

HONG KONG JOINT-US PRESS LIMITED
HKDSE MOCK EXAMINATION

**MATHEMATICS Compulsory Part
TEST
Question-Answer Book**

Time allowed: 60 minutes
This paper must be answered in English

INSTRUCTIONS

- (1) After the announcement of the start of the examination, you should first write your Candidate Number and stick a barcode label in the spaces provided on Page 1.
- (2) The total mark of this paper is 100. This paper consists of TWO parts: Part I Multiple Choice Questions and Part II Conventional Questions. You are suggested to complete Part I in 15 minutes and Part II in 45 minutes.
- (3) Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.
- (4) For Part II Conventional Questions, unless otherwise specified, all working must be clearly shown.
- (5) Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.
- (6) The diagrams in this paper are not necessarily drawn to scale.
- (7) No extra time will be given to candidates for sticking on the barcode label after the 'Time is up' announcement.

© Hong Kong Joint-Us Press Limited
All Rights Reserved

Please stick the barcode label here.

Candidate Number											
------------------	--	--	--	--	--	--	--	--	--	--	--



Part I - Multiple Choice Questions (36 marks)

Choose the BEST answer for each question.

1. Let $k > 1$ and $x > 0$. $k^{k \log_k x} =$

- A. x .
- B. $k^k x$.
- C. x^k .
- D. $k^k x^k$.

2. Let p and q be real numbers, where $q < 0 < p$. Which of the following must be true?

I. $(pq)^{94} = \left(\frac{1}{p}\right)^{-94} \left(\frac{1}{q}\right)^{-94}$

II. $\frac{1}{87^{pq}} = (87^p)^{\frac{1}{q}}$

III. $\sqrt[q]{\frac{p}{q}} = \frac{\sqrt[p]{p}}{\sqrt[q]{q}}$

- A. I only
- B. II only
- C. I and III only
- D. II and III only

3. Which of the following about the equation $-4\sqrt{-x} = x - 2$ is correct?

- A. The equation does not have any real roots.
- B. The equation has one real root only.
- C. The equation has a real root and a complex root.
- D. The equation has two distinct real roots.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

8. Let t be a real constant. If the graphs of $y = x^2 - 8x + 20$ and $y = 4x - t$ intersect at two distinct points A and B , then the equation of the perpendicular bisector of AB is

A. $x + 4y + 4t - 144 = 0$.

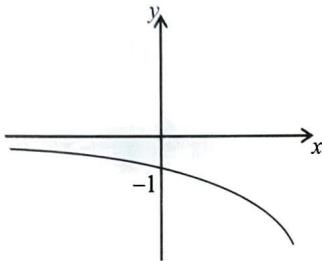
B. $x + 4y + 4t - 102 = 0$.

C. $x + 4y + 4t - 90 = 0$.

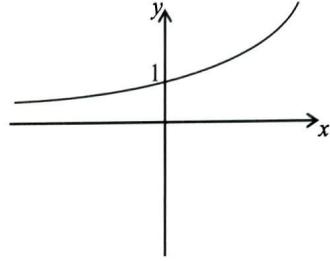
D. $x + 4y + 4t - 30 = 0$.

9. Let $0 < k < 1$. Which of the following figures correctly shows the graph of $k^{-x} + y = 0$?

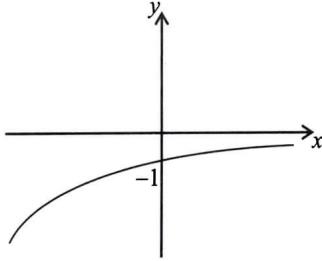
A.



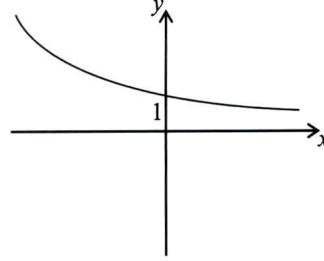
B.



C.



D.

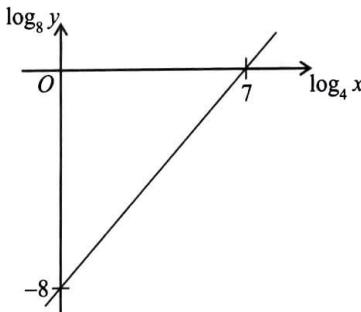


Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

10. The mass of bacteria in a container increases by 50% at 8:00 a.m. and decreases by 25% at 8:00 p.m. on each day. If the mass of bacteria in the container is 100 μg at 7:59 a.m. on 1st April, 2024, on which day will the mass first exceed 1000 μg ?
- A. 17th April, 2024.
B. 18th April, 2024.
C. 19th April, 2024.
D. 20th April, 2024.
11. Let k be a positive real constant not equal to 1. Which of the following about the graphs of $y = k^x$ and $y = \log_k x$ must be correct?
- I. The two graphs are symmetric along $y = x$.
II. The two graphs do not intersect.
III. The y -intercept of the graph of $y = k^x$ is equal to the x -intercept of the graph of $y = \log_k x$.
- A. I and II only
B. I and III only
C. II and III only
D. I, II and III
12. The figure below shows the relationship between $\log_4 x$ and $\log_8 y$. Which of the following must be true?



