



National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TĀEA

Exemplar for Internal Achievement Standard Mathematics and Statistics Level 1

This exemplar supports assessment against:

Achievement Standard 91036

Investigate bivariate numerical data using the statistical enquiry cycle

An annotated exemplar is an extract of student evidence, with a commentary, to explain key aspects of the standard. It assists teachers to make assessment judgements at the grade boundaries.

New Zealand Qualifications Authority

To support internal assessment

| | Grade Boundary: Low Excellence |
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| 1. | <p>For Excellence, the student needs to investigate bivariate numerical data using the statistical enquiry cycle, with statistical insight.</p> <p>This involves integrating statistical and contextual knowledge throughout the statistical enquiry cycle and may involve reflecting on the process or considering other explanations for the findings.</p> <p>The evidence comes from the TKI assessment resource 'Bivariate Smorgasbord'.</p> <p>The student has planned and conducted an investigation using bivariate numerical data by working with a given relationship question (1), determining appropriate variables and measures (2), and managing sources of variation (3).</p> <p>They have also gathered data (4) and selected and used appropriate displays (5). The student has also communicated the relationship in the data, including the strength and direction (6).</p> <p>The student has integrated statistical and contextual knowledge (7). There is reflection on the process (8).</p> <p>For a more secure Excellence, the student could strengthen the contextual discussion and reflection on the process. For example, the student could consider what effect different varieties of carrots could have on the relationship.</p> |

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| Student 1: Low Excellence |
| NZQA Intended for teacher use only |

What is the relationship is between the length of a carrot and the weight of carrot?

1

I am interested in this because when I went to the plant centre with my parents last week to buy some seedlings to put into our vegetable garden, my mum got talking to one on the staff members who made the comment that there are several types of carrots that can be grown and each carrot has different properties. The most common variety that most people associate with carrots is called a Danver. These are the carrots that are long and skinny which taper to a point and are typically orange in colour. However, the Emperor carrot is the one that is commercially grown and are found in supermarkets. These carrots are similar looking to the Danvers but are thicker in width. As I want to see if there is relationship between the length and weight of a carrot if I got a mixture of these two carrots this could lead some groupings so when I run my experiment I will have to try and ensure that I get all the same variety.

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Before measuring the carrots, we are going to ensure that we have just one variety, as the carrots have been purchased from a supermarket in 1.5 kg bags I can be confident that the variety is Emperor carrot as this is the carrot sold in supermarkets. I will place the carrot straight and flat against the surface of the table. I will use a piece of string to measure the length and then transfer the length of string onto the 30cm ruler this will ensure if the carrot has slight curve this will still give a more accurate measurement of the length. I will measure from the very bottom of the carrot to the top just before the leafy bit and will try to ensure that the piece of string is straight up from the bottom to the top to the carrot and not being measured on an angle as this would increase the length of the carrot and could create errors and the leafy bit would also increase the weight of the carrot. Also, if there is any leafy bit is remaining, I will remove it before I measure the carrot. When using the piece of string to measure the length I will tie a knot at one end and use this end as the starting point for my measurement. The other end of the string I will hold with my thumb nail and then transfer the length onto the ruler. I will then place the carrot onto the scales to get the weight. I will ensure that each time I take the weight I will reset the scales back to zero. I will also ensure that the carrots I measure are all reasonably straight to start with as this will allow me to pull the string tight if they are bent finding the length of carrot would be more difficult. Any broken carrots we will not measure, and we will select another carrot from the bag. To make this a fair test we have one person measuring the carrots this way any error that occurs in the measurements will be consistent. Also as some carrots will look very similar to others when we have measured the carrot the carrot will have a sticker placed on it stating the number order it was measured and weighed this way we don't re measure or re weigh the same carrot but also if we get a very different result we can go back to the carrot and re measure or re take the weight to ensure the result was appropriate. The number of carrots is 31.

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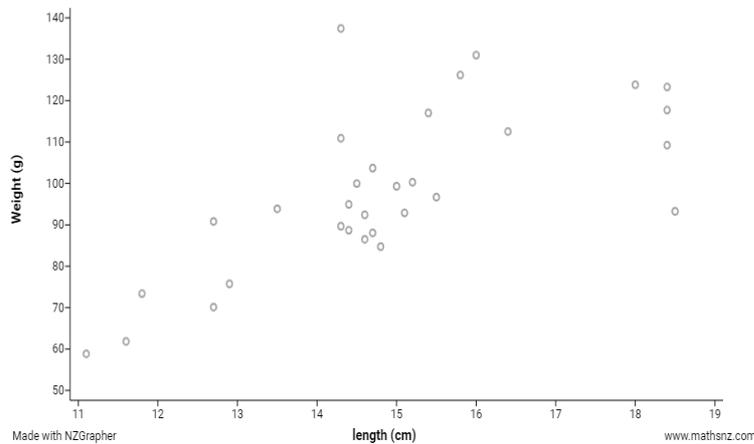
2

