91037

910370

1

SUPERVISOR'S USE ONLY

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

# Level 1 Mathematics and Statistics, 2011

## 91037 Demonstrate understanding of chance and data

9.30 am Monday 14 November 2011
Credits: Four

| Achievement | Achievement with Merit | Achievement with Excellence |
|---|---|---|
| Demonstrate understanding of chance and data. | Demonstrate understanding of chance and data, justifying statements and findings. | Demonstrate understanding of chance and data, showing statistical insight. |

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.**

Show ALL working.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2–13 in the correct order and that none of these pages is blank.

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

**TOTAL**

ASSESSOR'S USE ONLY

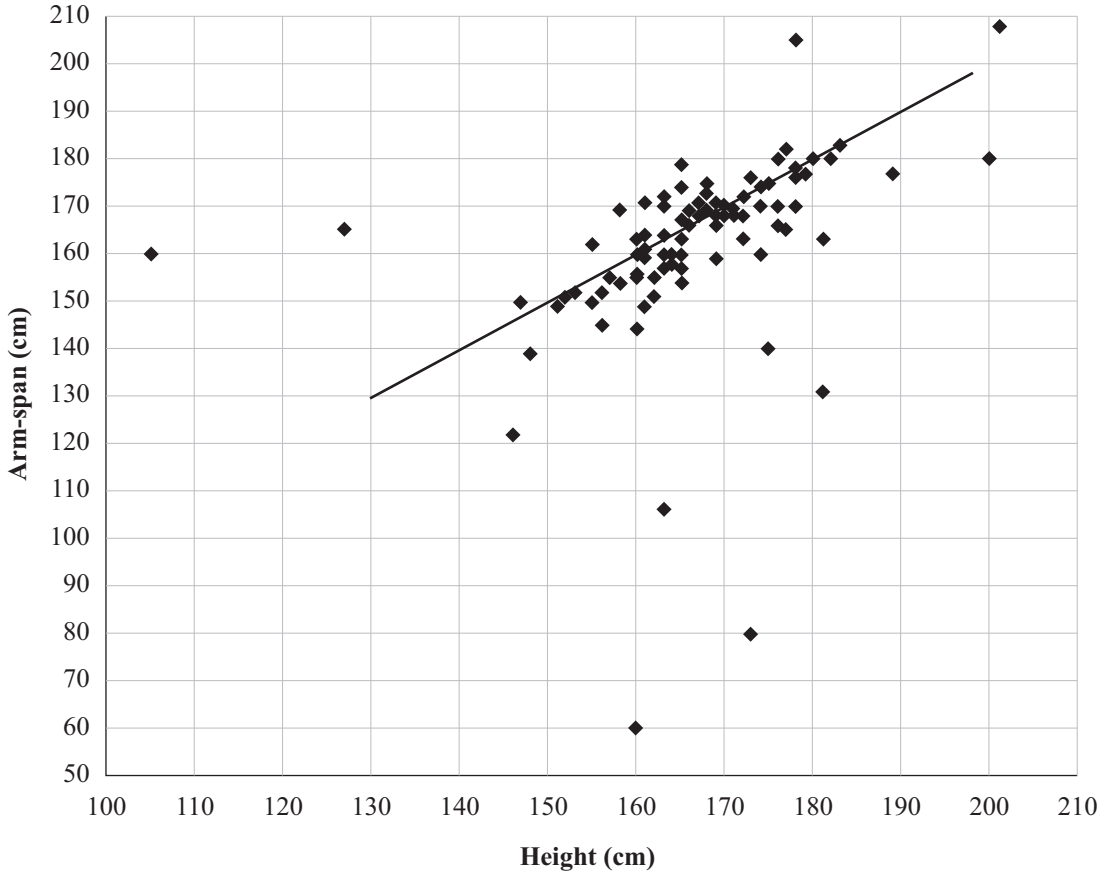
You are advised to spend 60 minutes answering the questions in this booklet.

ASSESSOR'S USE ONLY

## QUESTION ONE

Tuahu's grandfather told him that a person's arm-span is often the same as their height (your arm-span is the distance from the fingertips of your left hand to the fingertips of your right hand, when your arms are stretched out).

Tuahu wondered if this was true. He collected measurements from 100 randomly selected year 10 boys and girls. He drew a scattergraph of the results. He added a line of best fit to the graph. The results are shown on the graph below and some statistics are listed in the table.




| Statistics | Height | Arm-span |
|---|---|---|
| mean | 166 | 162 |
| minimum | 105 | 60 |
| lower quartile | 160 | 157 |
| median | 165 | 165 |
| upper quartile | 173 | 171 |
| maximum | 201 | 208 |
| | | |
| range | 96 | 148 |
| inter-quartile range | 13 | 14 |

ASSESSOR'S USE ONLY

(a) (i) What is the height of the tallest person on the graph?

