Sustainability - The Outlook for Someday

How might we promote a message of sustainability so that we contribute as active and caring members of our global community?

Walt calculate different averages such as the mean, the mode, the median and the range **Success Criteria:** I understand the differences between different types of averages. I know how to organise numbers from lowest to highest or ascending order. I can find the middle number and the difference between the highest and the lowest number. I can perform addition and subtraction.

View mean median mode song

(a)	9,4	l <i>,</i> 5,	7, 8, 7, 2	range of each of the following sets of test results(b) 10, 7, 3, 4, 8, 2, 6, 5			
Th	Thinking			Working			
(a)	(i)	1	Write the rule for finding the mean.	(a) (i) Mean = $\frac{\text{sum of data values}}{\text{number of data values}}$			
	2 Substitute data into the rule.3 Simplify and evaluate.		Substitute data into the rule.	$=\frac{9+4+5+7+8+7+2}{7}$			
			Simplify and evaluate.	$=\frac{42}{7}$			
		4	Write down the mean.	Mean = 6			
	(ii)	5	Order the values from smallest to largest. Count the number of values. If the number is odd, select the middle value.	(ii) 2, 4, 5,(7), 7, 8, 9 ↓ 7			
		6	Write down the median.	Median = 7			
	(iii)	7	Does any value appear more often than any other? This is the mode. (Yes)	(iii)			
		8	Write down the mode.	Mode = 7			
	(iv)	9	Range is highest data value – lowest data value.	(iv) Range = $9-2$ = 7			

Thinking and working

Further Thinking and working



(b)	(i)	1	Write the rule for finding the mean.	(৮)	(i)	$Mean = \frac{sum of data values}{number of data values}$
			2	Substitute data into the rule.			$=\frac{10+7+3+4+8+2+6+5}{8}$
							$=\frac{45}{8}$
			3	Simplify and evaluate.			= 5.625
			4	Write down the mean.			Mean = 5.625
		(ii)	5	Order the values from smallest to largest. Count the number of values. If the number is even, select the two middle values.	(i		2, 3, 4, 5, 6, 7, 8, 10 2, 3, 4, 5, 6, 7, 8, 10
			6	Find the mean of these two numbers to find the median.			2, 3, 4, 5, 6, 7, 8, 10 Median = $\frac{5+6}{2}$
			7	Write down the median.			Median = 5.5
	((iii)	8	Does any value appear more often than any other? This is the mode. (No)	(ii	ii)	
		9 Write that there is no mode.		Write that there is no mode.		-	There is no mode.
	((iv)	10	Range is highest data value – lowest data value.	(iv	v) 1	Range = 10 - 2 = 8

Everyone in class does this exercise!

Fluency

1 Find the (i) mean, (ii) median, (iii) mode and (iv) range of each of the following sets of test results.

(a) 7, 1, 7	(b) 5, 8, 5
(c) 6, 6, 6, 6, 6	(d) 4, 4, 4, 4, 4, 4, 4
(e) 7, 6, 7, 5, 7, 9, 7, 8	(f) 6, 5, 5, 5, 9, 9, 10
(g) 8, 7, 9, 5, 8, 2, 3	(h) 2, 8, 2, 6, 8, 6, 1, 2, 1, 4
(i) 4, 3, 6, 4, 8, 2, 5, 7, 6, 4	(j) 5, 3, 8, 7, 2, 5, 9, 5
(k) 1, 6, 2, 7, 9, 8, 9	(I) 6, 3, 2, 8, 9, 2, 5

- 2 Find the (i) mean, (ii) median, (iii) mode and (iv) range of each of the following sets of data. Round your answers to two decimal places if necessary.
 - (a) 29, 36, 29, 23, 32, 25
 - (b) 67, 73, 72, 82, 50, 45, 76
 - (c) 56, 72, 39, 47, 89, 81, 63, 81
 - (d) 12.8, 6.5, 19.3, 14.2, 4.7, 6.8, 6.5, 11.3
 - (e) 16.3, 15.8, 11.4, 15.2, 12.3, 11.4, 13.5
 - (f) 11.01, 11.001, 10.1, 10.11, 10.01, 1.11, 11.11, 1.01, 11

Understanding

01	maerstatiating								
3	<i>Without doing any calculations,</i> in each case, choose which one of the alternatives could be the mean.								
	(a) 9, 7, 8, 7, 7, 8, 6, 6, 9								
		A 3	в	5	С	7	D	10	
	(b) 6, 6, 6, 7, 6, 7, 4, 7, 2, 7								
		A 2	в	4	С	6	D	8	
	(c) 12, 19, 14, 18, 11, 17								
		A 10	в	12	С	16	D	19	
	(d) 86, 74, 85, 68, 91, 76, 80, 90								
		A 74	в	81	С	89	D	91	

Apply your understanding - All students work on this

4 The Korea–Japan 2002 World Cup in soccer was played in more stadiums than ever before. This record was not beaten in Germany in 2006 (12 stadiums) or in South Africa in 2010 (10 stadiums). The following table shows the city and capacity of the different stadiums.

