy with a playing partner. Record your results. Did your strategy work?

<u>Reflection</u>

Is it possible to develop a certain winning strategy? Justify your decision.

GAME BOARD 1

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

GAME BOARD 2

Department of Education

The Mathematical Association of Western Australia Inc.

Year 7 Mathematics

Statistics & Probability Activity

Data Displays

Produced by a Department of Education - MAWA partnership project

written for the Year 7 Australian curriculum

TASK 39: DATA DISPLAYS

Overview

The focus of this task is the use of different graphs to display data and the interpretation of the data displayed. Students should have had some experience of stem and leaf graphs and of calculating measures of central tendency.

Students will need

- calculators
- rulers/measuring tapes

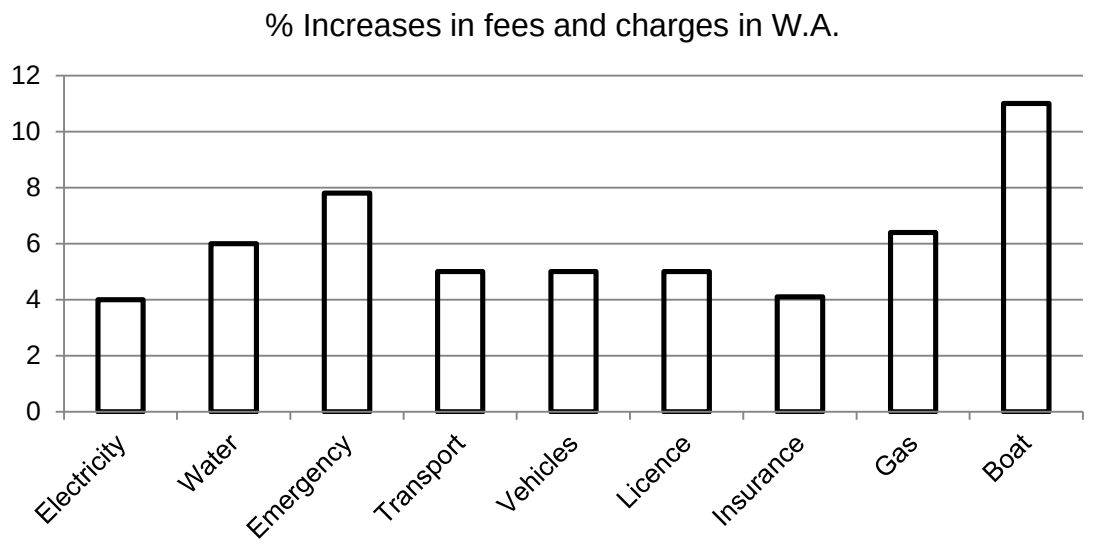
Relevant content descriptions from the Western Australian Curriculum

- Describe and interpret data displays and the relationship between the median, mean and range (ACMSP172)
- Construct and compare a range of data displays including stem-and-leaf plots and dot plots (ACMSP170)

Students can demonstrate

- *fluency* when they
  - calculate measures of central tendency
  - accurately represent data
- *understanding* when they
  - connect the data in the pie chart and the column graph
  - recognise the relationship of the mean, mode and median
- *reasoning* when they
  - explain the advantages and limitations of using particular graphs to represent data
  - interpret data displays

Activity 1



1. From the information provided in the graph, can you conclude that the fees and charges for gas increased more than the fees and charges for water? Justify your answer.

The percentage increase was more for gas but as the original costs are not known, it cannot be determined which actual increase in charges was the greatest or least.

2. Identify FIVE questions that could be used to test a student's interpretation of the data shown in the graph. Share your questions with another student.

Answers will vary. Below are some examples.

1. By what percentage did water fees and charges increase?

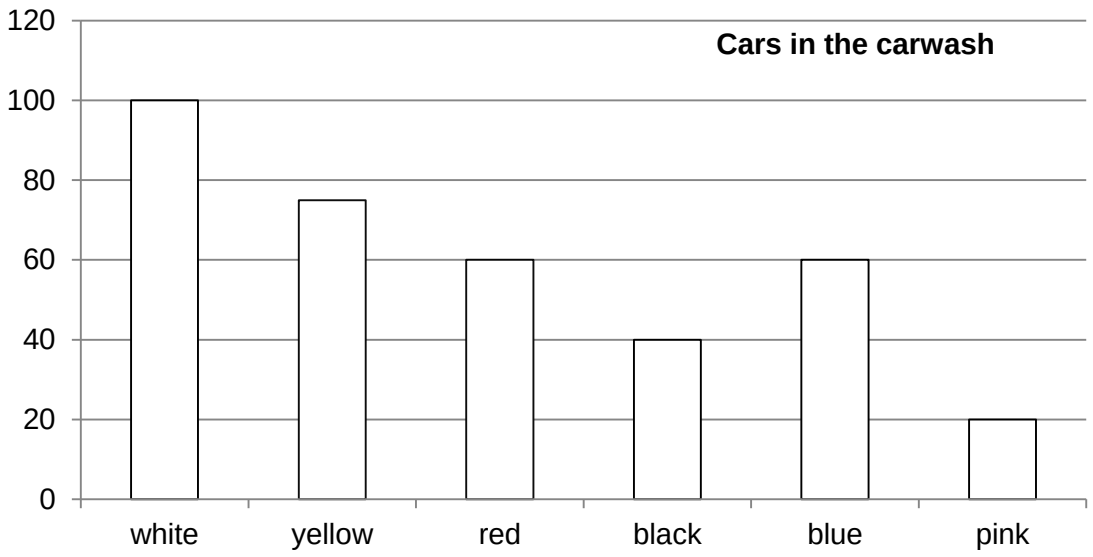
2. Which three services showed the same percentage increase?

3. How many services had increases exceeding 6%?

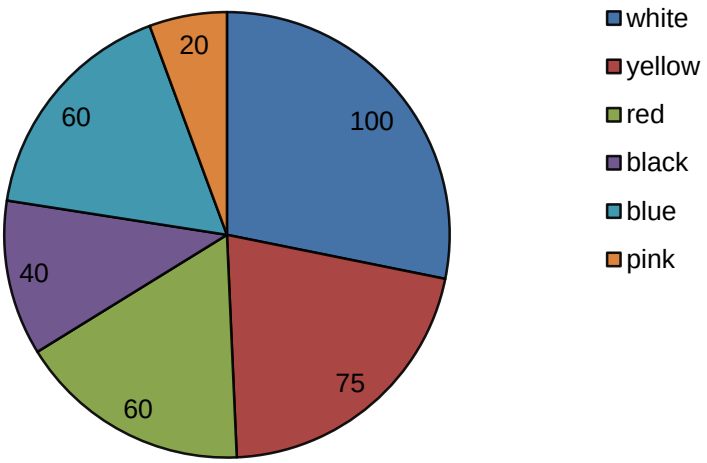
4. What services increased by the smallest proportion?

5. What is your estimate of the percentage increase in gas fees and charges?

3. The two graphs below represent the same data.



Complete the pie chart by finishing the legend and identifying each sector.



4. Describe one way by which the column graph better represents the data.

It is easy to read the values and to see the comparison of numbers.

5. Which graph would you prefer to use to represent the data? Justify your choice.

Answers will vary.