- A. $x^{-7}y^8 = 2^{56}$.
B. $x^8y^{-7} = 2^{56}$.
C. $x^{-7}y^{12} = 2^{168}$.
D. $x^{12}y^{-7} = 2^{168}$.

END OF PART I

Part II - Conventional Questions (64 marks)

1. Let p and q be positive real constants.

(a) Simplify $\frac{q^{\frac{5}{4}} p^{-\frac{3}{2}}}{\left(8p^8 q^{\frac{-5}{2}}\right)^{\frac{2}{3}}}$ and express your answer with positive indices only. (5 marks)

(b) Given that $\log_2 p = 9.4$ and $\log_2 q = 0.87$, find the value of $\log_2 \left(\frac{q^{\frac{5}{4}} p^{-\frac{3}{2}}}{\left(8p^8 q^{\frac{-5}{2}}\right)^{\frac{2}{3}}} \right)$. (3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2. Solve the following equations.

(a) $32^{2x-5} - 8^{4-3x} = 0$ (3 marks)

(b) $3^{4x+3} + 9^{x+1} = 6$ (3 marks)

(c) $\log_4 x - \log_8 x = \log_2 2$ (3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. Someone claims that there is only one intersection point between the graphs $y = \sqrt{8x + 7}$ and $y = 9x - 4$. Do you agree? Explain your answer. (6 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

3. Someone claims that there is only one intersection point between the graphs $y = \sqrt{8x + 7}$ and $y = 9x - 4$.
Do you agree? Explain your answer. (6 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

4. On 1st January 2020, Anson deposited \$10,000 in Bank ABC at an interest rate of 4% per annum compounded half-yearly.
- (a) Show that the interest earned by Anson after k years is \$10000(1.02^{2k} – 1). (2 marks)
- (b) In which year will the interest earned by Anson exceed \$9487? Explain your answer. (4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

5. Betty runs from her home to her school at an average speed of u km/h, and then returns to her home at an average speed of $(u + 2.4)$ km/h, where u is a real number.

(a) Show that her average speed of the whole journey is $\frac{5u^2 + 12u}{5u + 6}$ km/h. (3 marks)

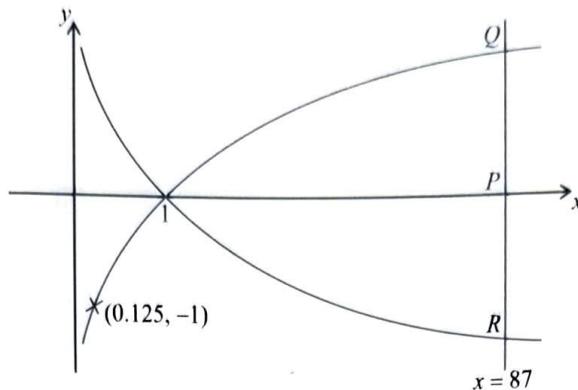
(b) If her average speed of the whole journey is 19.125 km/h, find the value(s) of u . (3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

6. The figure below shows the graphs of $y = \log_a x$ and $y = \log_b x$, where a and b are positive real constants. It is given that the graph of $y = \log_a x$ passes through $(0.125, -1)$, and the straight line $x = 87$ cuts the x -axis, $y = \log_a x$ and $y = \log_b x$ at points P , Q and R respectively such that $PQ : PR = 2 : 3$.



- (a) Find the values of a and b . (5 marks)
- (b) Sketch the graph of $y = b^x$ on the graph above. Mark the x -intercept and the y -intercept if they exist. (2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

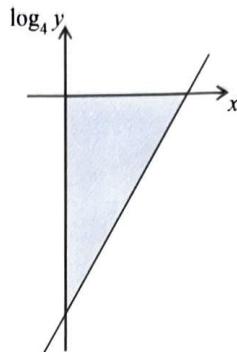
Answers written in the margins will not be marked.

