Please stick the barcode label here.

TUTGATHER PRACTICE PAPER

HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2027

Candidate Number

MATHEMATICS Compulsory Part
PAPER 1

Question-Answer Book

TUTGATHER
PRACTICE PAPER · NOT AN OFFICIAL HKEAA PAPER

1 hour 5 minutes

This paper must be answered in English

Topic practice: Arithmetic and Geometric Sequences and their Summations

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.

TUTGATHER

SECTION A(1) (16 marks)

1. A sequence is defined by $a_n = 3n^2 - 5$ for $n = 1, 2, 3, \ldots$ **(3 marks)**

   (a) Find a_1 and a_4.

   (b) Determine whether 202 is a term of the sequence. Justify your answer.

2. The 5th term of an arithmetic sequence is 17 and the 12th term is 45. **(3 marks)**

   (a) Find the first term and the common difference.

   (b) Find the 30th term.

3. In a geometric sequence, the second term is 6 and the fifth term is 162. All terms are positive. **(4 marks)**

   (a) Find the common ratio and the first term.

   (b) Find the sum of the first 8 terms.

Answers written in the margins will not be marked.
Answers written in the margins will not be marked.
TUTGATHER

4. Consider the arithmetic series $7 + 12 + 17 + \cdots + 402$. **(6 marks)**

(a) Find the number of terms in the series.

(b) Find the sum of the series.

(c) Find the sum of all the terms in the series that are divisible by 3.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

TUTGATHER

SECTION A(2) (24 marks)

5. A company starts a savings fund. In month 1 it deposits \$5000. Each subsequent month the deposit is 4% more than the deposit of the previous month. **(7 marks)**

(a) Find the deposit in month 10, correct to the nearest dollar. (2 marks)

(b) Find the total amount deposited over the first 12 months, correct to the nearest dollar. (3 marks)

(c) The company claims that the total amount deposited over the first n months will eventually exceed \$1 000 000. Find the least value of n for which this happens. (2 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

TUTGATHER

6. The sum of the first n terms of a sequence is given by $S_n = n^2 + 3n$ for all positive integers n. **(8 marks)**

(a) Find T_1 and T_2. (2 marks)

(b) Show that $T_n = 2n + 2$ for $n \geq 2$, and verify that this formula also holds for $n = 1$. (3 marks)

(c) Hence show that the sequence is arithmetic, and find the sum of the terms from the 10th term to the 25th term inclusive. (3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

TUTGATHER

7. An arithmetic sequence has first term $a = 8$ and common difference $d = 6$. **(9 marks)**

(a) Write down the nth term T_n and the sum S_n of the first n terms. (2 marks)

(b) Find the least value of n such that $S_n > 2027$. (3 marks)

(c) A second sequence is formed by taking every third term of the first sequence, i.e. $T_3, T_6, T_9, \ldots$ Show that this new sequence is arithmetic, and find the sum of its first 20 terms. (4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

TUTGATHER

SECTION B (10 marks)

8. A geometric sequence has first term a and common ratio r, where $a > 0$ and $0 < r < 1$. It is known that the sum to infinity is $S_\infty = 16$ and the sum of the first two terms is 12. **(10 marks)**

(a) Show that $r = \frac{1}{2}$ and find a. (4 marks)

(b) Find the least value of n such that the sum of the first n terms exceeds 15.9. (3 marks)

(c) A second geometric sequence has first term a and common ratio r^2. Find the sum to infinity of this second sequence, and express the difference between the two sums to infinity as a fraction in simplest form. (3 marks)

END OF PAPER

Answers written in the margins will not be marked.
Answers written in the margins will not be marked.
TUTGATHER