| | length (cm) | Weight (g) |
|----|-------------|------------|
| 1 | 14.6 | 92.42 |
| 2 | 15.5 | 96.7 |
| 3 | 12.7 | 70.12 |
| 4 | 18 | 123.84 |
| 5 | 11.6 | 61.84 |
| 6 | 18.5 | 93.26 |
| 7 | 14.7 | 103.7 |
| 8 | 14.6 | 86.5 |
| 9 | 15.4 | 117.02 |
| 10 | 11.8 | 73.38 |
| 11 | 18.4 | 123.3 |
| 12 | 12.9 | 75.74 |
| 13 | 13.5 | 93.88 |
| 14 | 14.4 | 94.94 |
| 15 | 14.3 | 110.92 |
| 16 | 14.7 | 88.06 |

| | length (cm) | Weight (g) |
|----|-------------|------------|
| 17 | 18.4 | 109.24 |
| 18 | 18.4 | 117.72 |
| 19 | 15.8 | 126.18 |
| 20 | 14.3 | 137.44 |
| 21 | 15.1 | 92.88 |
| 22 | 16 | 130.98 |
| 23 | 16.4 | 112.54 |
| 24 | 12.7 | 90.82 |
| 25 | 14.3 | 89.66 |
| 26 | 14.5 | 99.96 |
| 27 | 14.8 | 84.74 |
| 28 | 15.2 | 100.3 |
| 29 | 11.1 | 58.84 |
| 30 | 14.4 | 88.68 |
| 31 | 15 | 99.32 |

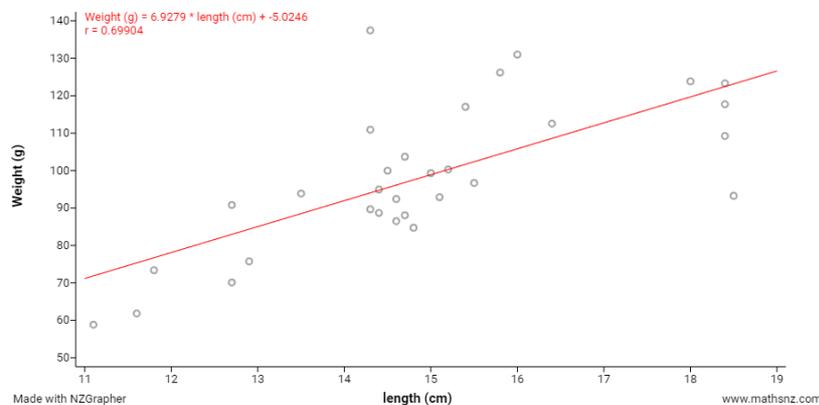
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Length versus Weight of Carrots



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Length versus Weight of Carrots



The graph shows that if the length of the carrot increases then the weight tends to increase also. I expected this because if a carrot has a is longer the weight of the carrot is also greater this is usually because not only is the carrot longer but also the carrot is usually wider. This is also supported with my own knowledge of baking carrot cake that while the recipe asks for 3 carrots usually if I have two larger carrots this is more than enough. This has been shown in my graph because the trend line shows a positive relationship sloping upwards. Most points are relatively close to the line of best fit, so I think the relationship is a strong one. There is also some clumping around the length of carrots from approximately 14.5cm to 15.5cm also there are 4 points around 18.4cm which have similar lengths but have different weights. There one point a far distance from the line of best which had a weight of 137.4 g and the length was only 14.3 cm but this carrot still fits the trend.

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Something which could possibly impact on the relationship could be the age of the carrot. From experience I know that as the carrot get older in the vegetable chiller in the fridge the carrot tends to lose its moisture/sugars and shrink. This only however has an impact on decreasing the weight but not the length. I also noticed that when you buy a bag of carrots at a set weight, for example, 1.5 kilograms from the supermarket not all the carrots are the same length. I found out that as they are priced on weight the carrots are selected to be as close to the given pre weighed bag as possible. I was also told that none of the pre weighed bags are less than the specified weight this is because of the Consumer Guarantee Act. Also, the growing conditions could have an effect for the length of the carrot.

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| | Grade Boundary: High Merit |
|----|--|
| 2. | <p>For Merit, the student needs to investigate bivariate numerical data using the statistical enquiry cycle, with justification.</p> <p>This involves linking aspects of the statistical enquiry cycle to the context and making supporting statements which refer to evidence, such as summary statistics, data values, trends or features of visual displays.</p> <p>The evidence comes from the TKI assessment resource 'Bivariate Smorgasbord'.</p> <p>The student has planned and conducted an investigation using bivariate numerical data by working with a given relationship question (1), determining appropriate variables and measures (2), and managing sources of variation (3).</p> <p>They have also gathered data (4) and selected and used appropriate displays (5). There is supporting evidence for the comments made about the strength and direction of the relationship (6).</p> <p>The student has also started to incorporate some contextual knowledge (7).</p> <p>To reach Excellence, the student could integrate contextual knowledge with the comments throughout the response and provide a more in-depth discussion about the features. The student could also reflect on the process.</p> |

What is the relationship between the circumference of a potato and the weight of potato? ①

I am interested in this because when I was watching the news this year there was an article on the price of potatoes increasing due to the amount of rain that had fallen and causing the potato to get a blight and rot. We eat a lot of potatoes in our house and if there is a blight it might mean we have to do without potatoes or pay more money for them.

