Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2851798509

MATHEMATICS **9709/11**

Paper 1 Pure Mathematics 1 **May/June 2020**

1 hour 50 minutes

You must answer on the question paper.

You will need: List of formulae (MF19)

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Blank pages are indicated.

1 The sum of the first nine terms of an arithmetic progression is 117. The sum of the next four terms is 91.

Find the first term and the common difference of the progression. [4]

$S_9 = 117 \rightarrow \frac{9}{2}[2a_1 + (n-1)d] = 117 \xrightarrow{\times 2/9} 2a_1 + (n-1)d = 26$

$n = 9 \rightarrow 2a_1 + 8d = 26 \rightarrow a_1 + 4d = 13$ – ①

$a_{10} + a_{11} + a_{12} + a_{13} = 91 \rightarrow (a_1 + 9d) + (a_1 + 10d) + (a_1 + 11d) + (a_1 + 12d) = 91$

$\rightarrow 4a_1 + 42d = 91$ – ②

$\begin{cases} a_1 + 4d = 13 \rightarrow a_1 = -4d + 13 \\ 4a_1 + 42d = 91 \end{cases}$

$\rightarrow 4(-4d + 13) + 42d = 91$

$\rightarrow -16d + 52 + 42d = 91$

$\rightarrow 26d = 39 \rightarrow d = 39/26 = 3/2 = 1.5$ #

$a_1 + 4d = 13 \rightarrow a_1 + 4(1.5) = 13 \rightarrow a_1 = 7$ #

2 The coefficient of $\frac{1}{x}$ in the expansion of $\left(kx+\frac{1}{x}\right)^5+\left(1-\frac{2}{x}\right)^8$ is 74.

Find the value of the positive constant k. [5]

$(kx+\frac{1}{x})^5$ term contain $\frac{1}{x}$: ${}^5C_2 (kx)^2 \cdot (\frac{1}{x})^3 = 10k^2 \cdot \frac{1}{x}$

$(1-\frac{2}{x})^8$ term contain $\frac{1}{x}$: ${}^8C_1 (1)^7 (-\frac{2}{x})^1 = -16 \cdot \frac{1}{x}$

$10k^2 - 16 = 74 \rightarrow 10k^2 = 90 \rightarrow k^2 = 9 \rightarrow k = 3$ ✓

3 Each year the selling price of a diamond necklace increases by 5% of the price the year before. The selling price of the necklace in the year 2000 was \$36 000.

(a) Write down an expression for the selling price of the necklace n years later and hence find the selling price in 2008. [3]

$a_n = a_1 \cdot r^{n-1} \rightarrow a_n = 36000 \times 1.05^n$

$a_8 = 36000 \times 1.05^8 = 53200$ //

(b) The company that makes the necklace only sells one each year. Find the total amount of money obtained in the ten-year period starting in the year 2000. [2]

$S_n = \frac{a_1(1-r^n)}{1-r} \rightarrow S_{10} = \frac{36000\,(1-1.05^8)}{1-1.05} = 453000$