Activity 2

1. The graph below shows the lengths of students' hands as measured from their wrist to the tip of the longest finger. The measurements are in mm.

14	9						
15	6						
16	4	6	8				
17	0	0	2	2	5	8	
18	2	2	3	5	5	5	9
19	0	0	0	2	7	7	
20	0						

Ms Leaf's class

For this class determine the

(a) range 200 – 149 = 51 mm

(b) mode(s) 185 and 190

(c) median 180

(d) mean. 4487 ÷ 25 = 179.48

2. Describe how using a stem and leaf graph makes it easy to determine the range.

The minimum and maximum values are easily located as they are the first and last in the list. Then one only needs to take the minimum from the maximum.

3. The graph below also shows the lengths of students' hands as measured from their wrist to the tip of the longest finger for another class of students. The measurements are in mm.

Mr Stem's class

15	~~0~~
16	~~0~~
17	~~0~~ ~~3~~ ~~3~~ ~~4~~
18	~~0~~ ~~0~~ 0 ~~0~~ 0 ~~1~~ ~~1~~ ~~3~~ ~~5~~ ~~5~~ ~~6~~ ~~8~~
19	~~0~~ ~~1~~
20	4

(a) Describe an advantage of using a "stem and leaf" graph.

It is very quick to create

(a) Describe a limitation of using a "stem and leaf" graph.

If there were many numbers it may not be easy to see a pattern, especially if the numbers were close in value.

4. Describe to another student a "crossing-out" method for determining the median in a stem and leaf graph.

Cross out a number from each end until there is just one (or two) left. If one left, it will be the median; if two left then they are averaged to calculate the median.

Determine the -

(a) Mode 180

(b) Mean 179.7

(c) Median (use your crossing out method) 180

5. How "close" are the median, mean and mode? Is this to be expected? Justify your decision.

They are very close in value. This is much closer than expected but not inaccurate. It can happen as a result of chance, but the larger sample the more it is likely to occur.

6. Create a table to record the statistics for both classes. Does the evidence suggest that both classes are the same year groups? Explain.

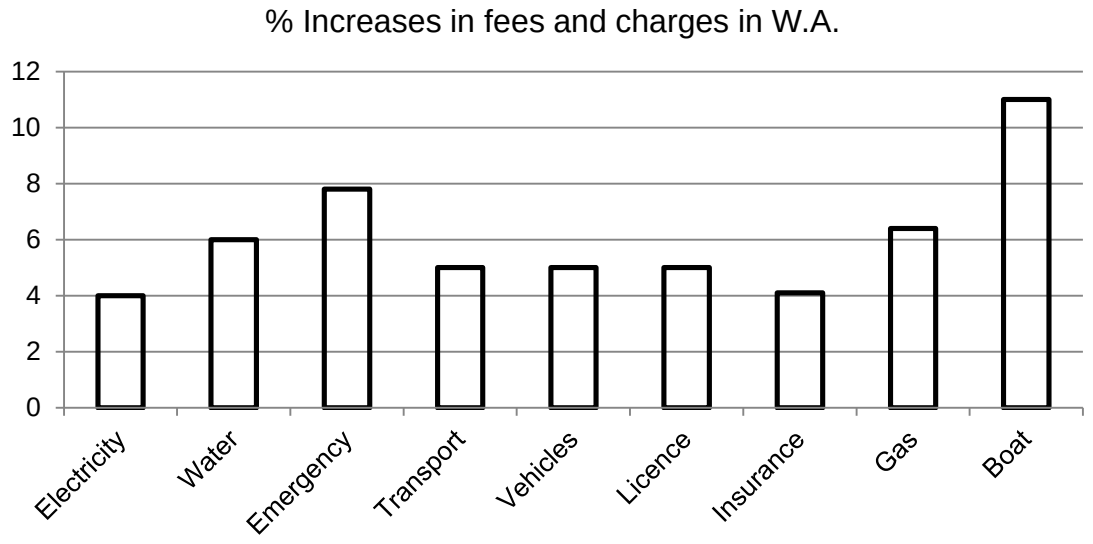
Statistic	Ms Leaf's class	Mr Stem's class
Minimum	149	150
Maximum	200	204
Range	51	54
Mode	185 and 190	180
Mean	179.48	179.7
Median	180	180

For both classes the median is the same and the means are very close in value. The mode for Mr Stem's class is the mean of the two modes for Ms Leaf's class. The minimum and maximum values are not the same but are very close in value, so these statistics suggest the data comes from two classes from the same year.

7. Create a stem and leaf graph of hand length for your class.
Calculate relevant statistics.
Does it appear that your class is older or younger than the above two classes? Use mathematics to justify your conclusion.

The answers will vary, but students should determine the statistics as in the previous activities and use a similar comparison as in the previous activity.

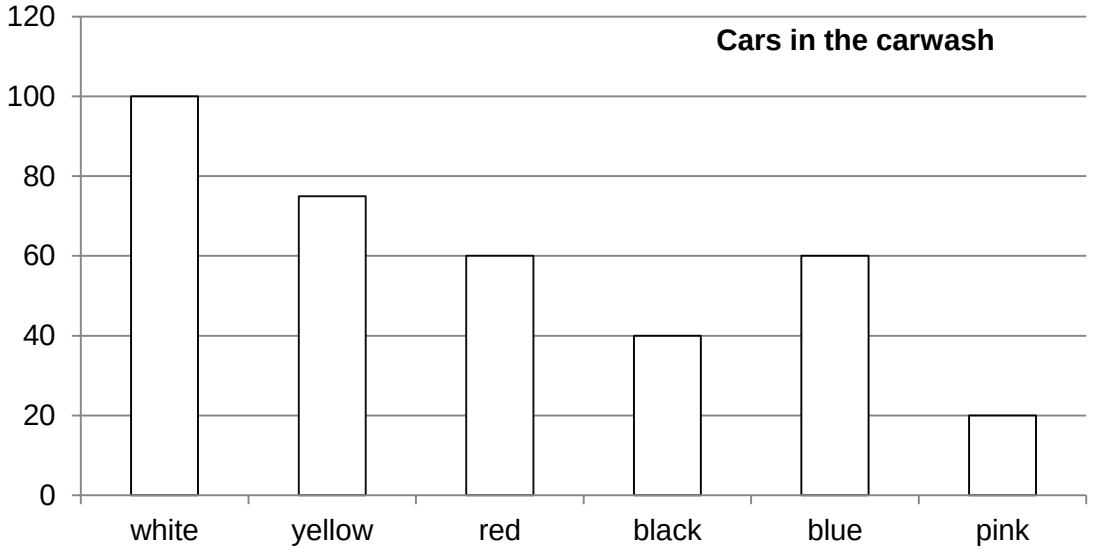
Activity 1



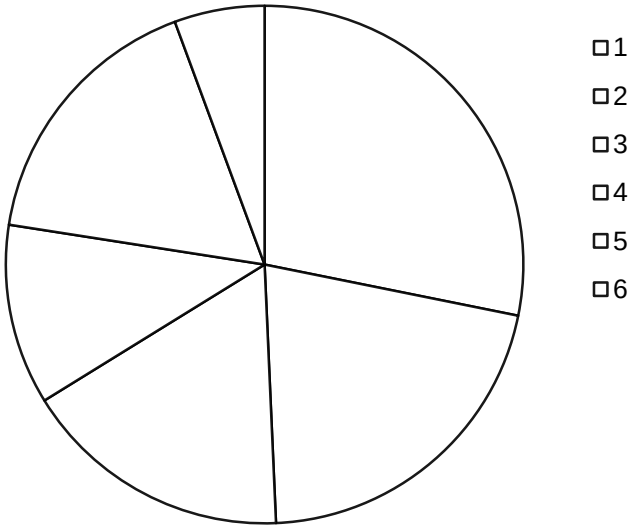
1. From the information provided in the graph, can you conclude that the fees and charges for gas increased more than the fees and charges for water? Justify your answer.