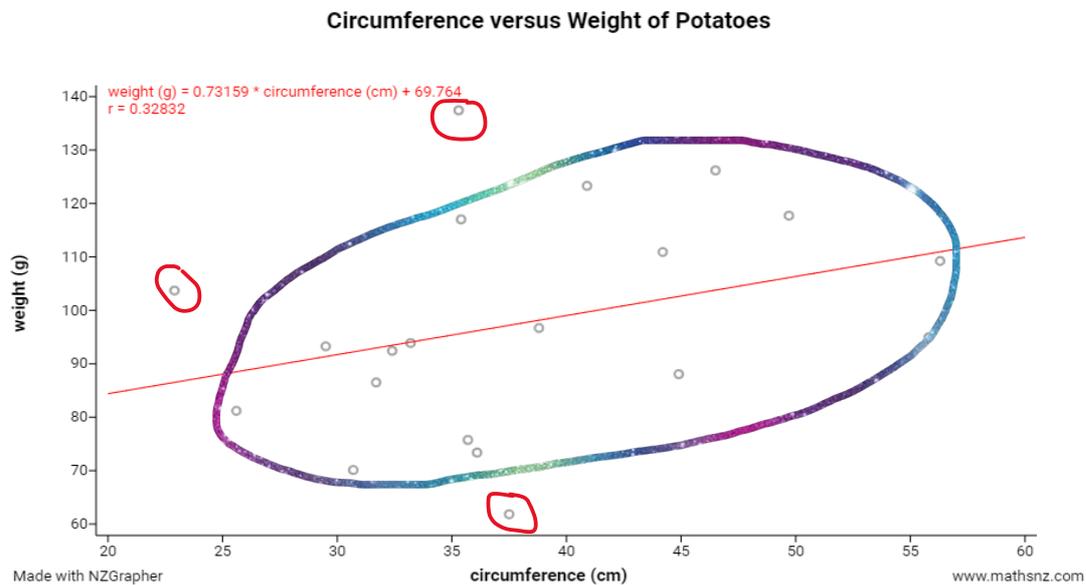
For this experiment I am going to select my potato's from a 10kg bag of new season potatoes which are unwashed, and the variety of potato called "white potatoes" because their skin is white hence the name.

To carry out the practical side of this experiment we have been given two periods of 1 hour one after the other. I will first wash the potato to remove all the dirt from skin and pat them dry with a handy towel and then leave them to dry for another 20 minutes. This hopefully will ensure that I am only going to weigh the potato without the additional weight of dirt or added water and measure then potato without additional dirt. When I measure the circumference of the potato, I am going to measure it from the eye end to the other end, so I am measuring the longest circumference of the potato. I decide to measure the potato's this way as when a potato grows it grows like a vine like structure under the ground attached to the seed potato so when it dug up the potato has some deformities. These can be referred to the eyes of the potato hence if all measurements are taken from end to end. I will place the potato against the surface of the table. I will use a piece of string to measure the circumference of the potato from end to end. I will do this because potatoes are not flat or straight, they are curved so using a piece of string should produce more accurate result. I will place a piece of string around the potato from one end to the other making sure I pull it tight but not tight that the string cuts into the potato. I will then transfer the length of string onto the 1-meter ruler. ③

When using the piece of string to measure the circumference I will tie a knot at one end and use this end as the starting point for my measurement. The other end of the string I will hold with my thumb nail and then transfer the length onto the ruler. I will then place the potato onto the scales to get the weight. I will ensure that each time I take the weight I will reset the scales back to zero. As potatoes come in different shapes and sizes, I will select random potatoes from a 10 kg bag. This should give a good representation. Any sooky or rotten looking potatoes we will not measure, and we will select another potato from the bag. The number of potatoes is 20. ②

| Count | Circumference of potato (cm) | Weight of potato (g) | Count | Circumference of potato (cm) | Weight of potato (g) |
|-------|------------------------------|----------------------|-------|------------------------------|----------------------|
| 1 | 32.4 | 92.42 | 11 | 40.9 | 123.30 |
| 2 | 38.8 | 96.70 | 12 | 35.7 | 75.74 |
| 3 | 30.7 | 70.12 | 13 | 33.2 | 93.88 |
| 4 | 25.6 | 81.20 | 14 | 55.8 | 94.94 |
| 5 | 37.5 | 61.84 | 15 | 48.2 | 110.92 |
| 6 | 29.5 | 93.26 | 16 | 44.9 | 88.06 |
| 7 | 22.9 | 103.70 | 17 | 56.3 | 109.24 |
| 8 | 31.7 | 86.50 | 18 | 49.7 | 117.72 |
| 9 | 35.4 | 117.02 | 19 | 46.5 | 126.18 |
| 10 | 36.1 | 73.38 | 20 | 35.3 | 137.44 |

