# Rossmoyne Senior High School

### Year 12 Trial WACE Examination, 2014

### Question/Answer Booklet

**SOLUTIONS**

# MATHEMATICS 2A/2B

## Section Two:

## Calculator-assumed

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Number: In figures |  |  |  |  |  |  |  |  |

 In words

 Your name

## Time allowed for this section

Reading time before commencing work: ten minutes

Working time for this section: one hundred minutes

## 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, pencils, pencil sharpener, eraser, correction fluid/tape, ruler, highlighters

Special items: drawing instruments, templates, notes on two unfolded sheets of A4 paper, and up to three calculators satisfying the conditions set by the Curriculum Council for this examination.

## Important note to candidates

No other items may be used in this section of the examination. 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.

## Structure of this paper

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Section | Number of questions available | Number of questions to be answered | Working time (minutes) | Marks available | Percentage of exam |
| Section One:Calculator-free | 7 | 7 | 50 | 50 | 33⅓ |
| Section Two:Calculator-assumed | 13 | 13 | 100 | 100 | 66⅔ |
|  | **Total** | 150 | 100 |

## Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2013*. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in the spaces provided in this Question/Answer Booklet. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
* Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
* Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.
1. **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.
2. It is recommended that you **do not use pencil**, except in diagrams.

Section Two: Calculator-assumed (100 Marks)

This section has**thirteen (****13)** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time for this section is 100 minutes.

Question 8 (4 marks)

(a) Find  for the sequence given by . (1 mark)

29, 34, **39**

(b) Find  for the sequence given by . (1 mark)



(c) Write down a recursive rule to continue the sequence 90, 83, 76, 69, 62, ... (2 marks)



Question 9 (6 marks)

The test marks achieved in seven tests by two students, Jo and Kim, are shown as percentages in the table below:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Total |
| Jo | 51 | 60 | 66 | 66 | 65 | 66 | 60 | 434 |
| Kim | 57 | 62 | 65 | 67 | 53 | 59 | 64 | 427 |

(a) State the mode of Jo's test marks. (1 mark)

66

(b) Determine the range of Kim's test marks. (1 mark)

67 - 53 = 14

(c) Who had the highest median test mark, and how much higher was it than the other person's median? (2 marks)

Jo: 51, 60, 60, **65**, 66, 66, 66: Median = 65

Kim: 53, 57, 59, **62**, 64, 65, 67: Median = 62

Jo had highest median by 3.

(d) Explain how it is possible to use information shown in the table to know that Jo had a higher mean mark than Kim. (1 mark)

Jo had a higher total for the seven tests.

(e) Calculate the mean of Kim's test marks. (1 mark)



Question 10 (7 marks)

A report on the preferred browser of students in a school during 2012 included the following pie chart.



(a) What percentage of students preferred Opera? (2 marks)



(b) How many times more popular was Chrome than Safari? (1 mark)

 times as popular.

120 students said they preferred Internet Explorer.

(c) How many students said they preferred Firefox? (1 mark)

 students.

(d) How many students were questioned for the survey? (1 mark)

 students.

(e) One third of those preferring Chrome were boys. How many girls preferred Chrome?

 (2 marks)



Question 11 (9 marks)

A triangle in position A has been transformed into positions B, C and D.

One transformation was a translation, one a reflection and the other a rotation.



(a) Fully describe the transformation used to transform the triangle from position A to

(i) position B. (2 marks)

Translation

of 4 units to the left and 8 units upwards.

(ii) position C. (2 marks)

Reflection

in the -axis.

(b) The triangle has been transformed by a rotation from position A to position D.

(i) State the coordinates of the centre of rotation. (1 mark)

(0, 0)

(ii) State the angle of rotation. (1 mark)

90°

(iii) State the direction of rotation. (1 mark)

Anti-clockwise

(c) The shape below is made from five squares and it displays rotational symmetry. What is the order of the rotational symmetry? (1 mark)

 

Order 2

(d) Add no more than two squares to the above shape, so that it displays line symmetry of order 2. (1 mark)

See diagram above.

