



INSIGHT
Trial Exam Paper

2010

SPECIALIST MATHEMATICS

Written examination 1

STUDENT NAME:

QUESTION AND ANSWER BOOK

Reading time: 15 minutes

Writing time: 1 hour

Structure of book

<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
10	10	40

- Students are permitted to bring the following items into the examination: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring sheets of paper, notes of any kind or white out liquid/tape into the examination.
- Calculators are not permitted in this examination.

Materials provided

- The question and answer book of 15 pages with a separate sheet of miscellaneous formulas.
- Working space is provided throughout this book.

Instructions

- Write your **name** in the box provided.
- Remove the formula sheet during reading time.
- You must answer the questions in English.

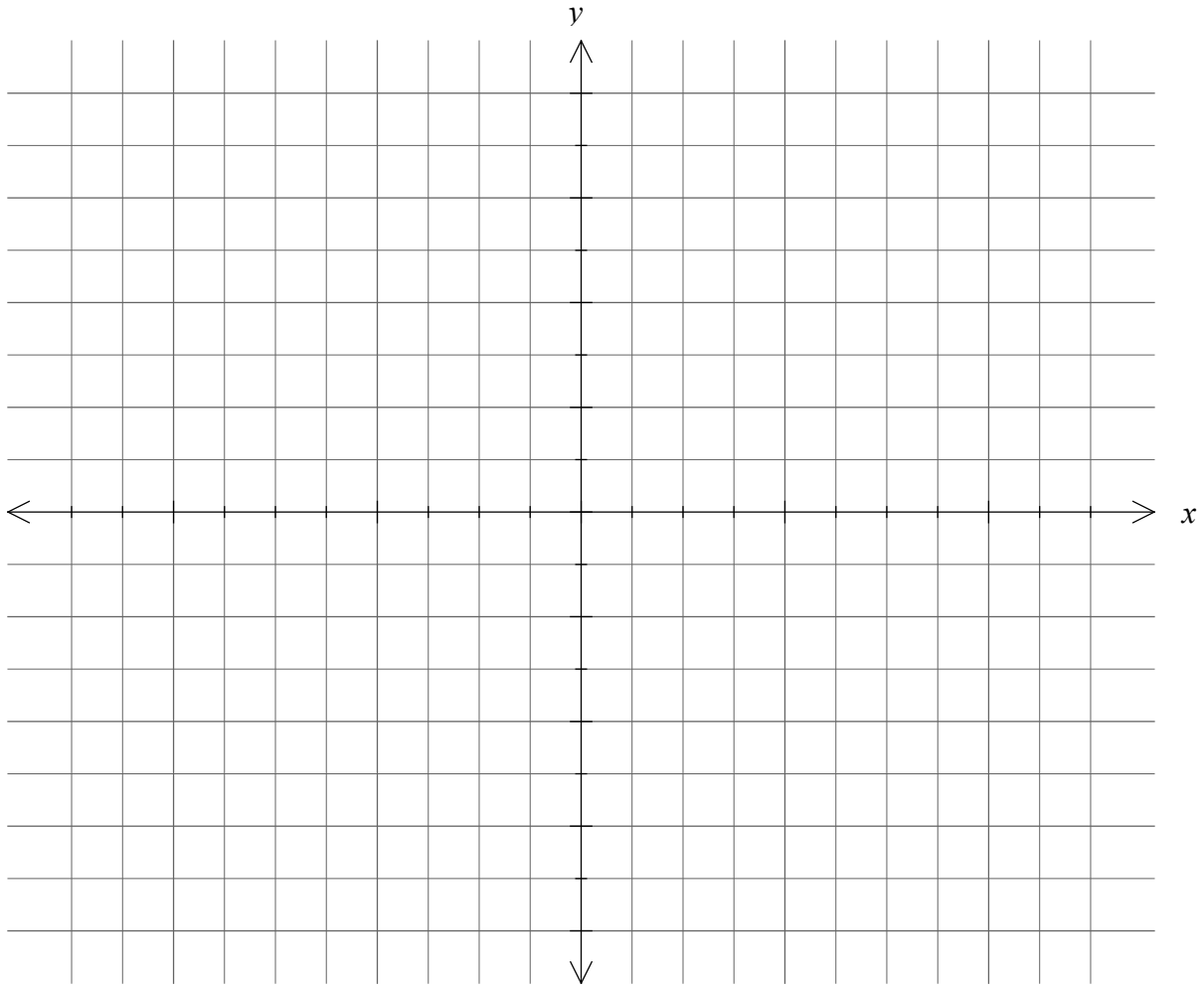
Students are NOT permitted to bring mobile phones or any other electronic devices into the examination.