(ii) What is the height of the person with the smallest arm-span?

(iii) How many people have an arm-span between 120 and 135 cm?

(b) Why was a scattergraph appropriate to show the data Tuahu had collected?

(c) There are some points on the graph that seem to be unlikely measurements for a year 10 student.

Give the height and arm-span for THREE points that seem unlikely. Explain why you think they are unlikely measurements for a year 10 student.

(d) Tuahu concludes from his graph that the statement made by his grandfather is correct: on average, a person's arm-span **is** the same as their height.

Is Tuahu's conclusion valid?

*You should give **at least TWO** reasons for your answer.*

ASSESSOR'S USE ONLY

## QUESTION TWO

ASSESSOR'S USE ONLY

Alice's local supermarket is running a competition.

On the back of each docket is printed one of the letters of the word ANKARA, a city in Turkey.

If Alice can collect the six letters needed to spell Ankara, she will go in the draw for a holiday to Turkey.

(a) On each of the 5 weekdays for 5 weeks Alice finds a discarded docket as she passes the supermarket.

In the order that she collects them, the letters collected are:

N K K R R  N A K A R  N N A K K  N R N A A  A K K R R

(i) Complete the table to summarise her data:

| Letter | Frequency |
|---|---|
| A | |
| K | |
| N | 6 |
| R | |

(ii) Using her data, what is the probability of Alice getting a K on the next docket?

(iii) How valid is this probability? Give at least 2 statistical reasons for your answer.

ASSESSOR'S USE ONLY

Alice wonders how many dockets she would have to collect, on **average**, to be able to spell the word ANKARA.

(b) Using her collection of dockets in (a), how many dockets did Alice collect before she had the whole word of ANKARA?

(c) Alice realises that it will take too long to find an answer by collecting actual dockets. Instead, she takes a dice and puts the **six** letters of A, N, K, A, R, A on it.


Alice wants to find out, on average, how many times she must roll the dice to spell the word ANKARA.

She rolls the dice and whatever letter is on top, she imagines is the letter she has found on the back of a docket.

Once she has all the letters she needs to spell Ankara, she begins again.

She stops her experiment when she has spelt the word Ankara 10 times.

R, K, N, A, A, K, K, K, A
A, A, N, A, R, A, K
A, N, N, K, A, N, R, A
K, A, K, K, R, A, A, A, N
R, A, N, A, A, R, A, K
N, A, R, R, A, A, A, K
A, A, A, A, R, A, R, A, N, R, A, A, A, A, R, A, A, N, R, N, A, K
N, K, A, A, N, A, A, N, A, K, N, A, R
N, K, A, N, N, A, N, A, A, R
A, A, K, A, K, A, N, N, A, R

Alice then uses her results to find out how many dockets she needed to spell the whole word of ANKARA.

Her results are: 9, 7, 8, 9, 8, 8, 22, 13, 10, 10

(i) Using Alice's data, give Alice an answer to her question:

"How many dockets would she have to collect, on average, to be able to spell the word ANKARA?"

Give at least TWO averages.