③



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The graph shows that if the circumference of the potato increases then the weight of the potato tends to increase also. I kind of expected this because if a potato has a larger weight then the potato is usually wider and bigger and hence a larger circumference. This has been shown in my graph because the trend line shows a positive relationship sloping upwards. Some points are relatively close or on the line of best fit, for example, data point 1 the circumference of the potato is 32.4 cm and the weight is 92.42grams, data point 13 has a circumference of 33.2 cm and a weight of 93.88grams, data point 6 has a circumference of 29.5cm and a weight of 93.26grams and data point 17 has a circumference of 55.3 cm and a weight of 109.24grams. There are points which are some way from the line of best fit, for example, data point 9 has a circumference of 35.4cm and a weight of 117.02 grams and data point 19 has a circumference of 46.5 cm and a weight of 126.18 grams, data point 10 has a circumference of 36.10cm and a weight of 73.38 grams however they still form a cluster in an upward slope. There is also three data points which is separate from the rest of the data these points is data are point 5 which has a circumference of 37.5 cm and a weight of 61.84grams, data point 20 has a circumference of 35.3 cm and a weight of 137.44 grams and data point 7 has a circumference of 22.9cm and a weight of 103.70grams. I can only say there given the wide scatter that there is only a weak relationship between the circumference of the potato and weight of the potato.

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So, I think the relationship is a weak one. If I were to repeat this experiment again, I would make sure I measured the potato three times and average out the circumference measurement, by doing this I would be trying to minimize and measurement error of the circumference. I would also ensure that each potato when washed was dried properly because as the time for collecting this data was only 2 hours the resting time for the potatoes after they were washed and dried was not the same and some of the potatoes were just washed, measured and weighed. Also depending on how much dirt there was on the potato influenced how much washing it required so some potatoes were scrubbed very hard potentially reducing the volume of the potato but increasing the amount of water used and maybe absorbed by the potato so overall increasing the weight whereas others only needed a light wash. I think these issues contributed to some of the very high weights for the circumference.

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| | Grade Boundary: Low Merit |
| 3. | <p>For Merit, the student needs to investigate bivariate numerical data using the statistical enquiry cycle with justification.</p> <p>This involves linking aspects of the statistical enquiry cycle to the context and making supporting statements which refer to evidence such as summary statistics, data values, trends or features of visual displays.</p> <p>The evidence comes from the TKI assessment resource 'Bivariate Smorgasbord'.</p> <p>This student has planned and conducted an investigation using bivariate numerical data by working with a given relationship question (1), determining appropriate variables and measures (2), and managing sources of variation (3).</p> <p>They have also gathered data (4), selected and used appropriate displays (5) and communicated the relationship in the data (6). There is supporting evidence for the comments made about the strength and direction of the relationship and unusual values (7).</p> <p>For a more secure Merit, the student could strengthen the discussion on managing possible sources of variation, for example explaining why the scales were reset each time and the number of outside layers removed. The student would also need to strengthen their communication by, for example, justifying the comments made about the unusual value and linking these to the context.</p> |

What is the relationship between the weight of an onion and its circumference?

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| Student 3: Low Merit |
| NZQA Intended for teacher use only |

Question: I wonder if there is a relationship between the weight (g) and circumference (cm) of an onion. 1

Prediction: I predict that as the weight of an onion increases the circumference of the onion will also increase.

Planning:

My partner and I have decided to find out the relationship between the weight and circumference of an onion, I expect that the bigger the circumference the more mass of the onion making it heavier.



Weight: I will check if the onion is clean and fully peeled and has nothing else



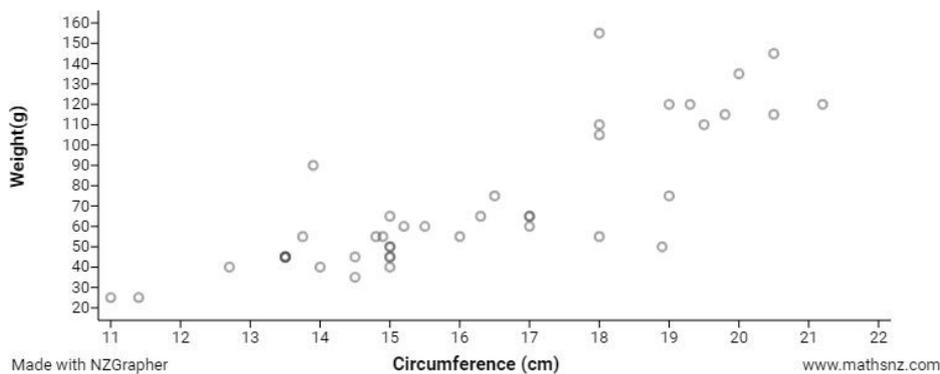
attached to it to make sure this doesn't give an incorrect measure and effect the weight. We will place our first onion on the scale, after making sure it is set to zero. I will then read out the number to Amy and she will then check the measurements and write it down on a piece of paper. 3

Circumference: I will take a piece of string and a ruler over to our desks, I will then wrap the string around the largest part of the onion which we decided was from the top to the bottom making sure the string is pulled tight and meets up with the beginning of the string on the other side. Carefully I will mark where the string ends with my finger and pull the string up against the ruler. Again, making sure the string is pulled tight. I will read the number in cm to Amy and she will write it down. 2

We will repeat this for each onion we are given to make sure that the measurements for each onion are taken the same way. We will then transfer our results into a table ready to be made into a scatter plot graph. We think that some onions may not be from the same area as we are getting them from the supermarket where they sell onions by the bag on the bags weight, this means that there might be some outliers. 3