2. Identify FIVE questions that could be used to test a student's interpretation of the data shown in the graph. Share your questions with another student.

3. The two graphs below represent the same data.



Complete the pie chart by finishing the legend and identifying each sector.



4. Describe one way by which the column graph better represents the data.

5. Which graph would you prefer to use to represent the data? Justify your choice.

Activity 2

1. The graph below shows the lengths of students' hands as measured from their wrist to the tip of the longest finger. The measurements are in mm.

14	9						
15	6						
16	4	6	8				
17	0	0	2	2	5	8	
18	2	2	3	5	5	5	9
19	0	0	0				
20	0						

Ms Leaf's class

For this class determine the

(a) range

(b) mode(s)

(c) median

(d) mean.

2. Describe how using a stem and leaf graph makes it easy to determine the range.

3. The graph below also shows the lengths of students' hands as measured from their wrist to the tip of the longest finger for another class of students. The measurements are in mm.

Mr Stem's class

15	0
16	0
17	0 0 3 3 4
18	0 0 0 0 0 1 1 3 5 5 6 8
19	0 1
20	4

(a) Describe an advantage of using a "stem and leaf" graph.

(a) Describe a limitation of using a "stem and leaf" graph.

4. Describe to another student a "crossing-out" method for determining the median in a stem and leaf graph.

Determine the -

(a) Mode

(b) Mean

(c) Median (use your crossing out method).

5. How "close" are the median, mean and mode? Is this to be expected? Justify your decision.

6. Create a table to record the statistics for both classes. Does the evidence suggest that both classes are the same year groups? Explain.

7. Create a stem and leaf graph of hand length for your class.
   Calculate relevant statistics.
   Does it appear that your class is older or younger than the above two classes? Use mathematics to justify your conclusion.

Department of Education

The Mathematical Association of Western Australia Inc.

Year 7 Mathematics

Statistics & Probability Activity

What Height?

Produced by a Department of Education - MAWA partnership project

written for the Year 7 Australian Curriculum

TASK 106: WHAT HEIGHT?

Overview

In this task, students will use data collected to compare their height to that of other students. Students will be required to represent concepts in different ways and identify differences between ‘averages’. They will need to recall factual knowledge and concepts to aid in interpreting the mathematical information in order to compare their heights to those of other students.

Students will need

- calculator
- graph paper

Relevant content descriptors from the Western Australian Curriculum

- Identify and investigate issues involving numerical data collected from primary and secondary sources (ACMSP169)
- Construct and compare a range of data displays including stem-and-leaf plots and dot plots (ACMSP170)
- Calculate mean, median, mode and range for sets of data. Interpret these statistics in the context of data (ACMSP171)
- Describe and interpret data displays using median, mean and range (ACMSP172)

Students can demonstrate

- *fluency* when they
    - identify the information required
    - choose how to record this information
    - represent this information in graphical form
- *understanding* when they
    - identify the different ‘averages’ that can be calculated
- *reasoning* when they
    - choose and explain why a particular ‘average’ is the best to use
    - compare their height to that of their peers
- *problem solving* when they
    - explain how the calculation of the ‘averages’ differ

How does your height compare to that of the height of the other students in your class?

Activity 1

1. To answer the question above, consider what information you will need.

   Students will need to measure the height of all students in the class.
   No other information is required.
   However, you may wish to collect additional information; e.g., gender, birthday, shoe size etc., to extend students and investigate whether this has an effect on their height.

2. Choose a way to record the collection of this information.

   This information would be best recorded in a tally chart using class intervals.
   For example:
   110 cm – 119 cm
   120 cm – 129 cm
   130 cm – 139 cm
   This will then require students to calculate an estimated mean.

   You may want to use a master chart on the chalk/white board in order to share information collected and ensure all students have the same data.

Activity 2

1. Using the information collected, find the average or mean height of a student in your class. Then find the median height and mode.

   Students in the same class should have the same 'averages' provided they have collected all of the relevant data.
   Students should have found the mean, median, mode and range.

2. What are the differences in finding each 'average'?

   Mean – add all of the data values and divide by how many values there are.
   Median – the middle value of an ordered data set.
   Mode – the value that occurs most often.
   Range – the difference between the greatest data value and the smallest data value.

3. What would you consider to be the 'best average' for this task?
   Explain why you have chosen that particular average.

   Answers will vary. Ensure students have provided a valid reason for their choice.
   For example, any outliers in the data will not affect the median.

Activity 3

Representing data in a graph can be a useful visual tool to help you analyse that data and draw conclusions. Use the space below to represent your data in two different graphs.

Students may choose different graphs, however; at Year 7 level they should be focusing on stem-and-leaf plots and dot plots. You may wish to stipulate what graphs you would prefer them to do.
Always ensure the students are using a ruler.
Check the axis, spacing, labels, dots, order and bars, if applicable.

Activity 4

Considering your data, 'averages' and graphs, discuss how your height compares to that of the other students in your class.

Answers will vary.
Students should make at least two points on how their height is similar to that of other student's and how their height is different from that of other students in their class.

How does your height compare to the height of the other students in your class?

Activity 1

1. To answer the question above, consider what information you will need.

2. Choose a way to record the collection of this information.

Activity 2

1. Using the information collected, find the average or mean height of a student in your class. Then find the median height and mode.

2. What are the differences in finding each ‘average’?

3. What would you consider to be the ‘best average’ for this task? Explain why you have chosen that particular average.

Activity 3

Representing data in a graph can be a useful visual tool to help you analyse that data and draw conclusions. Use the space below to represent your data in two different graphs.

Activity 4

Considering your data, ‘averages’ and graphs, discuss how your height compares to that of all the other students in your class.

Department of Education

The Mathematical Association of Western Australia Inc.

Year 7 Mathematics

Statistics & Probability Activity

To Chore Or Not To Chore

Produced by a Department of Education - MAWA partnership project

written for the year 7 australian curriculum

TASK 111: TO CHORE OR NOT TO CHORE

Overview

In this task, students will collect information on the housework habits of the students in their class. They will use and analyse this data to predict whether they will be subject to domestic inequality in the future.

Students will need

- calculators
- access to the internet

Relevant content descriptors from the Western Australian Curriculum

- Identify and investigate issues involving numerical data collected from primary and secondary sources (ACMSP169)
- Calculate mean, median, mode and range for sets of data. Interpret these statistics in the context of data (ACMSP171)

Students can demonstrate

- *fluency* when they
    - construct survey questions
    - plan how to collect information
    - calculate average housework hours
- *understanding* when they
    - identify factors that may need to be considered when creating a survey
- *reasoning* when they
    - recognise their results to be unreliable
    - attempt to reason how to make a change
- *problem solving* when they
    - interpret their results
    - make a prediction for their future

Recent research that has been released has showed that regardless of whether women stay home, work part-time or full-time, they still take on a significantly greater load of housework and childcare than men.

