

# ALL SAINTS' SOLIEGE

## Semester One Examination, 2018

Question/Answer booklet

If required by your examination administrator, please place your student identification label in this box

Calculator-free
Section One:
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WETHODS
<b>SOITAMENTAM</b>

Time allowed for this section		
 Your name		
 ln words		
Student number: In figures		

## Morking time: fifty minutes

Materials required/recommended for this section To be provided by the supervisor

Reading time before commencing work:

This Question/Answer booklet

Formula sheet

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener,

correction fluid/tape, eraser, ruler, highlighters

Special items: ni

#### 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 material. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

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METHODS UNIT 3 2 CALCULATOR-FREE

### Structure of this paper

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of examination
Section One: Calculator-free	8	8	50	52	35
Section Two: Calculator-assumed	13	13	100	98	65
				Total	100

#### Instructions to candidates

- 1. The rules for the conduct of examinations are detailed in the school handbook. Sitting this examination implies that you agree to abide by these rules.
- 2. Write your answers in this Question/Answer booklet.
- You must be careful to confine your response to the specific question asked and to follow any instructions that are specified to a particular question.
- 4. Supplementary pages for the use of planning/continuing your answer to a question have been provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.
- 5. 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.
- 6. It is recommended that you do not use pencil, except in diagrams.
- 7. The Formula sheet is not to be handed in with your Question/Answer booklet.

See next page SN001-115

CALCULATOR-FREE 11 METHODS UNIT 3

Supplementary page

Question number:

Calculate  $E\left( X\right) .$ (S marks) (4 marks) Construct a table to show the probability distribution of X. (S marks) (3 marks) (2 marks) By listing all possible outcomes (234, 235, etc.), determine  $P(X \le 5)$ . at the same time and the random variable X is the largest of the three numbers drawn. A box contains five balls numbered 2,3,4,5 and 6. Three balls are randomly drawn from the box (6 marks) Question 1 Working time: 50 minutes.

Section One: Calculator-free

CALCULATOR-FREE

T-STT-T00NS

See next page

This section has eight (8) questions. Answer all questions. Write your answers in the spaces

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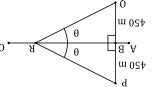
32% (22 Marks)

**METHODS UNIT 3** 

CALCULATOR-FREE 0τ **METHODS UNIT 3** 

(7 marks) 8 noitsauQ

travels towards B, 1200 m from C. perpendicular bisector of PQ and the midpoint of PQ is B. A small train, R, leaves station C and Two houses, P and Q, are  $900\,$  m apart on either side of a straight railway line AC. AC is the



train from the houses and station. Let  $\triangle$  PRB =  $\triangle$  QRB =  $\theta$ , where  $0<\theta<90^{\circ}$ , and X=PR+QR+CR, the sum of the distances of the

By forming expressions for PR , BR and CR, show that  $X = 1200 + 450 \left( \frac{2 - \cos \theta}{\sin \theta} \right)$  .

Use a calculus method to determine the minimum value of X.

End of questions T-STT-T00NS

**METHODS UNIT 3** 

Question 2 (5 marks)

A function defined by  $f(x)=13+18x-6x^2-2x^3$  has stationary points at (1,23) and (-3,-41).

Use the second derivative to show that one of the stationary points is a local maximum and the other a local minimum. (3 marks)

Determine the coordinates of the point of inflection of the graph of y = f(x). (2 marks) Question 7

The function g is such that  $g'(x) = ax^2 + 18x + b$ , it has a point of inflection at (-1,29) and a stationary point at (1,-19).

Determine g(2). (5 marks)

Determine

CALCULATOR-FREE

(i) 
$$\int_{1}^{2} g'(x) dx.$$
 (2 marks)

 $\int 4g'(x) + 16dx.$ (2 marks)

See next page

SN001-115-1

See next page

A particle travels in a straight line so that its distance x cm from a fixed point O on the line after t seconds is given by

$$.0 \le 1, \frac{3t^3}{1+12} = x$$

Calculate the acceleration of the particle when t=1.

Question 6 (5 marks)

8

The height, in metres, of a lift above the ground t seconds after it starts moving is given by

$$y = 2\cos^2\left(\frac{t}{5}\right).$$

Use the increments formula to estimate the change in height of the lift from  $t = \frac{5}{6}\pi$  to  $t = \frac{17\pi}{20}$ .

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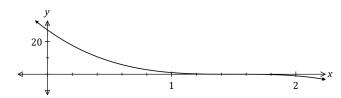
**METHODS UNIT 3** 

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CALCULATOR-FREE

(8 marks)

Question 4
The graph of  $y=|3-2x|^3$  is shown below.



(a) Determine the area of the region enclosed by the curve and the coordinates axes.

(4 marks)

(b) Given that the area of the region bounded by the curve, the x-axis and the line x=k is 8 square units, determine the value of k, where 0 < k < 1.5. (4 marks)

CALCULATOR-FREE

METHODS UNIT 3

Question 5

(7 marks)

Determine  $\frac{dy}{dx}$  for the following, simplifying each answer.

7

(a) 
$$y = \sqrt{5 - 6x}$$
.

(2 marks)

(b) 
$$y = 3x^4 \sin(4x)$$
.

(3 marks)

(c) 
$$y = \int_{x}^{2} \frac{1}{\sqrt{1+t}} dt$$

(2 marks)