



Christ Church
Grammar School

2016
UNIT TEST 1

Year 11 Mathematics Specialist

Section Two:

Calculator-assumed

Student name _____

Teacher name _____

Time and marks available for this section

Reading time before commencing work: 3 minutes
Working time for this section: 30 minutes
Marks available: 30 marks

Materials required/recommended for this section

To be provided by the supervisor

This Question/Answer Booklet
Formula Sheet (retained from Section One)

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: drawing instruments, templates, and up to three calculators approved for use in the WACE examinations

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Instructions to candidates

1. Answer all questions.
2. **Show all your working clearly.** Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.
3. It is recommended that **you do not use pencil**, except in diagrams.

Question 4**(4 marks)**

Prove by contradiction that a triangle with one side of length of $6x$, another of length $12x+13$ and the longest side of length $13x+14$, where x is an integer, cannot be right angled.

Question 5**(4 marks)**

A true statement is 'if a hexagon is regular then it has six sides of equal length'.

(a) Write the contrapositive of the statement and state whether or not the contrapositive is also true. (2 marks)

(b) Write the converse of the statement and state whether or not the converse is also true. (2 marks)

Question 6**(6 marks)**

For each of the following statements, state whether they are always true or sometimes false. Support each answer with an example.

(a) If $P \Rightarrow Q$, then it follows that $Q \Rightarrow P$. (2 marks)

(b) If $Q \Leftrightarrow P$, then it follows that $Q \Rightarrow P$ and $P \Rightarrow Q$. (2 marks)

(c) If $P \Rightarrow Q$, then it follows that $\bar{P} \Leftrightarrow \bar{Q}$. (\bar{P} is the negation of P) (2 marks)

Question 7**(6 marks)**

Thirty-eight people were interviewed about their travelling experience in the past 12 months. While the interviewer did not write down the details of the interviews, she remembered the following information. In the last 12 months:

2 people travelled overseas, interstate and within their own state

2 people travelled overseas and within their own state only

7 people travelled interstate only

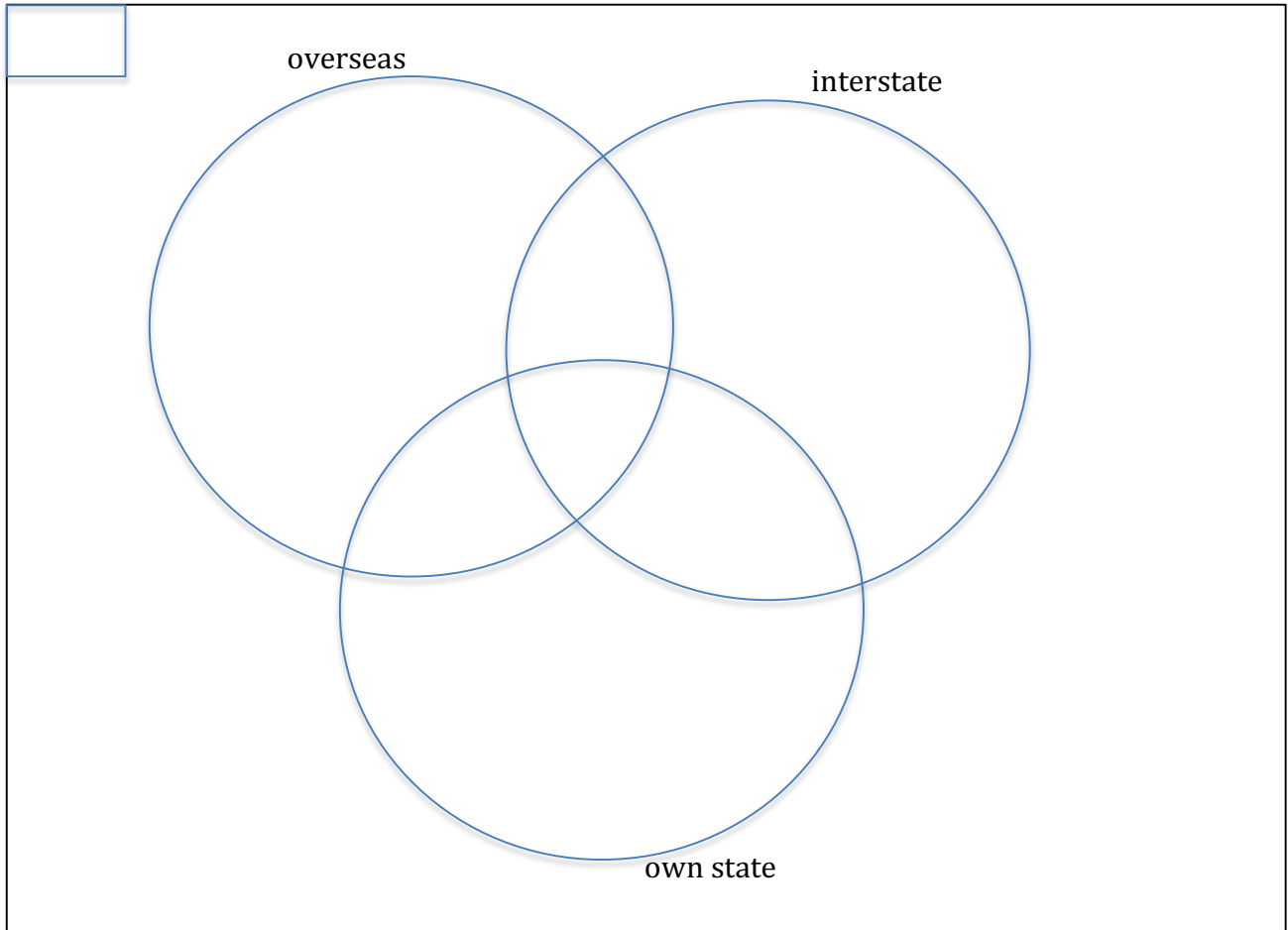
22 people travelled within their own state

3 people did not travel at all

The number of people who travelled interstate and within their own state only was twice the number of people who travelled overseas and interstate only (x)

The number of people who travelled overseas (y) was equal to the number of people who travelled within their own state only.

- (a) Use a Venn diagram to represent the information that the interviewer remembered. (3 marks)



(b) By writing down equations using the variables x (the number of people who travelled overseas and interstate only) and y (the number of people who travelled overseas), solve simultaneously and find:

(i) the number of people who travelled interstate and overseas only

(2 marks)

(ii) the number of people who travelled overseas

(1 mark)

Question 8

(7 marks)

A table in a restaurant has 5 seats.

They are arranged on two sides of the table, with 3 facing towards the window and the other 2 facing away.

A group of 5 people sits at the table.

- (a) In how many different ways can all 5 arrange themselves if there are no restrictions? (1 mark)

Agatha, Gertrude and Martha are members of the group.

In how many different ways can the group arrange themselves if

- (b) Agatha and Gertrude must sit on the same side of the table? (2 marks)

(c) Agatha and Gertrude must sit on opposite sides of the table? (2 marks)

(d) Agatha, Gertrude and Martha must sit facing towards the window? (2 marks)

Question 9

(3 marks)

The variables k and m are both positive integers such that $m^2 + 3 = 2k$.

(a) Explain why m must always be odd. (1 mark)

- (b) Using the fact that an odd integer can be written in the form $2n+1$, or otherwise, prove that k is always the sum of three square numbers.

(2 marks)

End of Questions