Researchers found that women spent three times as long on domestic chores, such as cooking, cleaning and washing, as their husbands or partners. Some female breadwinners, however, have to shoulder the burden of all the housework as almost one in five men admitted to doing nothing at all around the home.

The average for women was 17 hours per week, compared to just less than 6 hours for men. These times exclude childcare, which is also traditionally far more likely to fall on women.

The findings come despite the best intentions of most men, who agreed that they should share the burden by doing more housework.

Will this gender inequality carry on into your generation?

Activity 1

Your task is to design a survey, collect data from your classmates and use this data to determine whether it is likely that this trend will continue into your generation.

You may want to consider the following:

- What questions do you need to ask?
- What factors need to be taken into consideration?
- How will you record your information?

A think board may help them work together as a class to generate appropriate questions.
They should record the gender of the participants.
They will need to consider how long each student spends at home each day.
They will need to consider how many hours of housework each student does per day.
It may be more appropriate for your class to consider a week instead of a day.

Activity 2

1. What is the average number of hours that girls in your class do housework each day?

   Answers will vary.
   You may want to specify which ‘average’ to use.
   Mean is calculated out of 24 hours.

2. What is the average number of hours that boys in your class do housework each day?

   Answers will vary.
   You may want to specify which ‘average’ to use.
   Mean is calculated out of 24 hours.

3. What is the average percentage of housework completed by girls per day?

   Answers will vary.
   You may want to specify which ‘average’ to use.
   Percentage per day: Divide hours worked by 24 and from the decimal obtained, determine how many hundredths, as this is the percentage.
   Emphasise to students that Per cent = Hundredths.

4. What is the average percentage of housework completed by boys per day?

   Answers will vary.
   You may want to specify which ‘average’ to use.
   Percentage per day: Divide hours worked by 24 and from the decimal obtained, determine how many hundredths, as this is the percentage.

5. What is the average percentage of time spent on housework by girls, out of the total time spent at home?

   Answers will vary.
   You may want to specify which ‘average’ to use.
   Percentage per time at home: Divide hours worked by number of hours at home and from the decimal obtained, determine how many hundredths, as this is the percentage.

6. What is the average percentage of housework completed by boys, out of the total time spent at home?

   Answers will vary.
   You may want to specify which ‘average’ to use.
   Percentage per time at home: Divide hours worked by number of hours at home and from the decimal obtained, determine how many hundredths, as this is the percentage.

<u>Activity 3</u>

This activity could be used as a plenary or feedback session.

1. Are the results what you expected?

   Answers will vary.

2. Will this trend continue on into your generation?

   Answers will vary.

3. How reliable is your prediction? Explain why it is or isn’t reliable.

   Answers will vary.

4. Is there anything you can do to change this trend for the future?

   Answers will vary.

Recent research that has been released has showed that regardless of whether women stay home, work part-time or full-time, they still take on a significantly greater load of housework and childcare than men.

Researchers found that women spent three times as long on domestic chores, such as cooking, cleaning and washing, as their husbands or partners. Some female breadwinners, however, have to shoulder the burden of all the housework as almost one in five men admitted to doing nothing at all around the home.

The average for women was 17 hours per week, compared to just less than 6 hours for men. These times exclude childcare, which is also traditionally far more likely to fall on women.

The findings come despite the best intentions of most men, who agreed that they should share the burden by doing more housework.

Will this gender inequality carry on into your generation?

Activity 1

Your task is to design a survey, collect data from your classmates and use this data to determine whether it is likely that this trend will continue into your generation.

You may want to consider the following:

- What questions do you need to ask?
- What factors need to be taken into consideration?
- How will you record your information?

Activity 2

1. What is the average number of hours that girls in your class do of housework each week?

2 What is the average number of hours that boys in your class do of housework each week?

3. What is the average percentage of housework completed by girls per day?

4. What is the average percentage of housework completed by boys per day?

5. What is the average percentage of housework completed by girls, out of the total time spent at home?

6. What is the average percentage of housework completed by boys, out of the total time spent at home?

Activity 3

1. Are the results what you expected?

2. Will this trend continue on into your generation?

3. How reliable is your prediction? Explain why it is or isn't reliable.

4. Is there anything you can do to change this trend for the future?

Department of Education

The Mathematical Association of Western Australia Inc.

Year 7 Mathematics

Statistics & Probability Activity

How Do I Compare?

Produced by a Department of Education - MAWA partnership project

written for the Year 7 Australian Curriculum

TASK 116: HOW DO I COMPARE?

Overview

In this task, students will investigate whether or not they are an average Australian student. They will be required to document data regarding themselves, interpret data to calculate averages of other students and then analyse, compare and contrast both sets of data using mathematical reasoning to reach conclusions.

No special equipment required

Relevant content descriptions from the Western Australian Curriculum

- Identify and investigate issues involving numerical data collected from primary and secondary sources (ACMSP169))
- Construct and compare a range of data displays including stem-and-leaf plots and dot plots (ACMSP170)
- Calculate mean, median, mode and range for sets of data. Interpret these statistics in the context of data (ACMSP171)
- Describe and interpret data displays using median, mean and range (ACMSP172)

Students can demonstrate

- *fluency* when they
  - complete the tally chart
  - calculate the averages
  - represent the data in a histogram
- *understanding* when they
  - look at the different data sets and calculate appropriate averages
- *reasoning* when they
  - compare themselves, with reference to the other students
- *problem solving* when they
  - deduce whether they are or are not an average Australian student

Activity 1

In this task you will compare yourself to other students from around the country to see how you compare in different categories.

First you must answer the following questions about yourself:

1. Your height in centimetres _____
   Answers will vary

2. Hours spent doing homework per week _____
   Answers will vary

3. Hours spent on sport per week _____
   Answers will vary

4. Hours spent on video games per week _____
   Answers will vary

5. Hours spent doing work around the house _____
   Answers will vary

Activity 2

The table below shows 20 students from around the country that have answered the same questions that you have just answered. This data has been displayed in a table. Use this data to answer the questions that follow.

