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91946



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Mana Tohu Mātauranga o Aotearoa  
New Zealand Qualifications Authority

## Level 1 Mathematics and Statistics 2025

### 91946 Interpret and apply mathematical and statistical information in context

Credits: Five

Achievement	Achievement with Merit	Achievement with Excellence
Interpret and apply mathematical and statistical information in context.	Interpret and apply mathematical and statistical information in context using relational thinking.	Interpret and apply mathematical and statistical information in context using extended abstract thinking.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

**You should attempt ALL the questions in this booklet.**

Pull out Resource Booklet 91946R from the centre of this booklet.

Show ALL working.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

Do not write in the margins (▨▨▨▨). This area will be cut off when the booklet is marked.

**YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.**

Excellence

TOTAL 24

## QUESTION ONE

Use the information provided in Resource 1A and Resource 1B in the resource booklet to answer these questions.

- (a) Using Resource 1A, what percentage of Nike sports shoes cost more than \$500?

$$6/126 = \frac{1}{21} = 0.0476 \text{ (udp)}$$

4.8% of Nike shoes cost more than \$500

- (b) Compare the distributions of the cost of Adidas and Nike sports shoes shown in Resource 1A.

- Discuss similarities and differences considering **centre, shift, shape, and spread**.
- Provide numerical evidence where appropriate.
- In your answer, describe at least TWO different features, in context.
- **What conclusion about Adidas and Nike sports shoes can you make about which brand of shoe is more expensive, based on this sample?**
- Use evidence from the graph to support your answer.

The centre for Nike the cost of Nike shoes is higher than the centre for the cost of Adidas shoes. This is because the median for cost of Nike shoes is at \$234 which is \$103 more expensive than the median for Adidas shoes at only \$131. This might be because Nike sell more elite athlete shoes which would bring the median higher. The middle 50% for the cost of Nike shoes is shifted higher up than Adidas shoes. The lower quartile for Nike is at \$183 and goes to the upper quartile of \$298 whereas Adidas only range middle 50% ranges from the LQ of \$94 and ends at UQ of \$171. This might be because Adidas sell more basic shoes for say children or adults that just use them everyday meaning they don't have to be as special or as pricey. Both the cost of Nike and Adidas shoes <sup>data</sup> have the shape of being right skewed, with most of the data at the left end of the graph. This is probably because while both brands do sell very high end sports shoes, the main amount of shoes needs to be affordable for the average customer. (continue p 12)

- (c) Give at least one justified reason why Resource 1A may not be reliable for comparing the cost of Adidas and Nike sports shoes.

One reason why resource 1A may not be reliable for comparing the cost of Adidas and Nike sport shoes is that as this is only a sample, sampling variation could affect the results, and for example change the medians if the sample didn't by chance have lots of high end shoes. Another possible reason is that this is only a representation of New Zealand websites selling shoes but in ~~the~~ other countries it could be very different.

Resource 1B shows the amount of spending on clothing and footwear in New Zealand between the years 2010 and 2024, in millions of New Zealand dollars.

- (d) What trends, repeating patterns, and unusual features do you notice in the spending shown in the graph?
- Support your statements with evidence from the graph.
  - Give at least two reasons to support and explain your answer.

There is an overall increasing trend in the spending on clothing & footwear between 2010 and 2024. This is because the blue line of long-term trend starts at about 790 million of dollars spent in 2010 and ends at about \$1090 millions spent in 2024. This is an increase of about \$21 million spent a year. This is probably increasing due to inflation which is increasing the prices of clothing and footwear meaning you have to spend more to get the same clothes or shoes. There is a repeating pattern where there is a ~~peak~~ increase in Quarter One (Jan to Mar) then a drop in Q2 (Apr to Jun) an increase in Quarter 3 (Jul to sep) and a drop again in Q4 (Oct to Dec). With highest peak mostly at the start of Quarter 3 and troughs mostly at the start of Quarter 2. This might be because at the start of Quarter 3 is July or winter and people might go out buying lots of winter clothes when it starts to get really cold and they ~~can't~~ don't have them at home. (continue pg 12).

- (e) Using Resource 1B, make a prediction about future spending on clothing and footwear in New Zealand.

Explain your prediction, and discuss how confident you are in it.

I ~~th~~ would predict that the future spending on clothing and footwear in NZ would increase as that is what is shown by the overall trend (long term). In this increase from \$1090 million spent in 2024, I would expect it to slowly creep back up with a higher peak in Q3 and a low trough in Q2. I think I'm confident in this prediction as Q4 in 2021 is at almost \$1000 million spent showing that it was already starting to increase. Another reason I'm confident is that inflation is always going to keep increasing causing the prices of clothes and shoes to increase. One reason it is hard to predict is that if another lockdown happened and there were no tourists to buy stuff or NZers going out shopping then it might decrease again however this is very unlikely.