(Other possibilities exist)

Question 12 (6 marks)

The graph of  is shown below.



(a) Use the graph, clearly showing your method, to

(i) determine the value of . (1 mark)

11.3

(ii) determine the value of , if . (1 mark)



(b) Use the rule  to complete the table below to one decimal place. (2 marks)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 |
|  | 1.0 | 1.7 | 3.0 | **5.2** | **9.0** | **15.6** | **27.0** |

(c) Add the graph of  to the axes above. (2 marks)

Question 13 (8 marks)

A small park has nine paths linking six entrances (A, B, C, D, E and F) together. The distances along paths from one entrance to another are shown in the table below in metres.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | A | B | C | D | E | F |
| A | - | 55 | 65 | 50 | - | 60 |
| B | 55 | - | 50 | - | - | - |
| C | 65 | 50 | - | 55 | - | - |
| D | 50 | - | 55 | - | 50 | 55 |
| E | - | - | - | 50 | - | 45 |
| F | 60 | - | - | 55 | 45 | - |

(a) Use the above information to complete the network below. (3 marks)



(b) Determine the shortest path from entrance E to entrance B, stating the route and the minimum distance. (2 marks)

E - D - C - B

50+55+50 = 155 metres.

(c) Is the network in (a) traversable? Briefly justify your answer. (2 marks)

Yes.

There are just two odd vertices.

(d) The addition of one more path to the network above will change your answer to (c). Between which two entrances should this path be added? (1 mark)

Many possibilities exist, such as AB, AD, AE, ...

Two even vertices must be joined so that four odd vertices are created.

Question 14 (11 marks)

The weights, in kilograms, of 24 students selected from one year group are shown below:

42, 47, 58, 55, 53, 55, 46, 54, 65, 61, 53, 54, 52, 55, 52, 58, 55, 56, 45, 49, 50, 58, 55, 51.

(a) Use the 24 weights to complete the frequency column in the table below. (2 marks)

|  |  |  |
| --- | --- | --- |
| Weight (kg) | Class Midpoint | Frequency |
|  | 44 | 2 |
|  | 48 | **3** |
|  | **52** | **6** |
|  | **56** | **8** |
|  | **60** | **4** |
|  | **64** | **1** |

(b) State the modal class for the frequency table. (1 mark)



(c) Calculate the percentage of students who have weights in the  kg group in the frequency table. (1 mark)



(d) Complete the class midpoint column in the frequency table. (1 mark)

(e) Use the frequency table to calculate the mean weight of the 24 students. (2 marks)

54 kg

(f) Use the data from the frequency table to draw a histogram on the axes below. (2 marks)



(g) Describe the spread of the 24 weights. (2 marks)

The weights have a range of 23 kg, from the minimum of 42 kg up to 65 kg.

The weights are clustered around the modal class of 54 to 58 kg.

Question 15 (8 marks)

A cup of coffee costs $ at the Been Cafe and $ at the Coffey Cafe.

One week an office worker spent $19.40 buying 2 coffees from The Been Cafe and 3 coffees from The Coffey Cafe.

The following week, 4 coffees from The Been Cafe and 1 coffee from The Coffey Cafe cost the worker $20.30.

(a) Write two equations involving  and  using the above information. (2 marks)



(b) Solve the equations in (a) to determine the values of  and . (2 marks)

Using CAS, or otherwise:



The Been Cafe also sells hot chocolate for $4.50 per cup.

(c) A person with a 15% discount card buys two cups of hot chocolate. How much should they be charged? (2 marks)



(d) The Been Cafe plan to increase their prices by 4%. Calculate the new price, to the nearest five cents, for a cup of hot chocolate. (2 marks)



Charge $4.70 to nearest 5c.

Question 16 (7 marks)

In the diagram below, , , angle , and angles  and  are .

