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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: More about Polynomials

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. Using long division, find the quotient and the remainder when $3x^3 + 2x^2 - 7x + 4$ is divided by $x - 1$. **(3 marks)**

2. When $f(x) = 2x^3 + ax^2 - 5x + 6$ is divided by $x - 1$, the remainder is 4, where a is a constant.

(a) Find a. **(2 marks)**

(b) Hence find the remainder when $f(x)$ is divided by $x + 1$. **(1 mark)**

3. It is given that $x + 2$ is a factor of $f(x) = 2x^3 + ax^2 - 5x - 6$, where a is a constant.

(a) Find a. **(2 marks)**

(b) Factorise $f(x)$ completely. **(2 marks)**

Answers written in the margins will not be marked.
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4. Let $P(x) = x^3 - 4x$ and $Q(x) = x^2 + x - 6$.

(a) Factorise $P(x)$ and $Q(x)$ completely. **(2 marks)**

(b) Find the H.C.F. of $P(x)$ and $Q(x)$. **(2 marks)**

(c) Find the L.C.M. of $P(x)$ and $Q(x)$. **(2 marks)**

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SECTION A(2) (24 marks)

5. A metal worker cuts a square opening of side $(3x - 5)$ cm from the centre of a square metal plate of side $(3x + 2)$ cm to make a frame.

(a) Using the identity $a^2 - b^2 = (a - b)(a + b)$, show that the area of the frame is $(42x - 21)$ cm^2. **(2 marks)**

(b) The area of the frame is 231 cm^2. Find x. **(2 marks)**

(c) Using the identity in (a), evaluate $305^2 - 298^2$ without using a calculator. **(3 marks)**

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6. Let $f(x) = 3x^3 + 2x^2 - 7x + 2$.

(a) Using long division, find the quotient and the remainder when $f(x)$ is divided by $x - 1$. **(3 marks)**

(b) Hence factorise $f(x)$ completely. **(2 marks)**

(c) Solve the equation $f(x) = 0$. **(1 mark)**

(d) Write down the remainder when $f(x)$ is divided by $3x - 1$, giving a reason. **(2 marks)**

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7. Let $f(x) = x^3 + kx^2 - 4x - 6$, where k is a constant. It is given that $f(x)$ leaves the same remainder when divided by $x - 1$ and by $x + 2$.

(a) Find k. **(4 marks)**

(b) Hence find the common remainder. **(2 marks)**

(c) Show that $x - 3$ is a factor of $f(x)$. **(3 marks)**

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SECTION B (10 marks)

8. Let $P(x) = x^3 + ax^2 + bx + c$, where a, b and c are constants. It is given that $P(1) = 0$, $P(-1) = 0$ and $P(2) = 3$.

(a) Find a, b and c. **(4 marks)**

(b) Show that $(x - 1)^2$ is a factor of $P(x)$. **(3 marks)**

(c) Solve $P(x) = 0$. **(1 mark)**

(d) Describe how the graph of $y = P(x)$ meets the x-axis at $x = -1$ and at $x = 1$. Justify your answer using the factorised form of $P(x)$. **(2 marks)**

END OF PAPER

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