

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.

#### Important note to candidates

Special items: drawing instruments, emplatices, notes on two unfolded sheets of A4 paper, are permitted in this course examination

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

To be provided by the candidate

Formula sheet

This Question/Answer booklet

To be provided by the supervisor

#### Materials required/recommended for this section

Reading time before commencing work: five minutes  
Working time: fifty minutes

Number of additional answer booklets used

Time allowed for this section

Your Teacher's name

Your name

Calculator-free  
Section One:

UNIT 1&2  
METHODS  
MATHEMATICS

Question/Answer booklet

Semester Two Examination, 2022

INDEPENDENT PUBLIC SCHOOL

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**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	12	12	50	51	35
Section Two: Calculator-assumed	13	13	100	100	65
<b>Total</b>					<b>100</b>

**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 preferably using a blue/black pen. Do not use erasable or gel pens.
3. You must be careful to confine your answers to the specific question asked and to follow any instructions that are specific to a particular question.
4. 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.
5. It is recommended that you do not use pencil, except in diagrams.
6. Supplementary pages for planning/continuing your answers to questions are 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.
7. The Formula sheet is not to be handed in with your Question/Answer booklet.

Markers use only		
Question	Maximum	Mark
1	3	
2	4	
3	3	
4	2	
5	3	
6	5	
7	3	
8	4	
9	5	
10	4	
11	6	
12	9	
S1 Total	51	
S1 Wt (<0.35)	35%	

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(3 marks)

Determine the centre and radius of the circle with equation  $x^2 + y^2 - 6y = 0$ .

Question 1 (1.1.21)

Working time: 50 minutes.

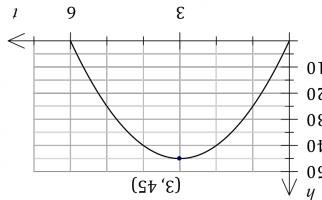
This section has twelve questions. Answer all questions. Write your answers in the spaces provided.

Section One: Calculator-free

35% (51 Marks)

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(4 marks)



(b) The height  $h$  metres above the ground

of a small body  $t$  seconds after it is projected vertically upwards is shown in the position-time graph.

Given that  $h = at^2 + bt$ , where  $a$  and  $b$  are constants, determine the speed of the body when  $t = 0.9$ .

Question 2 (1.1.17)

the speed of the body when  $t = 0.9$ .

**Question 3** (1.1.16)

(3 marks)

Solve the equation  $4 \cos^2\left(\frac{x}{2}\right) - 3 = 0$  for  $0 \leq x \leq 2\pi$ .

Supplementary page

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

**Question 4** (2.1.1, 2.1.2)

(2 marks)

- (a) Determine  $f(2)$  in simplified form when  $f(x) = 25^{1.5-x}$ .

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(3 marks)

- (a) The tangent to the curve  $y = f(x)$  at  $(3, -2)$  is perpendicular to the tangent to the same curve at point  $P$ . Determine the equation of the tangent at  $P$ .  
(3 marks)

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## Question 6 (1.3.1 – 1.3.5)

(a) State whether the following are True or False.

(i)  $90 \times 8! = 10!$

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(ii)  ${}^{25}C_1 + {}^{25}C_{24} = 26$

---

(iii)  $\frac{(n-2)!}{n!} = \frac{1}{n^2 - n}$

---

(b) Determine the 5<sup>th</sup> term in the expansion of  $(2a + 1)^8$ .

(2 marks)

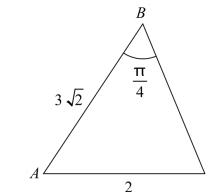
(5 marks)

(3 marks)

## Question 12 (1.2.4, 1.2.7, 1.2.8, 1.2.14)

(9 marks)

(a) Using sine rule, or otherwise, explain why the triangle drawn below cannot exist. (3 marks)



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(b) Given  $\sin A = \frac{1}{5}$ , where A is in the first quadrant, and  $\cos B = \frac{2}{3}$ , where B is in the fourth quadrant.(i) Determine the exact value of  $\sin(A+B)$ .

(4 marks)

(ii) Determine which quadrant is  $A+B$  in, justifying your answer.

(2 marks)

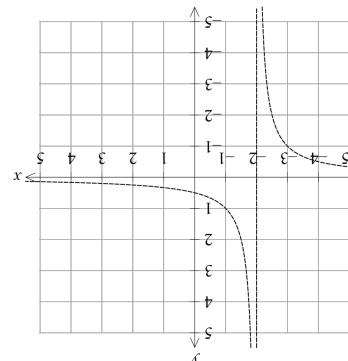
Question 11      (1.1.13, 1.1.14, 1.1.15, 1.1.26)      (6 marks)

Question 7      (2.1.1, 2.1.3)      (3 marks)

(a) Simplify the following, leaving your solution in scientific notation rounded to 2 significant figures:  

$$\frac{(3.42 \times 10^4) \times (2 \times 10^{-7})}{6 \times 10^{-8}}$$

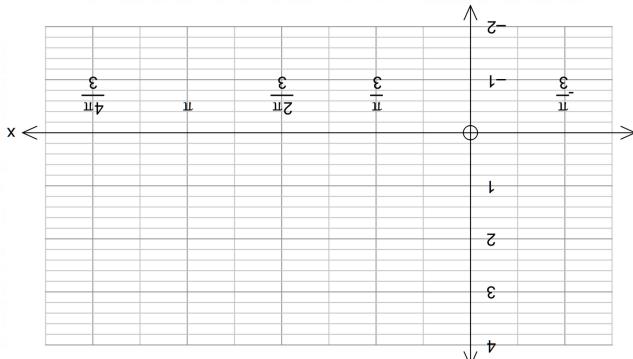
(b) The dashed hyperbola  $y = \frac{x+2}{1}$  is drawn below.



The dashed hyperbola  $y = \frac{x+2}{1}$  is drawn below.

Question 8      (1.2.9, 1.2.10, 1.2.12)      (4 marks)

(b) (i) Draw the graph of  $y = 2\cos(x) + 1$  over the domain  $-\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$  on the axes  
 $\text{passes through the origin.}$  (2 marks)



(ii) State the co-ordinates of the stationary points of the function on the given domain. (2 marks)

(iii) State the co-ordinates of the stationary points of the function on the given domain. (2 marks)

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A student claims that the section of the graph in part (a) in the first quadrant could present an inverse proportion relationship.  
(c) Is this student correct? Justify your answer either algebraically or graphically. (2 marks)

Question 9 (2.3.15, 2.3.22)

(5 marks)

- (a) Determine  $f(t)$  if  $f'(t) = \frac{3t^3 + 4}{6}$

(2 marks)

- (b) A gradient function is defined to be  $6 - 4x + 3x^2$ .

Determine the function if the point  $(-1, 4)$  lies on the graph of the function.

(3 marks)

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Question 10 (1.1.1 – 1.1.5)

(4 marks)

Two sides of a square are formed by the lines

$$\begin{aligned}y &= 3x + 2 \\3y + x - 6 &= 0\end{aligned}$$

One of the corners of the square is at  $(0, 2)$ .

- (a) Explain why these two lines intersect at  $(0, 2)$ .

(1 mark)

Another of the corners is the  $x$ -intercept of  $3y + x - 6 = 0$ .

- (b) Determine the coordinates of this corner.

(1 mark)

A third corner is found at  $(2, 8)$  on the line  $y = 3x + 2$ .

- (c) Given that the diagonals of a square bisect each other determine the coordinates of the fourth corner.

(2 marks)