ASSESSOR'S USE ONLY

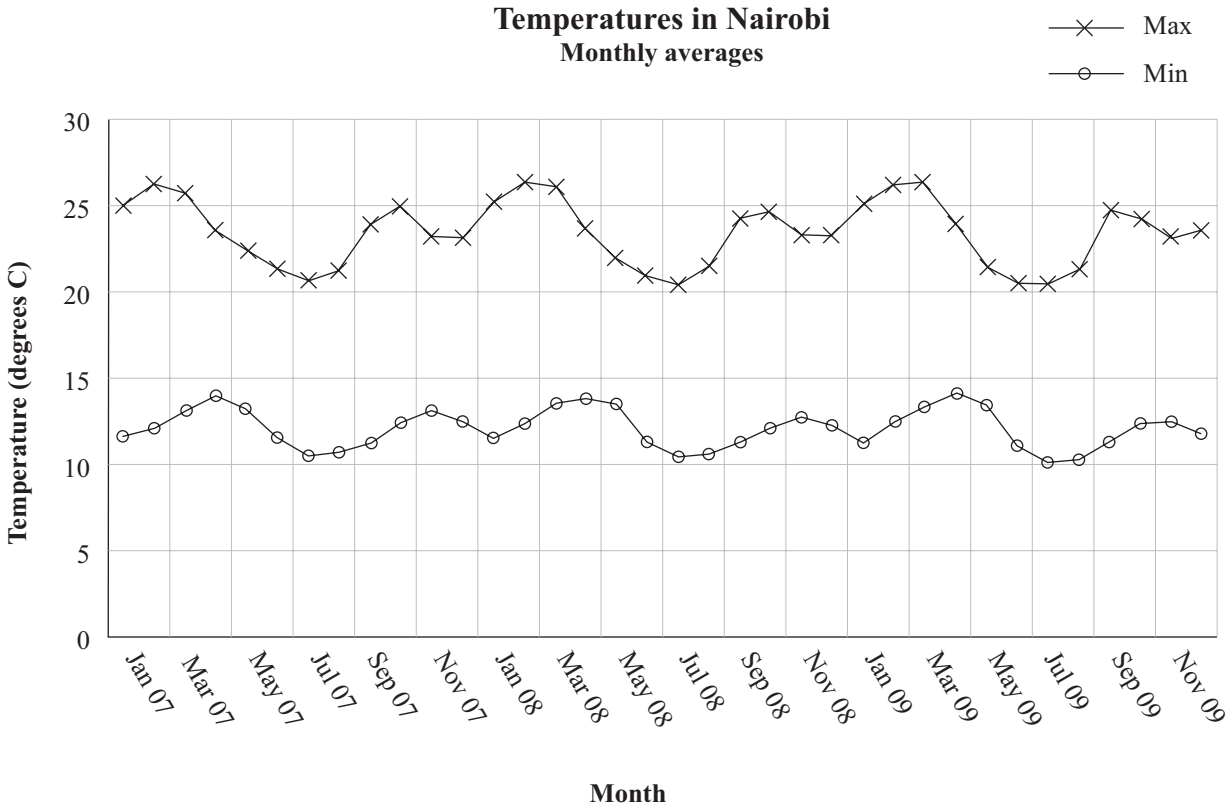
(ii) Explain which average you would suggest Alice uses and why.

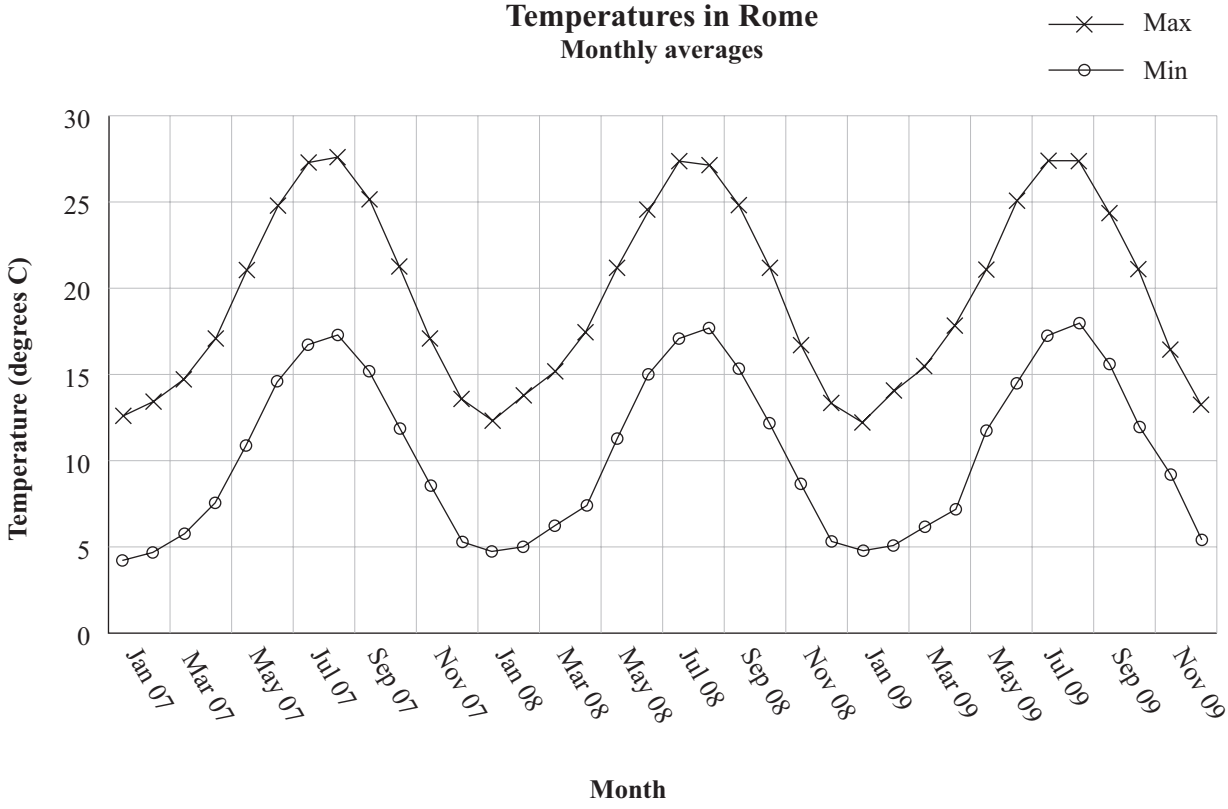
(iii) The supermarket says that each letter, A, N, K and R, is equally likely to be found.

