

Write your name below:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Hale School**

**Year 11 Semester 2 Examination, 2015**

**Mathematics
Methods**

**Teacher:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Section Two:
Calculator-assumed

Booklet 3 of 3**

TIME ALLOWED FOR THIS SECTION

Reading time before commencing: Ten minutes
Working time for paper: One hundred minutes

**MATERIAL REQUIRED/RECOMMENDED FOR THIS PAPER**

*TO BE PROVIDED BY THE SUPERVISOR*

**TWO** Question/Answer booklets for Section Two – complete BOTH.

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, notes on one unfolded sheet of A4 paper, and
 calculators approved for use.

**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. Please check carefully, and 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 | 33 1/3 |
| Section Two:Calculator-assumed | 12 | 12 | 100 | 100 | 66 2/3 |
|  |  | **Total** | 100 |

**INSTRUCTIONS TO CANDIDATES**

1. Write your answers in this Question/Answer Booklet.
2. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.
3. 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.

1. Fill in the number of the question that you are continuing to answer at the top of the page.
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 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.

**Section Two: Calculator Assumed 100 marks (66 2/3 %)**
This section has 12 questions. Answer all questions. Write your answers in the spaces provided.
Working time: 100 minutes
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**THERE ARE NO QUESTIONS ON THIS PAGE**

**TURN OVER FOR THE FIRST QUESTION IN THIS BOOKLET**

**Question 15 13 marks**

A particle travels in a straight line so that its displacement, in metres, from fixed point O, at time t seconds is given by  .

Determine

1. the position of the particle after 3 seconds, (1 mark)
2. the speed of the particle after 3 seconds, (3 marks)
3. the times at which the particle is stationary, (2 marks)
4. the distance travelled by the particle in the first 8 seconds. (3 marks)

**Question 15 (Cont)**

1. Draw a sketch of the velocity – time graph for the motion in the first 8 seconds.

 (2 marks)

****

1. Use your graph in part e. to state the range of times for which the speed is increasing.

 (2 marks)

**Question 16 8 marks**

The population, P, of feral cats in a remote Western Australian town, *t* months after the start of 2012, can be modelled by the equation .

1. By how much did the feral cat population grow in June 2012? Give your answer to the nearest one. (1 marks)
2. Find the average growth in the number of cats per month over the period from the start of 2012 until the start of 2015. Give your answer to 1 decimal place. (2 marks)

At the start of 2015 an eradication programme was put in place so that the number of feral cats began to fall exponentially. 7 months after the start of the programme the number of cats was 1200.

1. Given that the population after the start of 2015 can be modelled by the equation

, find the values of A and b. Give your answers to 3 significant figures.

 (3 marks)

1. Find the time, to the nearest month, when the feral cat population will have fallen back to the level that it was at the start of 2012. (2 marks)

**Question 17 9 marks**

A bouncy rubber ball is dropped from a height of 2 metres and follows a vertical path up and down, bouncing on the floor. After each bounce it returns to a height that is 95% of the previous height.

1. Calculate the height, in metres to 2 decimal places, that it returns to after the 3rd bounce.

 ( 3 marks)

1. Calculate the total distance, in metres to 1 decimal place, that the ball has travelled when it hits the ground for the 20th time. (3 marks)
2. Calculate the total distance travelled by the ball over its entire journey. (3 marks)

**Question 18 12 marks**

A clerk is employed by an accounting firm. He is offered two salary packages as described below.

Package A : A starting salary of $40 000 increasing by $1000 each year.

Package B : A starting salary of $36 000 increasing by 4% each year.

1. Find his salary for each of the first 3 years if he accepts package B. (2 marks)
2. In which year will his salary from package B first exceed his salary from package A?

 (2 marks)

1. Write down a formula for his total salary earned over the first n years for i. package A (2 marks)

 ii. package B (2 marks)

**Question 18 (Cont)**

1. How long will it take so that his total earnings from package B is more than his total earnings from package A? (2 marks)
2. The accounting firm wants to change the rate at which the salary increases each year for package B so that the total amount earned by the two packages is the same by the 10th year. What should the new rate of salary increase be? Give your answer as a percentage to 2 decimal places. (2 marks)

**Question 19 8 marks**

****

The axes above show the graph of the gradient function .

a. State the values of  for which the original function is increasing (2 marks)

b. State the values of  at which there is a stationary point on . (1 marks)

c. State, with reasons, the nature of the stationary point on  at x = 1. (2 marks)

d. Given that the gradient function is of the form , find the values of a, b and n. (3 marks)

**END OF BOOKLET 3**

This page may be used for extra working space:

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

This page may be used for extra working space:

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