Korea	Capacity		
Seoul	63 961		
Incheon	52 179		
Suwon	43 188		
Daejeon	40 407		
Daegu	68 0 14		
Jeonju	42 391		
Gwangju	42 880		
Ulsan	43 550		
Busan	55 982		
Seogwipo	42 256		

Japan	Capacity		
Sapporo	42 000		
Miyagi	49 000		
Niigata	42 300		
Ibaraki	42 000		
Saitama	63 000		
Shizuoka	50 600		
Kobe	42 000		
Osaka	50 000		
Oita	43 000		
Yokohama	70 000		



- (a) Find the (i) mean, (ii) median and (iii) range for the stadium capacities in Korea.
- (b) Which stadium has closest to the mean capacity in Korea?
- (c) Find the (i) mean, (ii) median and (iii) range for the stadium capacities in Japan.
- (d) Which stadium has closest to the mean capacity in Japan?
- (e) Use the mean and median to compare the sizes of the stadiums in the two countries.
- (f) Find the (i) mean, (ii) median and (iii) range for all 20 stadium capacities.
- (g) Which stadium is closest to the mean capacity for all 20 stadiums?

Are you ready to take this "Challenge"

Reasoning

- **5** Consider the following test results: 7, 5, 6, 8, 3
 - (a) Do you expect the mean to be an actual data value? Explain your answer.
 - (b) Find the mean of these results. Is the mean an actual data value?
 - (c) Do you expect the median to be an actual data value? Explain your answer.
 - (d) Find the median for the test results above.
- 6 (a) Explain what is meant by the statement 'The average family has 2.3 children'.
 - (b) Explain why the median of a group of whole-number values can only ever either end in .5 or be a whole number.
 - (c) If the data values are all whole numbers, can the mode ever be a decimal? Explain why or why not.
 - 7 A small company has a manager, an assistant manager, two office workers and 10 factory workers. The manager is paid \$125 000 per year, the assistant manager \$85 000, the office workers \$55 000 each, and the factory workers \$50 000 each.
 - (a) Find the (i) mean, (ii) median and (iii) mode for the annual income of all the people in the company, rounding your answer to the nearest cent.
 - (b) Which measure of centre gives you the best idea about the salaries paid by this company?
 - (c) Omit the manager's salary and recalculate the (i) mean, (ii) median and (iii) mode.
 - (d) Comment on what you found.

Open-ended

- **8** As well as giving a set of results, make sure you include a short explanation of how you found your answers for each of the following.
 - (a) Find five test results for which the mean, median and mode are all equal to 6 if the test results are not all the same.
 - (b) Find five test results for which the mean and the median are 7 and the mode is 9.
 - (c) Find five test results for which the mean is 7 and the median and mode are 6.
- **9** Three students are finding the median of the following data values. 20, 17, 28, 23, 19, 21, 22, 20

Sam says 'The median is the fourth value, so is 23.'

Veran says 'No, you need to put the data values in order first, so the median is 20.'

Lakme says 'No, you are both wrong.'

Help Lakme explain to Sam and Veran why they are incorrect.

10 Nine friends went tree planting at their local creek. The median number of trees planted was 5, the mean was 6 and the mode was 4. Find a data set for the number of trees each person planted to match the given statistics.

Extension

Problem solving the

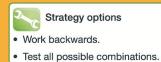
Running the race

- 1 In a sprint, the first three runners had times of 12.1, 3 In a third race, the first three runners had a mean 12.1 and 10.9 seconds. Find the mean, median and mode for the three times.
- 2 In a different race, the first three runners had a mean time of 11.7 seconds, a median time of 10.8 seconds and a modal time of 10.8 seconds. Find the times for the three runners.



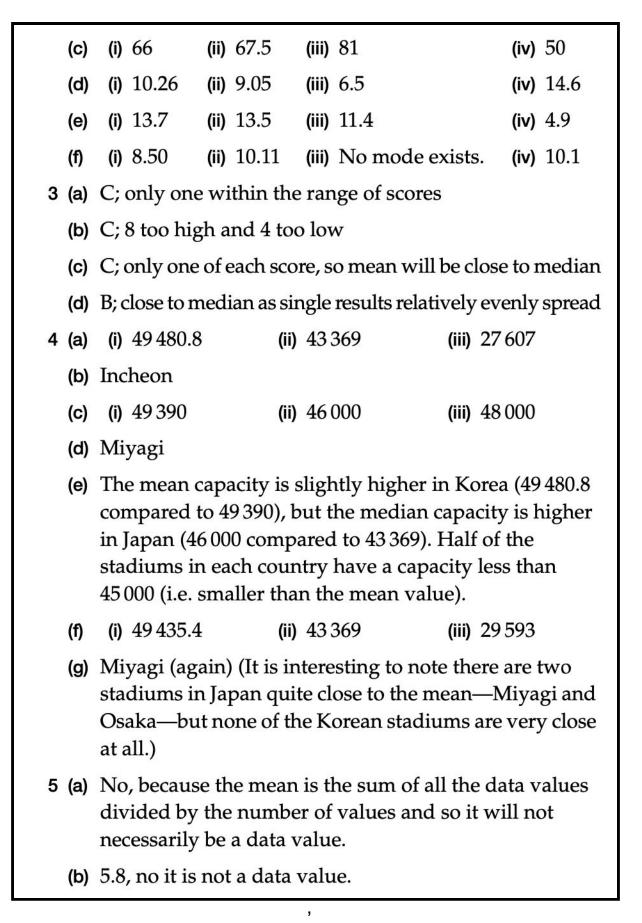
time of 11.8 seconds and a median time of 11.9 seconds. If all three times are different what can you say about the first and third placegetters?