7. Let $y = Ak^x$, where A and k are real constants. The graph of $y = Ak^x$ passes through $(2, 4)$ and $(1, 0.5)$.

(a) (i) Find the values of A and k . (3 marks)

(ii) Hence, express $\log_2 y$ in terms of x . (3 marks)

(b) The figure below shows the linear relation between x and $\log_4 y$. Find the area of the shaded region. (3 marks)



Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

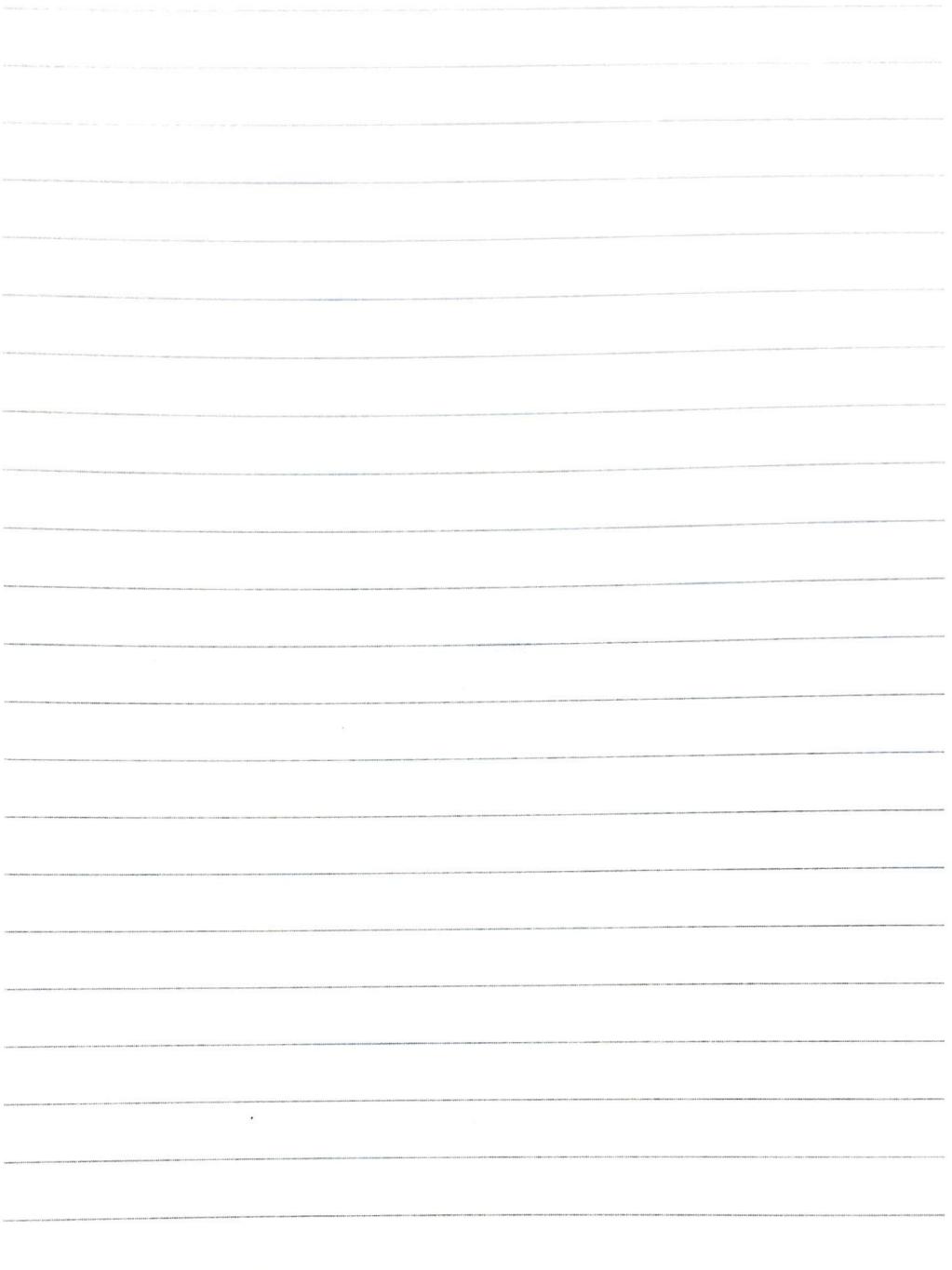
8. (a) (i) Show that $x + 11$ is a factor of $x^3 - 597x - 5236$. (1 marks)
- (ii) Hence, solve $x^3 - 597x - 5236 = 0$. (2 marks)
- (b) Hence, or otherwise, find all real roots of each of the following equations. You may express your answers in scientific notations if necessary.
- (i) $(\log y)^3 - 597(\log y) = 5236$
- (ii) $\left(\frac{940}{8-7^y}\right)^3 - 597\left(\frac{940}{8-7^y}\right) = 5236$
- (iii) $\left(\sqrt{y+12} - \sqrt{\frac{3600}{y+12}}\right)^3 - 597\left(\sqrt{y+12} - \sqrt{\frac{3600}{y+12}}\right) = 5236$ (10 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.



END OF PAPER

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.