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b. Sketch the graph of its path on the axes below.

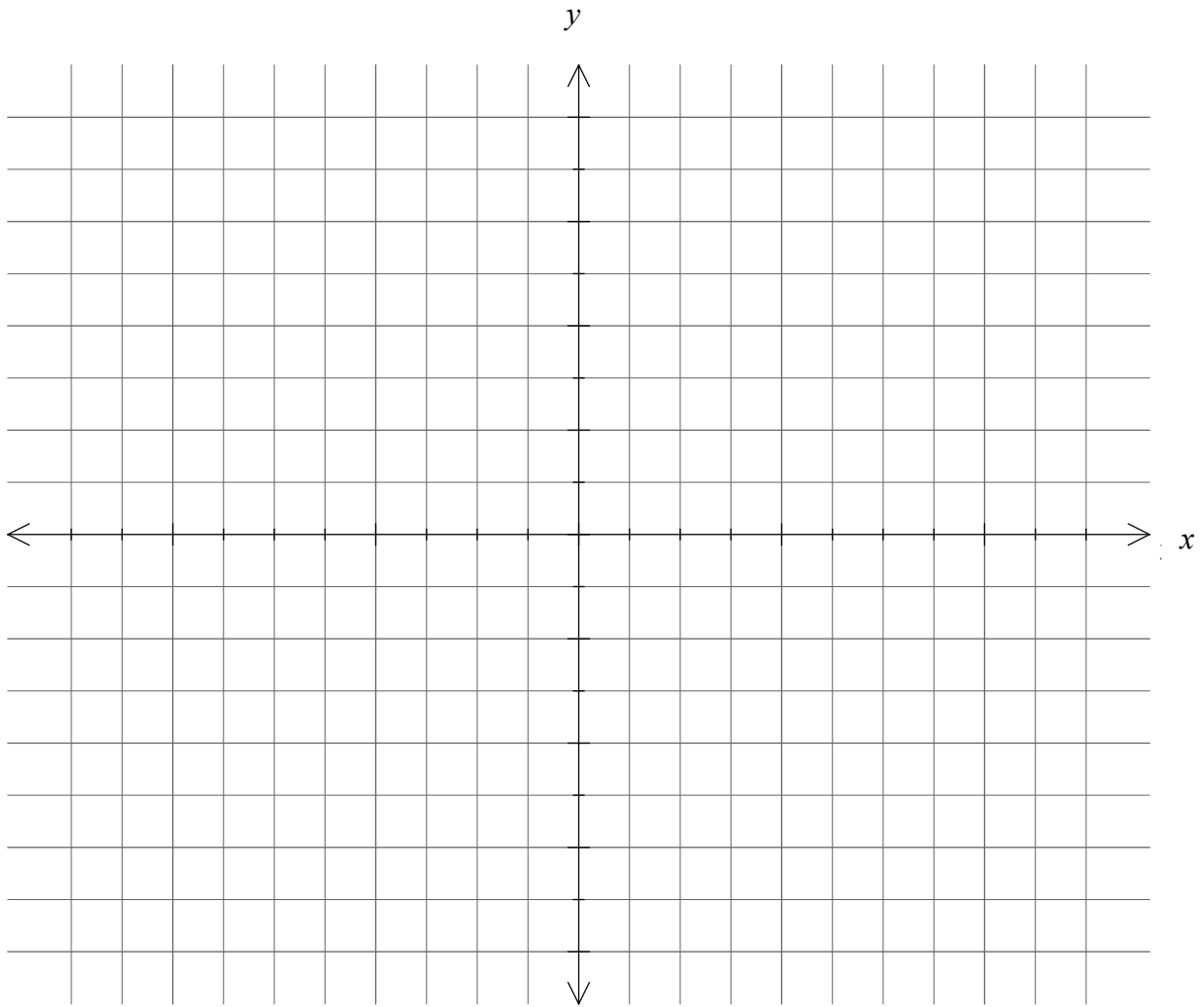


1 mark

End of Question 1
TURN OVER

Question 2

- a. On the set of axes below, shade the region enclosed by the graph of $y = \sin^{-1} x$ and the lines $y = 0$ and $x = 1$.



