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TUTGATHER PRACTICE PAPER

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2027

MATHEMATICS Compulsory Part
PAPER 1

Question-Answer Book

Candidate Number

TUTGATHER
PRACTICE PAPER · NOT AN OFFICIAL HKEAA PAPER

1 hour 5 minutes

This paper must be answered in English

Topic practice: Exponential and Logarithmic Functions

INSTRUCTIONS

(1) This paper consists of THREE sections, A(1), A(2) and B.

(2) Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins.

(3) Unless otherwise specified, all working must be clearly shown.

(4) Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.

(5) The diagrams in this paper are not necessarily drawn to scale.

(6) Calculators and mathematical drawing instruments may be used.

(7) The marks for each question are shown in brackets.

(8) No extra time will be given after the 'Time is up' announcement.

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SECTION A(1) (16 marks)

1. Simplify $\frac{(27x^6 y^{-3})^{2/3}}{(9x^{-2} y^4)^{1/2}}$, where $x > 0$ and $y > 0$. Express your answer with positive indices. **(3 marks)**

2. The graph of $y = ka^x$, where k and a are positive constants and $a \neq 1$, passes through the points $(0, 5)$ and $(2, 45)$. Find k and a. Hence find the value of y when $x = -1$. **(3 marks)**

3. Without using a calculator, evaluate $\log_8 4 + \log_9 \frac{1}{27} + \log_{16} 32$. **(4 marks)**

Answers written in the margins will not be marked.
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4. It is given that $\log 2 = x$ and $\log 3 = y$, where log denotes the common logarithm.

(a) Express $\log 72$ in terms of x and y. **(3 marks)**

(b) Express $\log_6 24$ in terms of x and y. **(3 marks)**

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SECTION A(2) (24 marks)

5. Solve the following equations.

(a) $2^{2x} - 5(2^{x+1}) + 16 = 0$ **(4 marks)**

(b) $\log_4 (x + 3) + \log_4 (x - 3) = 2$ **(3 marks)**

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6. A bank offers a savings plan with interest at 3.6% per annum, compounded monthly. Karen deposits HK$50 000 into the plan and makes no further deposits or withdrawals.

(a) Find the amount in Karen's account after 4 years, correct to the nearest dollar. **(2 marks)**

(b) Find the least number of complete months for the amount in the account to exceed HK$60 000. **(3 marks)**

(c) Find the effective annual rate of interest of the plan, correct to 2 decimal places. Explain briefly why it is greater than 3.6%. **(3 marks)**

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7. Let x be a positive real number such that $x + \frac{1}{x} = 7$.

(a) Show that $(x^{1/2} + x^{-1/2})^2 = 9$, and deduce that $x^{1/2} + x^{-1/2} = 3$. **(3 marks)**

(b) By expanding $(x^{1/2} + x^{-1/2})(x + x^{-1})$, find the value of $x^{3/2} + x^{-3/2}$. **(3 marks)**

(c) Hence find the value of $x^{5/2} + x^{-5/2}$. **(3 marks)**

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SECTION B (10 marks)

8. Let $f(x) = \dfrac{4^x - 1}{2^x}$ for all real values of x.

(a) Show that $f(x) = 2^x - 2^{-x}$. **(2 marks)**

(b) Show that $f(-x) = -f(x)$ for all real x, and describe the symmetry of the graph of $y = f(x)$. **(2 marks)**

(c) Solve $f(x) = \dfrac{3}{2}$. **(3 marks)**

(d) Explain why the equation $f(x) = k$ has exactly one real solution for every real number k. **(3 marks)**

END OF PAPER

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