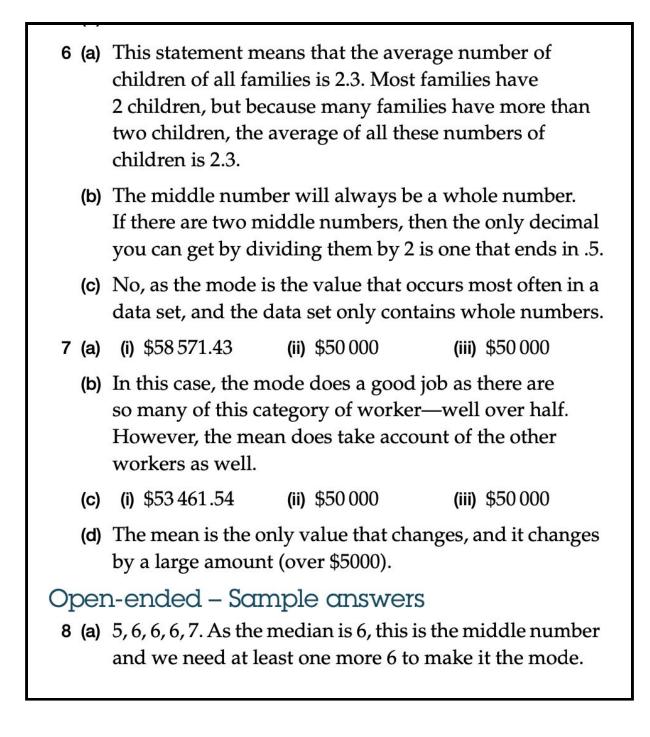
Give at least three pairs of possible times for these two runners, using one decimal place accuracy in your solutions. Explain how you found your answers.



Check Your Answers

1 (a)	(i) 5	(ii) <i>7</i>	(iii) <i>7</i>	(iv) 6			
(b)	(i) 6	(ii) 5	(iii) 5	(iv) 3			
(c)	(i) 6	(ii) 6	(iii) 6	(iv) 0			
(d)	(i) 4	(ii) 4	(iii) 4	(iv) 0			
(e)	(i) <i>7</i>	(ii) 7	(iii) <i>7</i>	(iv) 4			
(f)	(i) <i>7</i>	(ii) 6	(iii) 5	(iv) 5			
(g)	(i) 6	(ii) 7	(iii) 8	(iv) 7			
(h)	(i) 4	(ii) 3	(iii) 2	(iv) 7			
(i)	(i) 4.9	(ii) 4.5	(iii) 4	(iv) 6			
(j)	(i) 5.5	(ii) 5	(iii) 5	(iv) 7			
(k)	(i) 6	(ii) <i>7</i>	(iii) 9	(iv) 8			
(I)	(i) 5	(ii) 5	(iii) 2	(iv) 7			
2 (a)	(i) 29	(ii) 29	(iii) 29	(iv) 13			
(b)	(i) 66.43	(ii) 72	(iii) No mode ex	cists. (iv) 37			





The total of the five results is 30, so we have 18 left, which we can break up any way we like as long as we don't move the median number.

- (b) 4, 6, 7, 9, 9. As the median is 7, this has to be the middle number and we need two 9s after that. This adds to 25 and the total required is 35, so we only have 10 left to play with.
- (c) 4, 5, 6, 6, 14. The middle number is 6 and one more is 6. The total is 35, so we still have 23 to play with that can be allocated in many ways.
- **9** While Veran is correct to say the values must be ordered first when there is an even number of values, the median is found exactly midway between two of the values. The ordered list is: 17, 19, 20, 20, 21, 22, 23, 28, so the median is midway between 20 and 21 and so is 20.5.
- **10** As the median is 5, we know this must be in the middle; as the mean is 6, we know that the values must add up to 54, and 4 must be the most frequent. Sample answer: 1, 4, 4, 4, 5, 6, 6, 7, 17.