## QUESTION TWO

Use the information provided in Resource 2A and Resource 2B in the resource booklet to answer these questions.

The graph in Resource 2A shows the relationship between the price of sports shoes and the size of the shoes.

(a) Describe and interpret TWO different features of the relationship shown in Resource 2A.

Feature 1: There is a positive relationship between the price of a shoe and the size of a shoe. This is because the red trend line is increasing from left to right on the size axis, as shoe sizes increase, the price of the shoe also increases. This makes sense because the bigger the shoe the more material is needed to make it, therefore it costs the company more to make it so they will increase the price of the shoe to still make profit on it.

Feature 2: There is a weak relationship between the price of a shoe and its size. This is shown by the <sup>dots</sup> ~~dots~~ representing each shoe being quite far away from the trend line showing that the price of a shoe doesn't necessarily correlate with the size. This makes sense as different brands are going to charge different prices for ~~the~~ the same sized shoe and it would ~~be quite~~ make more sense for a brand to charge one price for each style or it would get complicated for employees, who are selling the shoes.

- (b) Adina needs to buy a new pair of size 6 sports shoes.

Using the graph in Resource 2A, what price should Adina expect to pay?

- How confident can you be in using this graph to predict shoe price?
- Support your answer with statistical reasoning.

From this data, the trend line shows that Adina should expect to pay about \$65 for her size six shoe. However I would not be very confident using this graph as there is a weak relationship between price and size of a shoe shown by the points being far from the trend line. Another reason not to be confident is that from the sample the size 6 shoes range from about \$27 to \$150 showing that ~~was~~ it ranges depending on brand and shoe style. As the sample size is only 117 this most likely doesn't represent the whole shoe population properly as there are a lot more shoes out there <sup>than</sup> ~~than~~ 117.

- (c) Resource 2B summarises three different sports shoe companies' prices and their special offers. Ricky wants to buy new size 7 football (soccer) sports shoes, and will choose from these companies.

Ricky wonders whether he should buy one or two pairs of sports shoes.

Which company should Ricky choose?

Make your recommendations, with reasons and considerations, using the information provided in Resource 2B, as well as including your own personal world views.

Football Direct's 1 pair = \$84.86  
2 pairs = \$166.40

Footy Fields : 1 pair = \$80.35  
2 pairs = \$146.58

Kick off (Assuming Ricky can pick up from factory)  
1 pair = \$80.50  
2 pair = \$120.75

Ricky should choose Footy Fields if he is going to buy just one pair of shoes as this is the cheapest option at \$80.35 (25 cents cheaper than kick off and \$4.51 cheaper than football direct). This way he also gets the shoes delivered straight to his house and doesn't need to worry about collecting them or anything.

Ricky should choose kick off if he is going to buy 2 pairs of shoes as this is the cheapest option at \$120.75 (\$26.13 cheaper than the next option Footy Fields). However Ricky would have to be able to get to the factory for this great price to pick his shoes up himself which could be a hassle.

Ricky should also consider how much he will use his shoes and what he is willing to pay before he goes and buys 2 pairs of shoes. Also Ricky might prefer one brand over the other as the shoes might look nicer or ~~at~~ feel better on his feet.

All of the above should come into consideration when Ricky buys his <sup>new</sup> shoes.

- (d) Ricky is currently wearing size 7 sports shoes, but he is growing quickly. His mother thinks that he will need larger size sports shoes next season.

Using **both** Resource 2A and Resource 2B, recommend the best option for Ricky when buying his sports shoes for next season.

I would recommend to Ricky that he should buy a bigger size shoe than size 7 as this way it would last him maybe 2 seasons instead of one which would save him about around an average of \$72 according to resource 2A which has that as the average price for a size 7 sport shoe. However by buying a size 8 shoe prices of the three companies is likely to be higher as Resource 2A shows a positive relationship between shoe size and shoe price (as one increases so does the other). So assuming that the price of a size 8 shoe increase the same proportionally it would probably still be best to buy one pair of shoes from Footy Fields according to resource 2B.

### QUESTION THREE

Use the information provided in Resource 3 in the resource booklet to answer these questions.

- (a) The survey was completed by 2571 people who visited the *Running Shoes Guru* website.

Approximately how many of the people who completed this survey, would be expected to run in the morning?

53% of 2571 or  $2571 \times 0.53 = 1362.63$   
 So approximately 1363 people who completed the survey would run in the morning.

- (b) According to the survey, which brand of running shoe is the most preferred?

- Discuss how confident you would be in concluding that this brand is the most popular running shoe.
- Justify your answer.

According to the survey Asics running shoes are most preferred at 22% which is 2% higher than the second preferred of Nike at 20%. I would not be ~~too~~ too confident in ~~that~~ concluding this as all the percentages are very even/similar about about 1 to 3% difference between top 3 which shows that sampling variation could easily affect this data meaning one sample may show ~~Asics~~ <sup>Asics</sup> being the most preferred and the next choosing Nike. Also as 14% said they ~~didn't~~ didn't have a favourite make this changes the data and it would have been better if this had either been left out or they were forced to chose.