 

(a) Use Pythagoras' Theorem to determine the length . (2 marks)



(b) Determine the size of angle . (2 marks)



(c) Determine the length of

(i) . (2 marks)



(ii) . (1 mark)



Question 17 (8 marks)

A fishing boat has dropped two cray pots at A(8, -6) and B(12, 5) relative to a harbour at H(0, 0), where one unit represents 1 km.

(a) Plot the locations of the two cray pots on the axes below. (1 mark)



(b) If the fishing boat motors from the harbour to location A, on to location B and then returns to the harbour, determine the total distance it has to travel. (3 marks)



(c) The gradients of the lines AB and BH are 2.75 and  respectively.

(i) Calculate the gradient of the line AH. (2 marks)



(ii) Determine the equation of the line AB. (2 marks)



Question 18 (8 marks)

The sketch below shows a solid wooden sphere with a radius of 7.5 cm.

 

(a) Calculate

(i) the volume of the sphere. (2 marks)



(ii) the total surface area of the sphere. (2 mark)



(b) The wooden sphere is sliced in half to create two hemispheres. Calculate

(i) the volume of one of the hemispheres. (1 mark)



(ii) the total surface area of one of the hemispheres. (3 marks)



Question 19 (11 marks)

A regular octahedral die, with eight faces, together with a possible net, is shown below.



A single digit, chosen from 1, 2 or 3, is used to number each of the eight faces of the die, with each of the digits used one or more times.

(a) If the faces are marked with the numbers 1, 1, 1, 1, 2, 3, 3 and 3, what is the probability of rolling

(i) a one? (1 mark)



(ii) an odd number? (1 mark)



(b) If the faces are marked with the numbers 1, 1, 1, 1, 1, 2, 2 and 3, what is the probability of rolling an odd number? (1 mark)



(c) Label this copy of the net so that there is a greater chance of rolling a three than a one.

 (1 mark)



(d) Label this copy of the net so that the chance of rolling a two is the same as the chance of rolling a three but more than the chance of rolling a one. (2 marks)



(e) A die is rolled 16 times, with the results summarised in the table below.

|  |  |
| --- | --- |
| Number | Frequency |
| 1 | 6 |
| 2 | 1 |
| 3 | 9 |

(i) Is it possible that the faces of this die are marked with 1, 2, 2, 2, 2, 2, 3 and 3? Explain your answer. (1 mark)

Yes, since faces can be marked with any combination of 1's, 2's and 3's.

(ii) If the die was thrown another 16 times, would you expect exactly the same frequencies as in the table above? Explain your answer. (1 mark)

No, since the die lands randomly and it is only being rolled a small number of times.

(f) Another die is rolled 800 times, with the results summarised in this table:

|  |  |
| --- | --- |
| Number | Frequency |
| 1 | 97 |
| 2 | 398 |
| 3 | 305 |

(i) Based on these results, show the most likely labelling of the die on the net below.

 (2 marks)



(ii) If the die had been rolled 80 times, instead of 800 times, would you be more or less confident in predicting the labelling of the die? Explain your answer. (1 mark)

Less confident, as relative frequencies tend to stabilise in the long run.

Question 20 (7 marks)

The first three complete rows of a number pattern are shown below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Row |  |  |  |  | Result |
| 1 | 2 | 1 |  |  |  |
| 2 | 3 | 2 |  |  |  |
| 3 | 4 | 3 |  |  |  |
| 4 | 5 | 4 |  |  |  |
| 5 | 6 | 5 |  |  |  |

(a) Complete Row 4. (2 marks)

(b) Looking at the result column, a student made the conjecture that the result was always an even number. Write down another conjecture that could be made about the type of number in the result column. (1 mark)

Result is always a whole number.

Result is always a multiple of four.

Result is always one less than number in fourth column.

Etc, etc.

(c) Complete Row 5 in the table and comment on whether the result supports both conjectures in (b). (4 marks)

Depending on ans to (b), result is likely to support both conjectures.

Additional working space

Question number: \_\_\_\_\_\_\_\_\_

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*Published by WA Examination Papers*

*PO Box 445 Claremont WA 6910*