1 mark

- b.** Find the exact area enclosed by the graph of $y = \sin^{-1} x$ and the lines $y = 0$ and $x = 1$.

2 marks

- c.** Find the exact volume generated by rotating this area about the y -axis.

3 mark

End of Question 2
TURN OVER

Question 3

Given that $z_1 = 2$ is a solution to the equation $z^2 + (i\sqrt{3} - 3)z + 2 - 2\sqrt{3}i = 0$, $z \in \mathbb{C}$

a. Show that the other solution is $z_2 = 1 - \sqrt{3}i$.

1 mark

b. Find the square root of z_2 in the form $a + bi$.

3 marks

Question 5

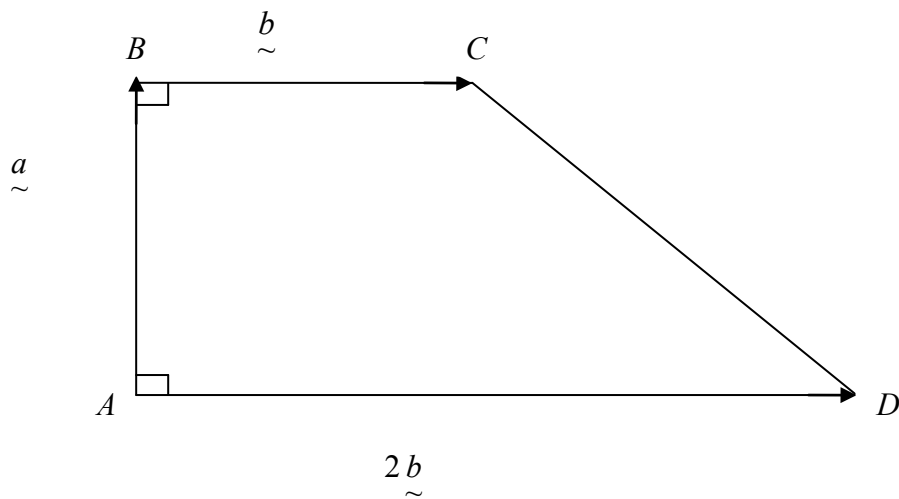
a. Show that $\frac{2x}{4-x^2} = \frac{1}{2-x} - \frac{1}{2+x}$.

2 marks

b. Hence, or otherwise, find $\int_{-1}^1 \frac{2x}{4-x^2} .dx$.

2 marks

Question 6



Given that $|\vec{a}| = |\vec{b}|$ in the trapezium shown above, use vectors to show that $\triangle ACD$ is right angled.

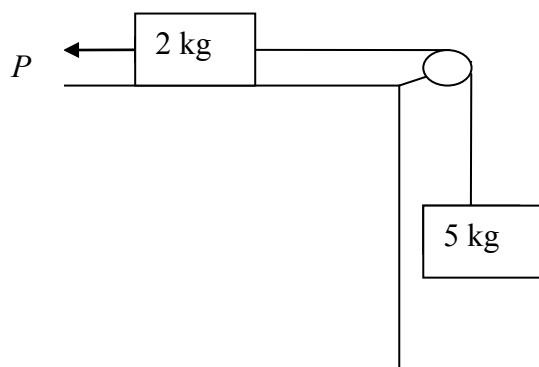
3 marks

End of Question 6
TURN OVER

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Question 8

A 2 kg mass on a horizontal bench is connected by an inextensible string via a smooth pulley to a 5 kg mass, as shown below. The force of P newtons is acting on the 2 kg mass, as shown. The coefficient of friction between the 2 kg mass and the bench is 0.25.