Student Number	Height (cm)	Hours homework	Hours sport	Hours video games	Hours house work
1	152	8	12	1	2
2	151	1	0	20	2
3	170	4	6	11	0
4	142	1	2	15	3
5	157	2	10	1	5
6	148	8	13	3	4
7	168	6	13	4	1
8	168	1	3	1	2
9	146	1	10	0	2
10	182	6	18	1	5
11	162	2	10	1	2
12	135	10	24	13	24
13	157	8	14	5	20
14	125	2	5	0	1
15	145	10	12	21	1
16	160	3	12	0	16
17	167	1	1	40	5
18	154	6	4	4	4
19	177	11	5	14	7
20	160	6	2	0	0

1. Complete the frequency table for the number of hours spent on homework

Hours Spent on Homework	Tally	Frequency
1 – 2	~~IIII~~ III	8
3 – 4	II	2
5 – 6	IIII	4
7 – 8	III	3
9 – 10	II	2
11 – 12	I	1

2. Calculate the mean number of hours spent on homework

97/20 = 4.85 hours

3. Calculate the mode for homework.

1 hour

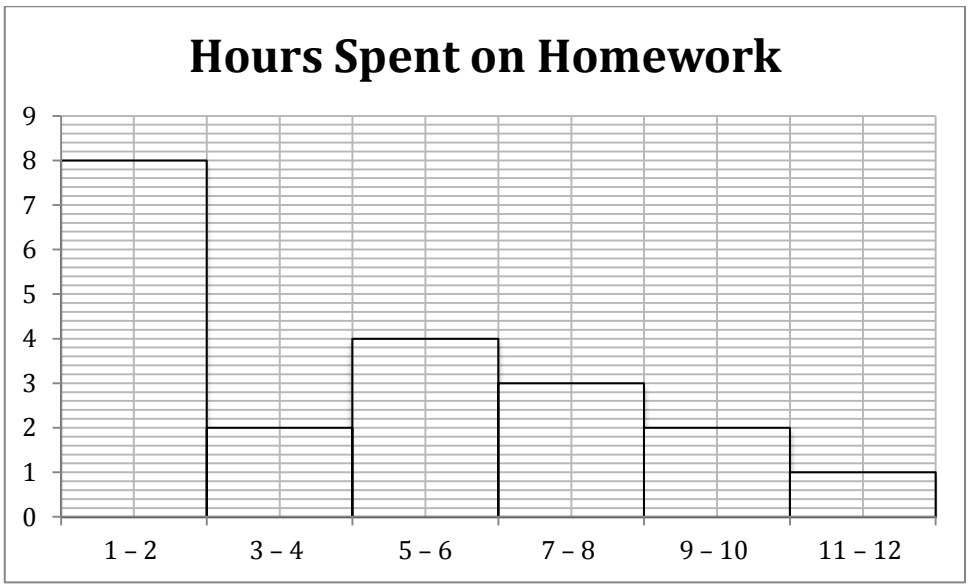
4. Calculate the median for homework.

Between 4 & 6 which is 5 hours

5. Calculate the range for homework.

11 – 1 = 10 hours

6. Represent the data for the number of hours spent on homework as a frequency histogram



Activity 3

1. Take a closer look at the data on height. What is the 'average' height of students from around the country? Choose the most appropriate average and explain why you have chosen that one.
   Allow students to calculate the 'average' they feel is appropriate. They must provide an acceptable reason as to why they have chosen that particular average.
   Mean: 156.3 cm
   Median: 157 cm
   Mode: no mode
   Range: 57 cm

2. Take a closer look at the data on sport. What's the 'average' amount of time spent on sport for the students from around the country? Choose the most appropriate average and explain why you have chosen that one.
   Allow students to calculate the 'average' they feel is appropriate. They must provide an acceptable reason as to why they have chosen that particular average.
   Mean: 8.8 hours
   Median: 10 hours
   Mode: 10 and 12 hours
   Range: 24 hours

3. Take a closer look at the data on video games. What's the 'average' amount of time spent on video games for the students from around the country? Choose the most appropriate average and explain why you have chosen that one.
   Allow students to calculate the 'average' they feel is appropriate. They must provide an acceptable reason as to why they have chosen that particular average.
   Mean: 7.75 hours
   Median: 3.5 hours
   Mode: 1 hour
   Range: 40 hours

4. Take a closer look at the data on housework. What's the 'average' amount of time spent on housework for the students from around the country? Choose the most appropriate average and explain why you have chosen that one.
   Allow students to calculate the 'average' they feel is appropriate. They must provide an acceptable reason as to why they have chosen that particular average.
   Mean: 5.3 hours
   Median: 2.5 hours
   Mode: 2 hours
   Range: 24 hours

Activity 4

How do you compare to the other students from around the country?
Write a paragraph as to how your results are similar or different from the results obtained from around the country. Are you an average Australian student?

Discuss with class.

For example,
Are you taller/shorter than the average student?
Do you study more/less than the average student?

Answers will vary.

Activity 1

In this task you will compare yourself to other students from around the country to see how you compare in different categories.

First you must answer the following questions about yourself:

1. Your height in centimetres _____

2. Hours spent doing homework per week _____

3. Hours spent on sport per week _____

4. Hours spent on video games per week _____

5. Hours spent doing work around the house _____

Activity 2

The table below shows 20 students from around the country that have answered the same questions that you have just answered. This data has been displayed in a table. Use this data to answer the questions that follow.

Student Number	Height (cm)	Hours homework	Hours sport	Hours video games	Hours house work
1	152	8	12	1	2
2	151	1	0	20	2
3	170	4	6	11	0
4	142	1	2	15	3
5	157	2	10	1	5
6	148	8	13	3	4
7	168	6	13	4	1
8	168	1	3	1	2
9	146	1	10	0	2
10	182	6	18	1	5
11	162	2	10	1	2
12	135	10	24	13	24
13	157	8	14	5	20
14	125	2	5	0	1
15	145	10	12	21	1
16	160	3	12	0	16
17	167	1	1	40	5
18	154	6	4	4	4
19	177	11	5	14	7
20	160	6	2	0	0

1. Complete the frequency table for the number of hours spent on homework.

Hours spent on homework	Tally	Frequency

2. Calculate the mean number of hours spent on homework.

3. Calculate the mode for homework.

4. Calculate the median for homework.

5. Calculate the range for homework.

6. Represent the data for the number of hours spent on homework as a frequency histogram.

Activity 3

1. Take a closer look at the data on height. What is the ‘average’ height of students from around the country? Choose the most appropriate average and explain why you have chosen that one.

2. Take a closer look at the data on sport. What’s the ‘average’ amount of time spent on sport for the students from around the country? Choose the most appropriate average and explain why you have chosen that one.

3. Take a closer look at the data on video games. What's the 'average' amount of time spent on video games for the students from around the country? Choose the most appropriate average and explain why you have chosen that one.

4. Take a closer look at the data on housework. What's the 'average' amount of time spent on housework for the students from around the country? Choose the most appropriate average and explain why you have chosen that one.

Activity 4

How do you compare to the other students from around the country?
Write a paragraph as to how your results are similar or different from the results obtained from around the country. Are you an average Australian student?

For example,
Are you taller/shorter than the average student?
Do you study more/less than the average student?

Department of Education

The Mathematical Association of Western Australia Inc.

Year 7 Mathematics

Statistics & Probability Activity

Spin To Win

Produced by a Department of Education - MAWA partnership project

written for the year 7 australian curriculum

TASK 127: SPIN TO WIN

Overview

In this task, students are required to investigate the reliability and fairness of spinners. They will apply their familiar notions to develop new ideas and an understanding of the relationship between the 'why' and 'how'. They will need to make choices and plan their approach to find a solution. They are required to justify their solutions by reflecting on and comparing their methods.