Explain why Alice's experiment is not valid.

## GRAPHS FOR QUESTION THREE

Data source: http://www.worldclimate.com/



## QUESTION THREE

ASSESSOR'S USE ONLY

Richard wants to move overseas to a warmer city. He would like to move to either Rome or Nairobi.

The graphs on page 8 show the monthly average minimum and maximum temperatures in each city for three years from 2007 to 2009.

Richard decides to move to Rome because he thinks:

- The temperature in Rome is higher than the temperature in Nairobi, so Rome is warmer.
- The maximum temperature in Rome peaks every year, which is more pleasant to live in.
- The temperature in Rome is less variable over a year, so this is more pleasant.
- The temperature appears to be rising in Rome, so it will get warmer in future.
- There is less difference between the maximum and minimum temperature in Rome, so it will be more comfortable.

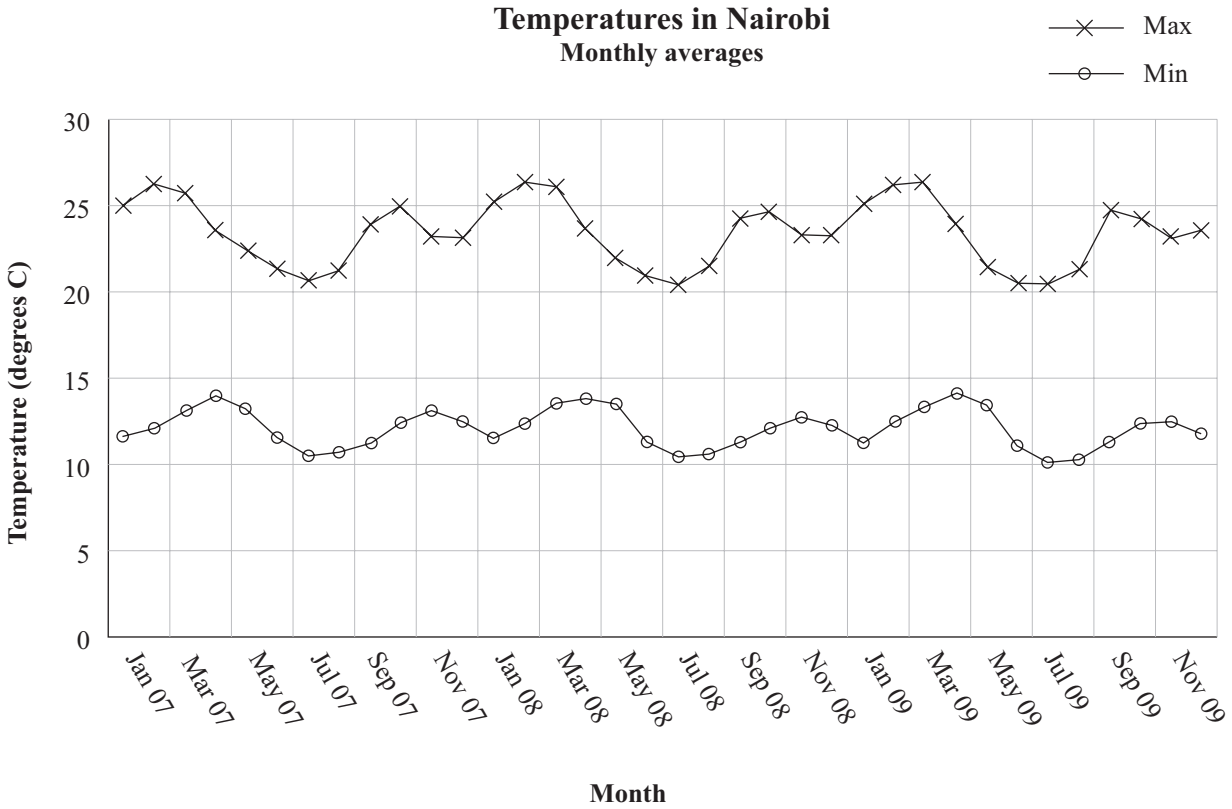
Use the graphs given on page 8 to answer each of questions (a) to (f). You do **not** need to explain why the climate features happen.