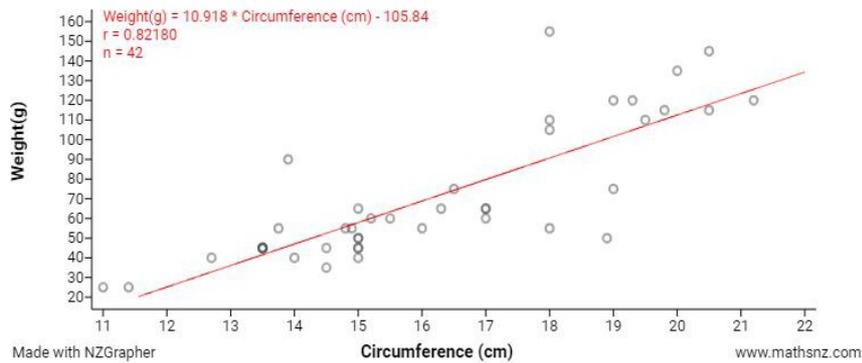


Circumference and Weight of Onions



The graph shows that as the weight of an onion increases the circumference tends to increase also. The graph also shows the trend line sloping upwards meaning there is a positive relationship. Most points are fairly close to the line of best fit, so I feel there is a moderately strong relationship. Most onions have a circumference between 14.5cm and 17cm. There are quite a few points that have a circumference of 15cm they are all close in weight. 5

Circumference and Weight of Onions



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However, there are two points quite far from the line of best fit (18,155) This onion is surprisingly heavy for its circumference and could be a very long rather than round and fat onion this could be because of its growing conditions. I would consider that onion to be an outlier. Another onion that doesn't quite fit the line of best fit is (18.9, 50) it happens to be very light for its circumference this could be because the onion was not getting enough nutrients where it was growing. I would also assume that this onion is an outlier and does not fit the trend line.

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Some things that could possibly impact the relationship could be where the onions are grown. I know that some onions are grown in different spots where they might not get enough nutrients, therefore they never grow to their full potential. This could impact both the weight and circumference of the onions. We were lucky to get 42 onions from the same supermarket, otherwise the results would have been all over the place as different supermarkets have different suppliers. But also, some onions seemed a bit dry and could be older.

Data:

| Number | Weight(g) | Circumference (cm) |
|--------|-----------|--------------------|
| 1 | 75 | 16.5 |
| 2 | 75 | 19 |
| 3 | 55 | 14.9 |
| 4 | 115 | 20.5 |
| 5 | 120 | 21.2 |
| 6 | 110 | 19.5 |
| 7 | 25 | 11 |
| 8 | 65 | 17 |
| 9 | 115 | 19.8 |
| 10 | 40 | 12.7 |
| 11 | 35 | 14.5 |
| 12 | 110 | 18 |
| 13 | 120 | 19.3 |
| 14 | 145 | 20.5 |
| 16 | 55 | 18 |
| 17 | 55 | 16 |
| 18 | 155 | 18 |
| 19 | 135 | 20 |
| 20 | 65 | 15 |
| 21 | 40 | 14 |
| 22 | 45 | 15 |
| 23 | 60 | 17 |
| 24 | 40 | 15 |
| 25 | 45 | 13.5 |
| 26 | 120 | 19 |
| 27 | 45 | 13.5 |
| 28 | 55 | 13.75 |
| 29 | 105 | 18 |
| 30 | 25 | 11.4 |
| 31 | 55 | 14.8 |
| 32 | 45 | 13.5 |
| 33 | 90 | 13.9 |
| 34 | 50 | 18.9 |
| 35 | 60 | 15.2 |
| 36 | 65 | 16.3 |
| 37 | 60 | 15.5 |
| 38 | 45 | 14.5 |
| 39 | 50 | 15 |
| 40 | 50 | 15 |
| 41 | 45 | 13.5 |
| 42 | 45 | 15 |

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| | Grade Boundary: High Achieved |
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| 4. | <p>For Achieved, the student needs to investigate bivariate numerical data using the statistical enquiry cycle.</p> <p>This involves using each component of the statistical enquiry cycle to investigate bivariate numerical data.</p> <p>The evidence comes from the TKI assessment resource 'Bivariate Smorgasbord'.</p> <p>The student has planned and conducted an investigation using bivariate numerical data by working with a given relationship question (1), determining appropriate variables and measures (2), and managing sources of variation (3).</p> <p>They have also gathered data (4), selected and used appropriate displays (5) and communicated the relationship in the data (6).</p> <p>To reach Merit, the student could justify the comments about the strength of the relationship. The student could also strengthen the discussion around the plan and managing sources of variation by explaining what accurate and inaccurate measurements mean in this situation.</p> |

What is the relationship between people's cubit length and their heights?

(Cubit length is from the elbow to the tip of the middle finger.)

Question:

I wonder if there is a relationship between cubit length (in centimetres) and the height (in centimetres) of year 10 students. I predict that taller students will have a longer cubit length.