Students will need

- card
- scissors
- colouring pens/pencils
- pencil or toothpick

Relevant content descriptions from the Western Australian Curriculum

- Construct sample spaces for single-step experiments with equally likely outcomes (ACMSP167)
- Assign probabilities to the outcomes of events and determine probabilities for events (ACMSP168)

Students can demonstrate

- *fluency* when they
  - develop a strategy to answer the question
  - successfully record results
  - successfully complete the game and records results
- *understanding* when they
  - decide correctly whether or not their spinner is fair
  - develop a spinner to meet the set probabilities
  - calculate the probabilities of an unfair spinner
- *reasoning* when they
  - justify whether or not their spinner is fair
- *problem solving* when they
  - develop the spinner in Activity 3

Activity 1

Spinners are often used in board games to determine what a person has to do for their turn. Are spinners a fair way to make these decisions? Your task is to create a spinner that is seemingly fair and then test it to find out if it is in fact fair.

Using the template on the last page, if required, create a spinner that should be fair when spun.

- Students should use card where possible to create the spinner.
- Students may choose not to use the template.
- They can combine sections on the template to make fewer colours on the spinner.
- Ensure all sections are the same size.

Activity 2

1. Test the fairness of your spinner. To do this, consider the following:

- How will you do this?
- How will you record the results?
- How many spins will you need to do?
- What will happen if it lands in-between colours?
- How do you know if it is or isn't fair?

- Students should cut out the spinner.
- Use a pencil/toothpick to poke through the middle of the spinner to spin it.
- Alternatively use spinning arrows if available.
- They should draw up a table to record results.
- The more time available, allow for more spins, as results will be more precise.
- Discuss discounting the spin if it lands between two colours.
- If the probabilities are roughly all the same, the spinner can be deemed as fair.

2. Once you have tested your spinner, comment on whether or not it is fair and explain why it is or isn't.

- If all probabilities are roughly the same, the spinner is fair.
- Allow for some differences, depending on how many spins.
- The more spins the closer the probabilities will be.
- If the spinner is not cut out correctly or the pencil/toothpick is not centred, this will affect results.

Activity 3

Now let's look at spinners that are designed not to be fair.

Using the template on the last page, if required, to create a spinner with the following probabilities:

- Probability of landing on red 0.2
- Probability of landing on blue 0.1
- Probability of landing on yellow 0.4
- Probability of landing on green 0.25
- Probability of landing on orange 0.05

- Students should use card where possible to create the spinner.
- Students may choose not to use the template.
- Discuss how they can divide up the sections to meet the requirements.
- Each section on the template has a probability of 0.1.

Activity 4

1. Play a game with a partner to test the reliability of you spinner. You will need to consider the following:

- Each player will have 25 spins
- The player who lands on green has the most wins
- Record the results mathematically in a table.

- Students should cut out the spinner.
- Use a pencil/toothpick to poke through the middle of the spinner to spin it.
- Alternatively use spinning arrows if available.
- They should draw up a table to record results.
- They should include each person and each colour. They may require guidance. A sample could be drawn on the whiteboard.
- Discuss discounting the spin if it lands between two colours.

2. Once you have played your game and found a winner, decided whether your spinner worked according to the probabilities set out in Activity 3. Why or why not?

- Answers will vary

3. Use your scores to calculate the probability of landing on each colour.

- Answers will vary
- Students should count how many times each colour came up – from both players.

4. Do the probabilities found from the results match those in Activity 3? Give your reasons.

- Answers will vary
- It is likely the probabilities will not match due to minimal sample size.

5. Why do the probabilities from the results match/not match the probabilities set out in Activity 3?

- 50 spins is a low number.
- The more spins, the more likely results will be similar to the probabilities set out.

6. Comment on how you would make any changes to improve the reliability of the spinners?

- Answers will vary
- Improving cutting
- Use a spinning arrow
- Centre pencil/toothpick
- Do more spins

Activity 1

Spinners are often used in board games to determine what a person has to do for their turn. Are spinners a fair way to make these decisions? Your task is to create a spinner that is seemingly fair and then test it to find out if it is in fact fair.

Using the template on the last page, if required, create a spinner that should be fair when spun.

Activity 2

1. Test the fairness of your spinner. To do this, consider the following:

- How will you do this?
- How will you record the results?
- How many spins will you need to do?
- What will happen if it lands in-between colours?
- How do you know if it is or isn't fair?

2. Once you have tested your spinner, comment on whether or not it is fair and explain why it is or isn't.

Activity 3

Now let's look at spinners that are designed not to be fair.

Using the template on the last page, if required, to create a spinner with the following probabilities:

- Probability of landing on red 0.2
- Probability of landing on blue 0.1
- Probability of landing on yellow 0.4
- Probability of landing on green 0.25
- Probability of landing on orange 0.05

Activity 4

1. Play a game with a partner to test the reliability of you spinner. You will need to consider the following:

- Each player will have 25 spins
- The player who lands on green has the most wins
- Record the results mathematically in a table.

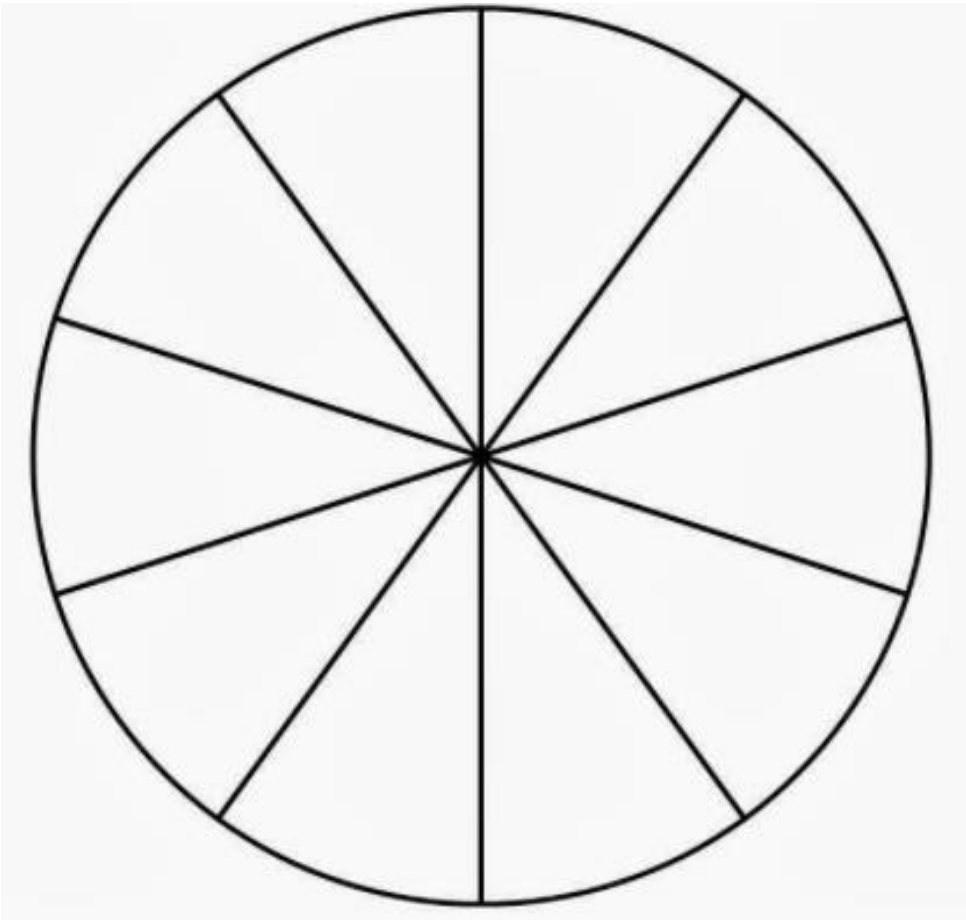
2. Once you have played your game and found a winner, decided whether your spinner worked according to the probabilities set out in Activity 3. Why or why not?