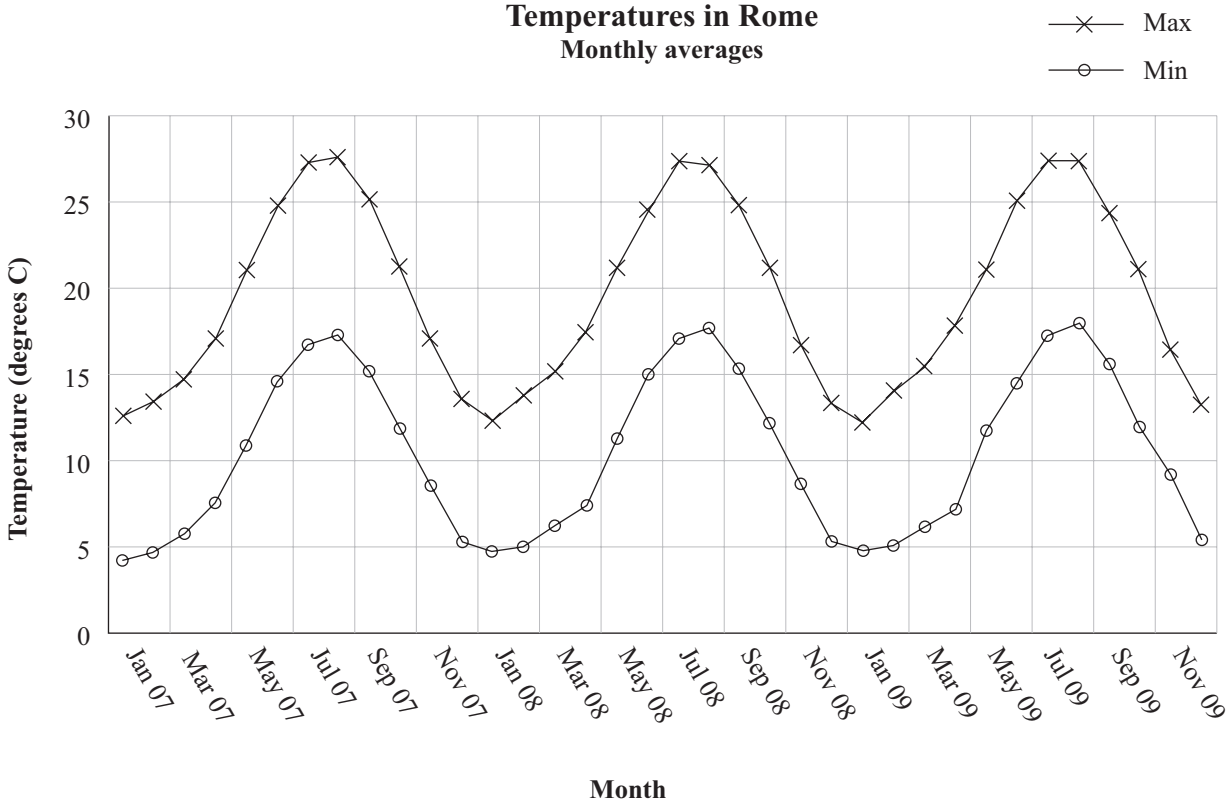
(a) Is Richard correct to believe that the temperature in Rome is higher than the temperature in Nairobi, so Rome is warmer? Justify your answer using the graphs.

(b) Comment on how the maximum and minimum temperatures in the two cities vary over a year.

## GRAPHS (reprinted from page 8)

Data source: http://www.worldclimate.com/



ASSESSOR'S USE ONLY

(c) Richard has been told that both the maximum and minimum temperatures vary less in Rome than they do in Nairobi. Do the graphs support this? Justify your answer.

(d) Richard thinks that "the temperature appears to be rising in Rome, so it will get warmer in the future". Do you agree? Justify your answer, using the graphs.

(e) Is Richard correct to say that "the difference between the maximum and minimum temperature is less in Rome"? Justify your answer using the graphs.

(f) Richard wants to live somewhere warm.

Should he choose Rome or Nairobi?

Justify your answer by referring to the graphs. Discuss any limitations in the data, or any other research you would need to do before you could make a valid decision.

ASSESSOR'S USE ONLY

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

91037