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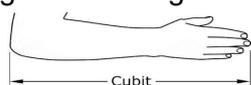
Plan:

For this experiment my partner and I choose 25 of our year 10 classmates in our math class and measure each student's cubit length (in centimetres) and Height (in centimetres).

Cubit length is the length of a person's forearm, from their elbow to the tip of their middle finger. We will be measuring each student's cubit length to the nearest centimetre using a ruler. We will do this by getting the student to place their right arm on a table, with their elbow against the wall. We decided to measure each student's right arm so that we could get an accurate measurement, because if we were to measure one student's left arm's cubit length and another student's right arm's cubit length then that would make our measurements slightly less accurate. But before we begin measuring, the student will need to remove any gloves that they might be wearing and roll up any long sleeves that they might have on so we can get an accurate measurement. We will also ask the students to keep their arm and fingers as straight as possible, which will allow us to take the best reading possible. Once we are sure that the student is set up properly and in the correct position with their right arm laying on the table and their elbow pressed firm against the wall. My partner will take the ruler and measure from the wall to the very tip of the student's middle finger. She will then read the measurement and call it out for me to immediately record into a google sheet next to the student's name. After we have completed the reading the student may leave and we will begin measuring the next student using the same process.

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3



We will measure each student's height to the nearest centimetre, using a special type of equipment called a stadiometer, and a ruler which is used to put on the student's head to get their correct height. Before measuring, the student will need to remove any footwear because different types of footwear have different types of sole thickness and could cause us to have inaccurate measurements. Next the student will need to stand up as straight as possible with their back to the stadiometer. We will politely ask the student to stand with their feet together and move back until both their heels are touching the bottom of the stadiometer. The students will need to keep their feet firmly on the ground, meaning no tip toeing or anything like that, because doing that could cause our measurements to be inaccurate. When we are positive that the student is in the correct position with their heels pressed up against the bottom of the stadiometer and their back to the stadiometer as straight as possible, we will ask them to stand very still. Then I will take a hard ruler and place it on the top of the student's head, I will need to make sure that it is a hard ruler so that it doesn't bend and affect our results. I will

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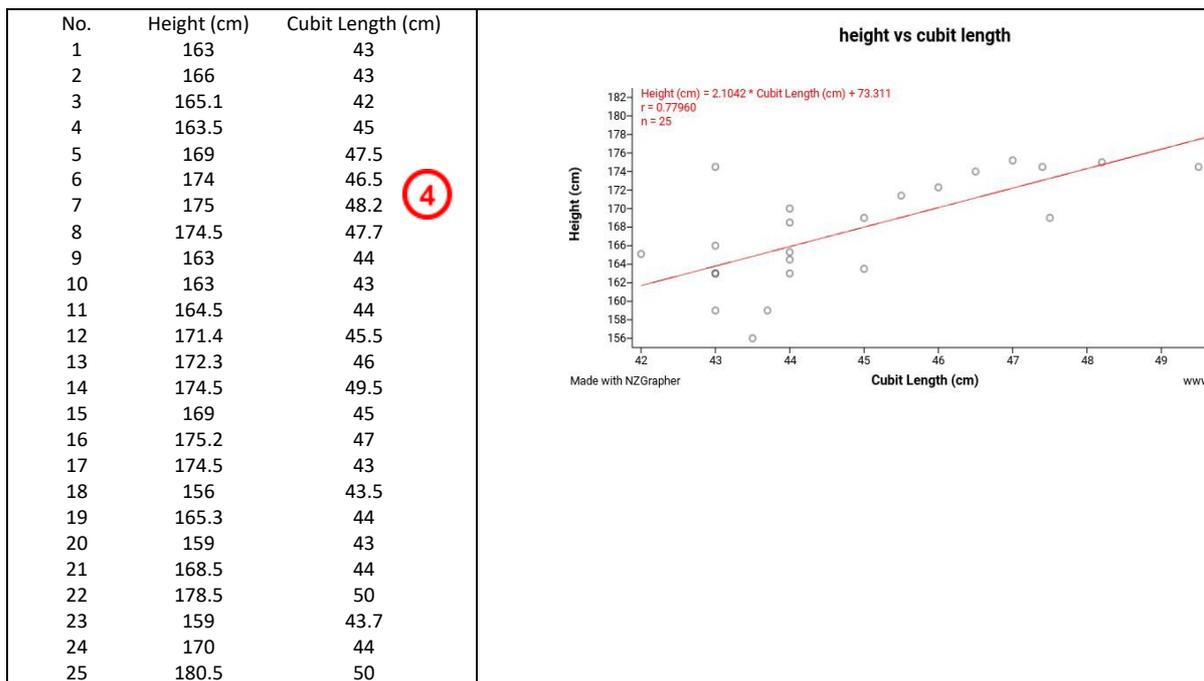
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read the measurement that is parallel to the ruler and call out the student's height for my partner who will then record the student's measurement next to their name in a google sheet.

Once we have finished measuring, the student may leave, and we will go on to measuring our next student using the same process.



For both tests we will keep a list of the names of each student so that we don't measure the same student twice or so that if we needed to, we could re-measure someone.



Features of the graph.