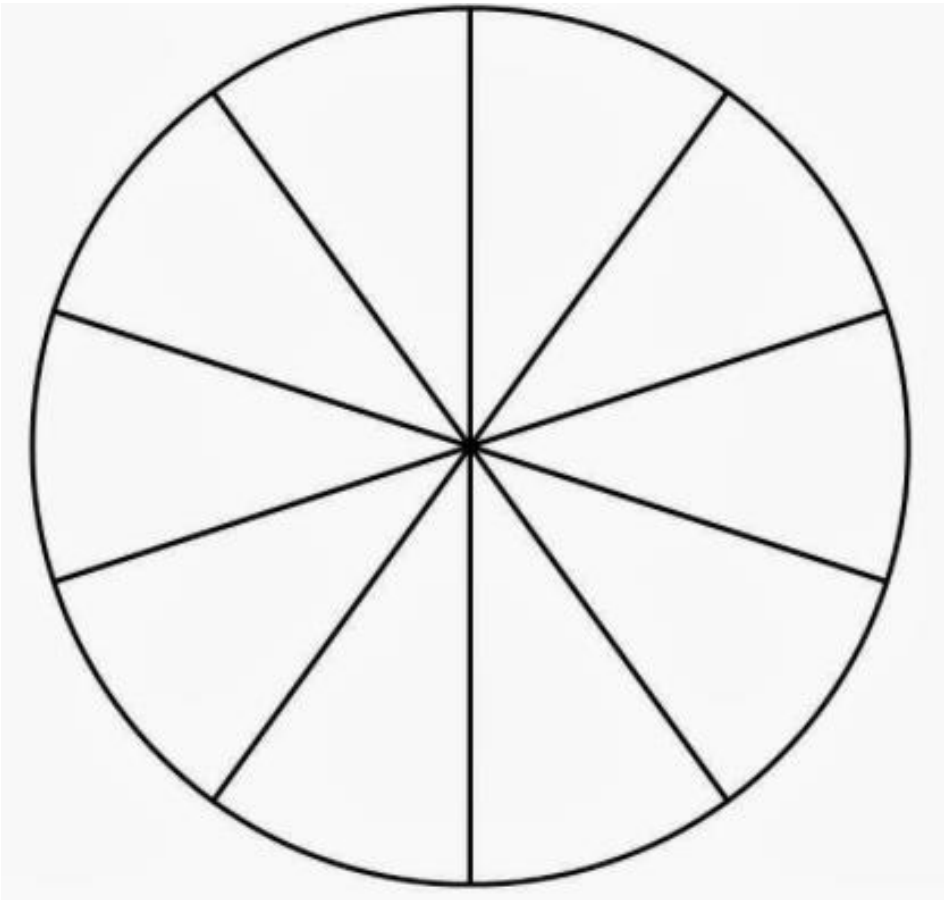
3. Use your scores to calculate the probability of landing on each colour.

4. Do the probabilities found from the results match those in Activity 3? Give your reasons.

5. Why do the probabilities from the results match/not match the probabilities set out in Activity 3?

6. Comment on how you would make any changes to improve the reliability of the spinners?





Department of Education

The Mathematical Association of Western Australia Inc.

Year 7 Mathematics

Statistics & Probability Activity

Ratio Head

Produced by a Department of Education - MAWA partnership project

written for the Year 7 Australian Curriculum

TASK 129: RATIO HEAD

Overview

In this task, students will investigate the ratios between different body parts. They are first required to estimate the sizes of different body parts. They will need to work together with a partner to measure specified body parts. They will need to recall factual knowledge and carry out procedures readily to collect the relevant information. Using this information they will need to calculate ratios and transfer the information to a graph. They will need to identify patterns within the information by examining their work and extend their finding to the unknown.

Students will need

- measuring tape
- calculator

Relevant content descriptions from the Western Australian Curriculum

- Identify and investigate issues involving numerical data collected from primary and secondary sources (ACMSP169)
- Construct and compare a range of data displays including stem-and-leaf plots and dot plots (ACMSP170)
- Calculate mean, median, mode and range for sets of data. Interpret these statistics in the context of data (ACMSP171)
- Recognise and solve problems involving simple ratios (ACMNA173)

Students can demonstrate

- *fluency* when they
  - measure specified body parts
  - calculate class average
- *understanding* when they
  - estimate the size of specified body parts
  - complete the ratios as required
  - display information on a scatter graph
- *reasoning* when they
  - identify and explain any patterns in the ratios
- *problem solving* when they
  - attempt to find other body part ratios

How big is your foot? Do you know of a quick way to estimate the size of your foot?

Compare the size of your foot to the length of your forearm, what do you notice? The two body parts should be very close in size. Are there any other body parts that might be the same size? Are there any interesting ratios between the sizes of different body parts?

Activity 1

To answer the questions above, let's collect some information about our body measurements. To complete the table below, estimate the size of each body part and then measure, with the help of a partner. Then swap places so partner can record results. Once all the class has done this, calculate the class averages and enter them on the table.

Body Part	Estimated Size (cm)	Actual Size (cm)	Class Average (cm)
Height			
Arm Span			
Waist circumference			
Neck circumference			
Wrist circumference			
Length of nose			
Length of head			
Length of hand			
Length of foot			
Length of face			
Length of ear			
Length of forearm			
Width of eye			
Width of head			
Distance between tip of thumb and pinky			
Distance between eyes			

- Students will need some guidance on how to estimate the size of each body part.
- They could estimate the size of their hand and then use that to estimate some of the other sizes.
- Draw a master table on the whiteboard for calculating the class average or allocate it to a group of students.

Activity 2

1. Using your actual measurements from above, complete the information below. Round off to the nearest whole number or common fraction.

1 length of foot = _____1 x_____ length of forearm
1 waist circumference = _____ neck circumference
1 height = _____ arm span
1 length of foot = _____ length of face
1 width of eye = _____ distance between eyes
1 width head = _____ width of eye

