



SHENZHEN COLLEGE OF INTERNATIONAL EDUCATION

General Certificate of Education

Advanced Subsidiary Level and Advanced Level

CANDIDATE  
NAME

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CENTRE  
NUMBER

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CANDIDATE  
NUMBER

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**MOCK EXAMINATIONS**

**MATHEMATICS**

**9709/35**

Paper 3 Pure Mathematics (**P3**)

**March 2024**

**1 hour 50 minutes**

Additional materials: List of Formulae (MF19)

Please circle your teachers' name

Ryan	Yassine	Melissa	Mahinur	Mathew	Tamas	Jianzhong
Barbara	Daniel	Alpha	Bill	Liam	Tifa	Hardeep

**READ THESE INSTRUCTIONS FIRST**

Write your Candidate number, English name, Chinese name and the name of your mathematics teacher on all work that you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** the questions.

Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.

The use of an electronic calculator is expected, where appropriate.

You are reminded of the need for clear presentation in your answers.

The number of marks is given in brackets [ ] at the end of each question or part question.

The total number of marks for this paper is **75**.

Question	Mark
Q1	
Q2	
Q3	
Q4	
Q5	
Q6	
Q7	
Q8	
Q9	
Q10	

This paper consists of **18** printed pages and **2** blank pages

**[Turn over**

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1. Find the quotient and remainder when  $x^4$  is divided by  $x^2 + 2x - 1$ . [3]

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

2. Expand  $(2 - x)(1 + 2x)^{-\frac{3}{2}}$  in ascending powers of  $x$ , up to and including the term in  $x^2$ , simplifying the coefficients. [4]

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3. The equation of a curve is  $y = x \tan^{-1}\left(\frac{1}{2}x\right)$ .

(a) Find  $\frac{dy}{dx}$ . [3]

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- (b) The tangent to the curve at the point where  $x = 2$  meets the y-axis at the point with coordinates  $(0, p)$ .

Find  $p$ . [3]

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4. Using the substitution  $u = \sqrt{x}$ , find the exact value of

$$\int_3^{\infty} \frac{1}{(x+1)\sqrt{x}} \, dx. \quad [6]$$

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5. (a) Sketch, on the same diagram, the graphs of  $y = |2x - 11|$  and  $y = 3x - 3$ . [2]

- (b) Solve the inequality  $|2x - 11| < 3x - 3$ . [3]

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- (c) Find the smallest integer  $N$  satisfying the inequality  $|2 \ln N - 11| < 3 \ln N - 3$ . [2]

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7. (a) The complex number  $u$  is given by  $u = 8 - 15i$ . Showing all necessary working, find the two square roots of  $u$ . Give answers in the form  $a + ib$ , where the numbers  $a$  and  $b$  are real and exact. [5]

This image shows a full page of white paper with horizontal dotted lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- (b) On an Argand diagram, shade the region whose points represent complex numbers satisfying both the inequalities  $|z - 2 - i| \leq 2$  and  $0 \leq \arg(z - i) \leq \frac{1}{4}\pi$ . [4]

8. The positive constant  $a$  is such that  $\int_0^a x e^{-\frac{1}{2}x} dx = 2$ .

(i) Show that  $a$  satisfies the equation  $a = 2 \ln(a + 2)$ . [5]

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(ii) Verify by calculation that  $a$  lies between 3 and 3.5. [2]

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- (iii) Use an iteration based on the equation in part (i) to determine  $a$  correct to 2 decimal places. Give the result of each iteration to 4 decimal places. [3]

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9. Let  $f(x) = \frac{4x^2 + 7x + 4}{(2x + 1)(x + 2)}$ .

(i) Express  $f(x)$  in partial fractions.

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(ii) Show that  $\int_0^4 f(x) \, dx = 8 - \ln 3$ .

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10. (i) Show that  $\sin 2x \cot x \equiv 2 \cos^2 x$ .

[2]

[illegible]



(ii) Using the identity in part (i),

(a) find the least possible value of

$$3 \sin 2x \cot x + 5 \cos 2x + 8$$

as  $x$  varies,

[4]

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(b) find the exact value of  $\int_{\frac{1}{8}\pi}^{\frac{1}{6}\pi} \operatorname{cosec} 4x \tan 2x \, dx$ . [5]

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**Additional Page**

**If you use the following line page to complete the answer(s) to any question(s), the question number(s) must be clearly shown.**

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