I notice that there is a positive linear relationship between the height (in centimetres) and cubit length (in centimetres) of year 10 students in my math class. It is positive relationship because the line of best fit has a positive gradient and is sloping up towards the right. This means that taller students tend to have a long cubit length.

I also notice that the strength of the relationship between the height and cubit length is moderate.

When we measured the height and cubit length of the students in our class there was one student who was away. But we knew that his cubit length was 50 cm, so we used the formula on the graph ($\text{Height} = 2.1042 \times \text{cubit length} + 73.311$) to estimate the length of his right foot. We found the students height by calculating $2.1042 \times 50 + 73.311$ which gave us 178.521.

I would be more confident in the relationship found in this investigation if I had a larger sample size. The sample size was just 25, so it wasn't as reliable as it could have been. If I were to repeat my experiment again, I would expect to get a similar relationship, but the trend line would be slightly different.

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| | Grade Boundary: Low Achieved |
| 5. | <p>For Achieved, the student needs to investigate bivariate numerical data using the statistical enquiry cycle.</p> <p>This involves using each component of the statistical enquiry cycle to investigate bivariate numerical data.</p> <p>The evidence comes from the TKI assessment resource 'Bivariate Smorgasbord'.</p> <p>The student has planned and conducted an investigation using bivariate numerical data by working with a given relationship question (1), determining appropriate variables and measures (2), and managing sources of variation (3).</p> <p>They have also gathered data (4), selected and used appropriate displays (5) and communicated the relationship in the data (6).</p> <p>For a more secure Achieved, the student could clearly link the description of the relationship to the context of height and cubit length. This student could also provide more detail in their plan on how possible sources of variation were managed for the cubit measurements.</p> |

What is the relationship between people's cubit length and their heights?

(Cubit length is from the elbow to the tip of the middle finger.)

Question:

I wonder if there is a relationship between the cubit length and height of year 10 students. I think that as the height of the student increases the cubit length of the student will also increase, this is because as we grow we grow in a symmetrical way, we do not grow 1 meter in our cubit length and then 1 meter in our height so I think that there will be a positive relationship between the height and cubit length of year 10's in my math class.

①

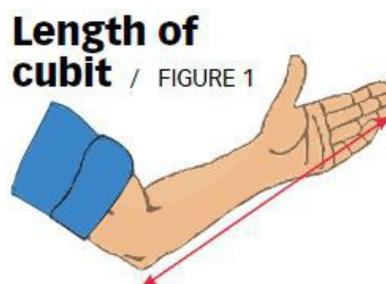
My partner and I decided to see if there is a relationship between the height (in centimeters) and cubit length (in centimeters) of year 10 students. We chose 25 of our year 10 classmates and measured each student's height to the nearest centimeter, using a stadiometer (equipment used to measure height) and a ruler that will be used to put on student's head to transfer the correct height. we will need to make sure that the ruler is hard and does not bend so that our results won't be inaccurate. Before measuring they will need to remove their shoes. Briella will then place a hard ruler on top of their heads and read the measurement that is parallel to the ruler in Centimeters out loud and I will record the measurement on my computer next to the student's name.

③

We then measured each student's cubit length to the nearest centimeter, using a tape measure (equipment used to measure cubit length) measuring from the elbow to the tip of the middle finger. My partner will use a tape measure to measure the length of the student's cubit length and then we will collect the data. See the diagram below.

②

For both tests we kept a list of the names of the students so that we didn't measure the same person twice and so that we could re-measure a person if necessary, if a measurement seemed wrong.



| Student | Height (cm) | Cubit Length (cm) |
|---------|-------------|-------------------|
| 1 | 163 | 43 |
| 2 | 166 | 43 |
| 3 | 165.1 | 42 |
| 4 | 163.5 | 45 |
| 5 | 169 | 47.5 |
| 6 | 174 | 46.5 |
| 7 | 175 | 48.2 |
| 8 | 174.5 | 47.4 |
| 9 | 163 | 44 |
| 10 | 163 | 43 |
| 11 | 164.5 | 44 |
| 12 | 171.4 | 45.5 |
| 13 | 172.3 | 46 |
| 14 | 174.5 | 49.5 |
| 15 | 169 | 45 |
| 16 | 175.2 | 47 |
| 17 | 174.5 | 43 |
| 18 | 156 | 43.5 |
| 19 | 165.3 | 44 |
| 20 | 159 | 43 |
| 21 | 168.5 | 44 |
| 22 | 178.5 | 50 |
| 23 | 159 | 43.7 |
| 24 | 170 | 44 |
| 25 | 180.5 | 50 |