- a. Label all forces on the diagram above.

1 mark

- b. Show that the minimum value of the force P required to maintain equilibrium is $4.5g$ newtons.

2 marks

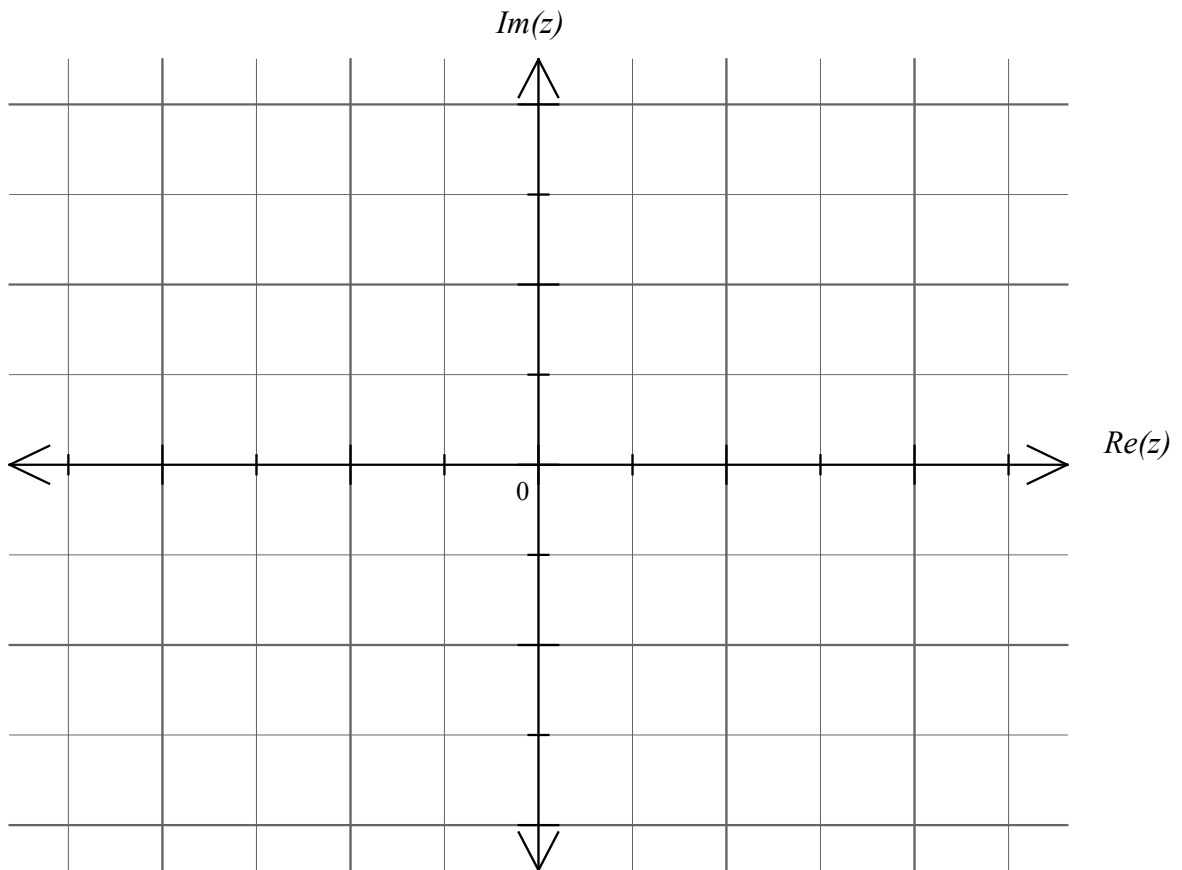
Question 10

$$S = \{z: (z+1)(\bar{z}+1) = 4, z \in \mathbb{C}\} \text{ and } T = \{z: \text{Arg}(z+1) = \frac{-3\pi}{4}, z \in \mathbb{C}\}.$$

a. Find the Cartesian equations of S and T .

2 marks

- b. Show the subsets S and T on the complex plane below.



1 mark