Question Three continues  
on the following page.

- (c) Discuss two similarities or differences in the running shoe preference by age.

Use this information to make suggestions of what brand of shoe you think will be bought by Quinn, who is 31 years old.

Similarity or difference 1: One similarity is that all age groups have their preferred brand to be Nike. For under 20s this is ~~33%~~ 46%. 21-30 it is 33%, for 31-40 it is tied at ~~25%~~<sup>24%</sup> with Asics ~~and~~ for 41-50 it is preferred by 25%, 51-60 preferred by 27% and for over 60s it is preferred by 26%. This shows that the most preferred shoe is Nike for every age group. This might be because they are popular shoes so people are maybe more likely to buy them.

Similarity or difference 2: One difference is the preferred running shoe by age is that only 8% of under 20 yrs olds like Asics where for the other age groups this is between ~~21%~~ 21% (41 to 60 over) and 24% (31-40). This might be because Asics aren't popular on social media which most under 20s use and maybe Asics are more expensive so less affordable for young runners with lower incomes.

Suggestions for Quinn: I would suggest that Quinn would either buy a Nike or an Asics shoe. This is because these are the two most popular preferred running shoe at 24% for both for Quinn's age group of 31 to 40. However if Quinn has children they might take up a Nike shoes rather than Asics as these are much more preferred for young runners. (unders 20s 46% Nike & 8% Asics). This is only from the information from the survey and so Quinn may actually buy a different shoe because of price reasons or something else.

- (d) Axel is 45 years old and runs approximately 50 km per week.  
He needs to buy a new pair of running shoes.

Using any of the Resources 1–3, recommend which brand of shoe Axel should consider buying and estimate the cost of the shoes.

Include evidence from at least two sections of Resource 3 to justify your answer.

Others who run 41 to 65 km a week suggest that Asics are the most ~~common~~ preferred shoe at 24% <sup>of the</sup> of the survey who runs that distance likes them (3). Resource 3 also shows that 45 yrs are more likely prefer ~~the~~ Nike running shoes at 25% of the 41-50 age group liking them. <sup>Resource</sup> ~~therefore~~ <sup>as overall</sup> this shows the most prefer running shoe is Asics, this is the shoe that I would recommend Axel buying as it is preferred by the general running population and people who runs similar distance to him showing that it is probably a sturdy shoe. I estimate that the cost of Axel shoe will be around the \$80 mark as this is what it costs for football boots made of similar material to running shoes and is the average cost for a size 8 shoe which is an average mens shoe size and Resource 3 shows that almost half of bought shoes cost between \$80 and \$120.

- (e) How confident would you be using information from this survey to make recommendations about running shoes?

In the sense of how many people answered the survey so how big is the sample size, yes I would be confident ~~to~~ use the survey data to make recommendations as 2571 is a big sample size. However what overrules this for me to make me not very confident making predictions is that all the percentages are very similar showing that most running shoes are similar rated and it would probably come down to someone's budget or style they were looking for.

Extra space if required.  
Write the question number(s) if applicable.

QUESTION  
NUMBER

1b From this sample we can claim that Nike shoes tend to be more expensive than Adidas shoes. This is because the medians for Nike is higher at \$234 rather than \$131 for Adidas. This is an accurate claim as both the medians are outside the middle 50% of the other Brand - Interquartile Range - and because the distance between medians is at \$103 which is more than  $\frac{1}{3}$  of the overall visible spread of 204 for a sample size of <sup>about</sup> 100.

1d There is an unusual feature in which <sup>the amount spent on clothes and footwear</sup> ~~starts in about Q2 (start) of 2020~~ and very suddenly drops from Q3 in 2020 to Q4 in 2020. This causes the long term trend to decrease from the middle of 2020 to the a low in the middle of 2021, at about 920 millions spent compared to 1100 million spent at the same time the year before. This might be because the 2020 and 2021 covid 19 lockdowns caused people to not go out and buy clothes and shoes meaning the average spent decreased by a lot as the only way you could buy stuff was online.

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## Excellence

**Subject:** L1 Mathematics and Statistics

**Standard:** 91946

**Total score:** 24

Q	Grade score	Marker commentary
One	E8	Context has been used throughout the response. The candidate has made good use of numerical evidence and features in the displays to justify their response. Real world thinking has been used in statements supporting the description of features.
Two	E8	The candidate has demonstrated good statistical and mathematical knowledge. There is evidence of clear communication and 'real world' thinking.
Three	E8	The candidate shows excellent understanding and use of the resources provided. They have clearly communicated their recommendations and justified these, very well using the relevant information. Good knowledge of sample size, variability and uncertainty when using data is shown throughout the response.