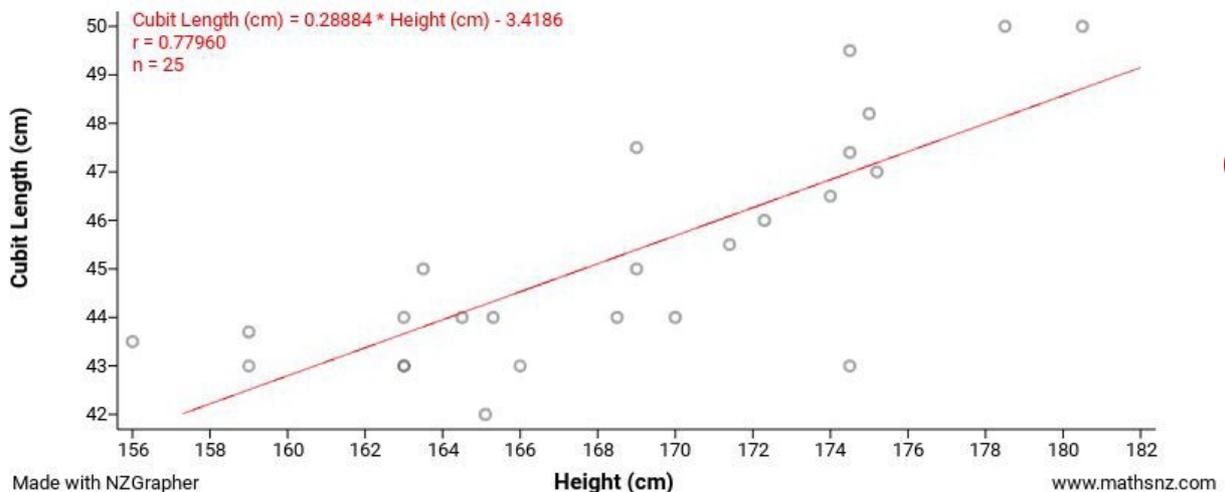
Discussion of the features on the graph

I notice that there is a positive relationship between the height and cubit length. It is a positive relationship because the line has a positive gradient and is sloping up towards the right.

This means that as one increases the other tends to increase. I also notice that the strength of the relationship is a moderately weak one. This is because the points are fairly scrambled from the trend line.

For every 2cm in height, cubit length increases by 0.289

Height vs Cubit Length



| | |
|----|--|
| | Grade Boundary: High Not Achieved |
| 6. | <p>For Achieved, the student needs to investigate bivariate numerical data using the statistical enquiry cycle.</p> <p>This involves using each component of the statistical enquiry cycle to investigate bivariate numerical data.</p> <p>The evidence comes from the TKI assessment resource 'Bivariate Smorgasbord'.</p> <p>The student has worked with a given relationship question (1), determined appropriate variables and measures (2), gathered data (3), selected and used appropriate displays (4) and communicated the relationship in the data (5).</p> <p>To reach Achieved, the student could explain how the height and weight were measured and identify and manage possible sources of variation.</p> |

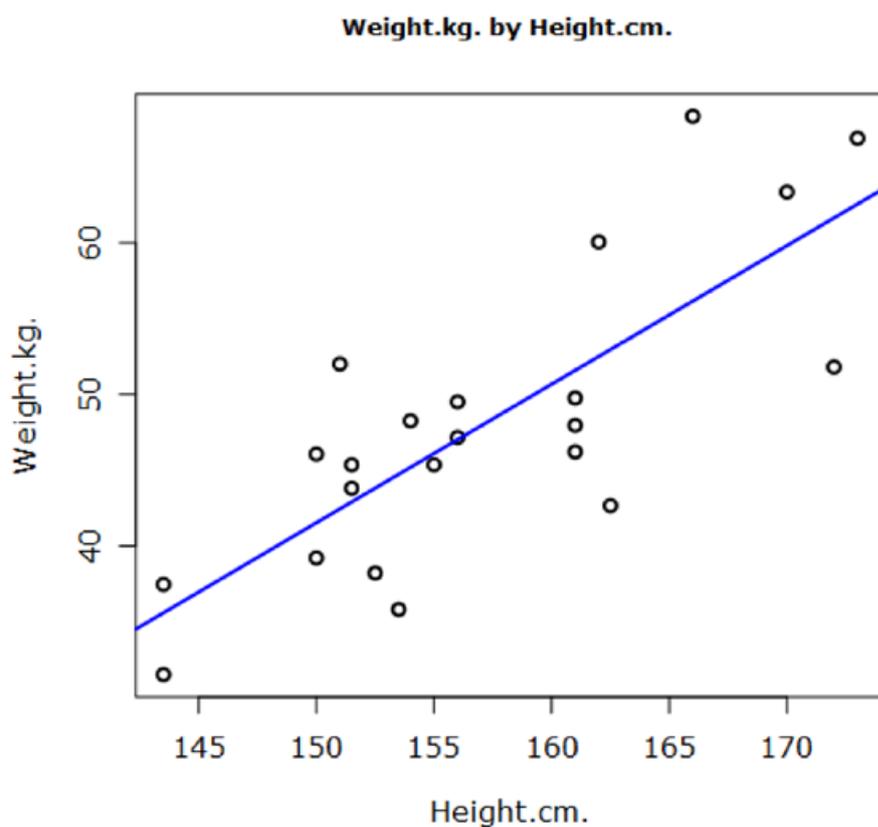
Student 6: High Not Achieved
NZQA Intended for teacher use only

Is there a relationship between the heights and weights of this group of year 8 students?

1

Measure both the height and weight of the students.

2



3

4

The relationship is a positive one. This can be seen by the trend line sloping upwards. The taller the year 8 student the greater the weight tends to be.

5

The relationship is not a very strong one because the points are not very close to the trend line.

There are equal number of points above and below and trend line.