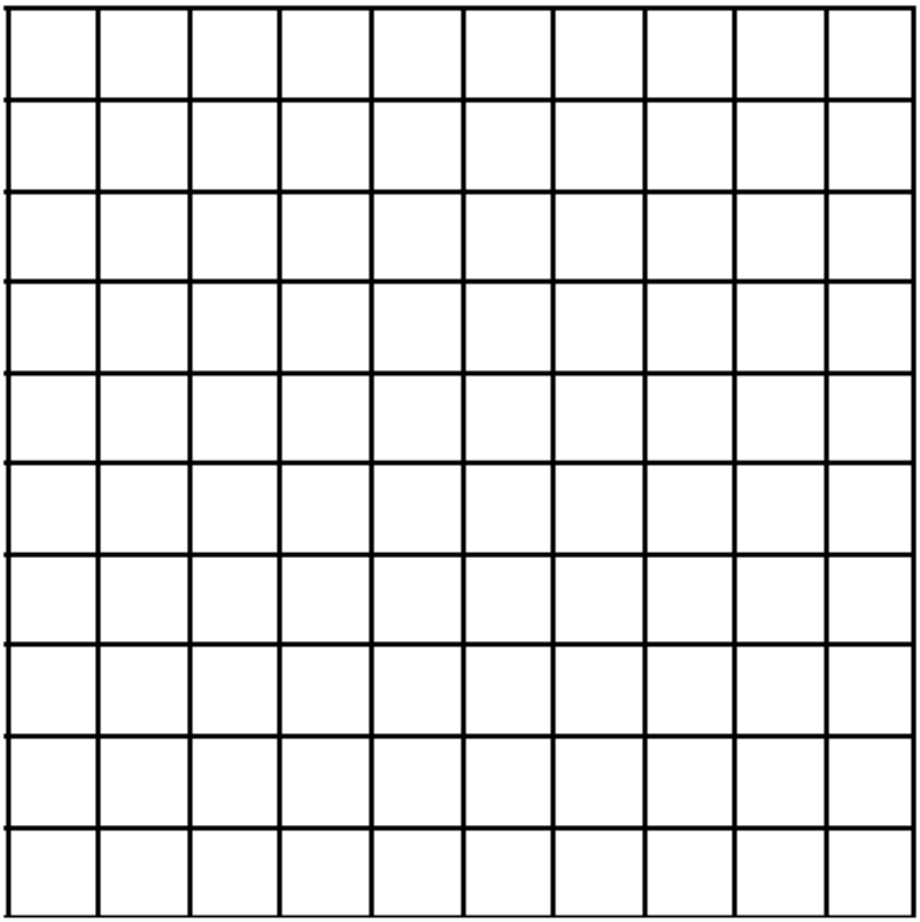
2. Using the class average measurements from above, complete the information below. Round off to the nearest whole number or common fraction.

1 length of foot =	1 x	length of forearm
1 waist circumference =	_____	neck circumference
1 height =	_____	arm span
1 length of foot =	_____	length of face
1 width of eye =	_____	distance between eyes
1 width head =	_____	width of eye

Answers will vary. Use the class feedback session to identify common body part ratios.

Activity 3

1. Choose two measurements that you think are linked, then display both of them on the same scatter graph.



Answers will vary.
Some students may not be comfortable drawing scatter graphs, so offer assisstance if necessary. Choose the body parts for the whole class to use so as to avoid a variety of answers.
Students should be able to see if there is a relationship between the two body parts chosen.

2. Looking at your comparisons and graph, do you notice any patterns between the pairs of measurements?

   Answers will vary.

3. Can you find any other body ratios using your measurements from above?

   Answers will vary.

How big is your foot? Do you know a quick way to estimate the size of your foot?

Compare the size of your foot to the length of your forearm, what do you notice? The two body parts should be very close in size. Are there any other body parts that might be the same size? Are there any interesting ratios between the sizes of different body parts?

Activity 1

To answer the questions above, let's collect some information about our body measurements. To complete the table below, estimate the size of each body part and then measure, with the help of a partner. Then swap places so partner can record results. Once all the class has done this, calculate the class averages and enter them on the table.

Body Part	Estimated Size (cm)	Actual Size (cm)	Class Average (cm)
Height			
Arm Span			
Waist circumference			
Neck circumference			
Wrist circumference			
Length of nose			
Length of head			
Length of hand			
Length of foot			
Length of face			
Length of ear			
Length of forearm			
Width of eye			
Width of head			
Distance between tip of thumb and pinky			
Distance between eyes			

Activity 2

1. Using your actual measurements from above, complete the information below. Round off to the nearest whole number or common fraction.

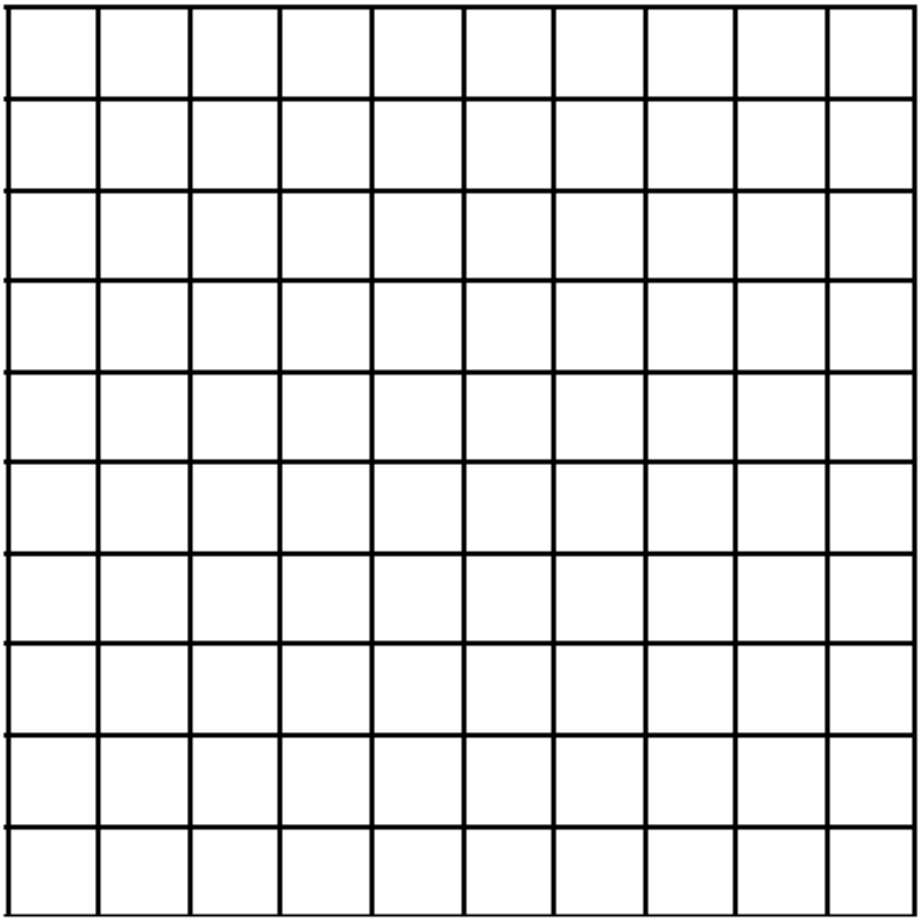
1 length of foot = _____1 x_____ length of forearm
1 waist circumference = _____ neck circumference
1 height = _____ arm span
1 length of foot = _____ length of face
1 width of eye = _____ distance between eyes
1 width head = _____ width of eye

2. Using the class average measurements from above, complete the information below. Round off to the nearest whole number or common fraction.

1 length of foot =	1	length of forearm
1 waist circumference =	_____	neck circumference
1 height =	_____	arm span
1 length of foot =	_____	length of face
1 width of eye =	_____	distance between eyes
1 width head =	_____	width of eye

Activity 3

1. Choose two measurements that you think are linked, then display both of them on the same scatter graph.



2. Looking at your comparisons and graph, do you notice any patterns between the pairs of measurements?

3. Can you find any other interesting body ratios using your measurements from above?