Candidate Index Number

Anglo - Chinese School

(Independent)

FINAL EXAMINATION 2019
YEAR THREE EXPRESS
ADDITIONAL MATHEMATICS
PAPER 2

Wednesday **09 Oct 2019** **1½ hours**

Candidates answer on the Question Paper.
No additional materials are required.

READ THESE INSTRUCTIONS FIRST

Write your index number on the space provided above.
Do not open this examination paper until instructed to do so.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Answer **all** questions.
Write your answers on the spaces provided.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of a scientific calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is **60.**

For Examiner's Use
60

This question paper consists of 12 printed pages. **[Turn Over**

Mathematical Formulae

1. ALGEBRA

Quadratic Equation

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Binomial expansion

$$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \ldots + \binom{n}{r}a^{n-r}b^r + \ldots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{r!(n-r)!} = \frac{n(n-1)\ldots(n-r+1)}{r!}$

2. TRIGONOMETRY

Identities

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulae for ΔABC

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\Delta = \frac{1}{2}ab\sin C$$

Answer all the questions.

1. The graphs $x^2 - pxy + y^2 = 1$ and $x - py - 2 = 0$ intersect at $(0, -1)$. Find,

(i) the value of p, [1]

(ii) and the other point of intersection. [3]

2. The polynomial $bx^3 + cx^2 - 7x + c$ leaves a remainder of 7 when it is divided by $(x+1)$ and a remainder of 43 when it is divided by $(x-3)$. Find the value of b and of c. [4]

[Turn Over

3. Find the point of intersection of $y = \frac{1}{x}$ and $y^2 = 2x$. Hence, sketch the graphs of $y = \frac{1}{x}$ and $y^2 = 2x$ on the same diagram, indicating the point of intersection clearly. [4]

4. A cuboid has a volume of $\left(14 + 12\sqrt{3}\right)\text{cm}^3$ and a square base of side $\left(1 + \sqrt{3}\right)\text{cm}$. Find the height of the cuboid in the form $a + b\sqrt{c}$ where *a*, *b* and *c* are integers. [4]

5. Express $\frac{x^2+5x+4}{x\left(x^2+4\right)}$ in partial fractions. [5]

[Turn Over

6 (i) Show that $(y+1)$ is a factor of the polynomial $2y^3+(m-2)y^2+(m-7)y-3$ for all values of *m*. [2]

(ii) If $(2y-1)$ is also a factor of the polynomial, find the value of *m*. [3]

(iii) Hence, solve $2y^3+(m-2)y^2+(m-7)y-3=0$ [2]

7 (a) Find the range of values of m for which $mx^2 + m - 6 > -8x$ for all real values of x. [4]

(b) Explain why $2x^2 + (2k+1)x = 2 - k$ has real and distinct roots for all real values of k.

[4]

[Turn Over

8 (a) Solve $\frac{2^{x-3}}{4^{-x}} = \frac{16}{\sqrt{8^x}}$ [4]

(b) Solve $3^{2x} + 5\left(3^x\right) - 6 = 0$ [4]

(c) Given that $7^{2-x} = 28^{x+3}$, find the value of 14^{2x}. Hence, solve for x. [5]

[Turn Over

9 The following table shows some corresponding values of x and y which are related by the equation $y = x + ax^b$.

x	2	3	4	5	6	10
y	5.80	9.33	11.00	12.59	14.12	19.90

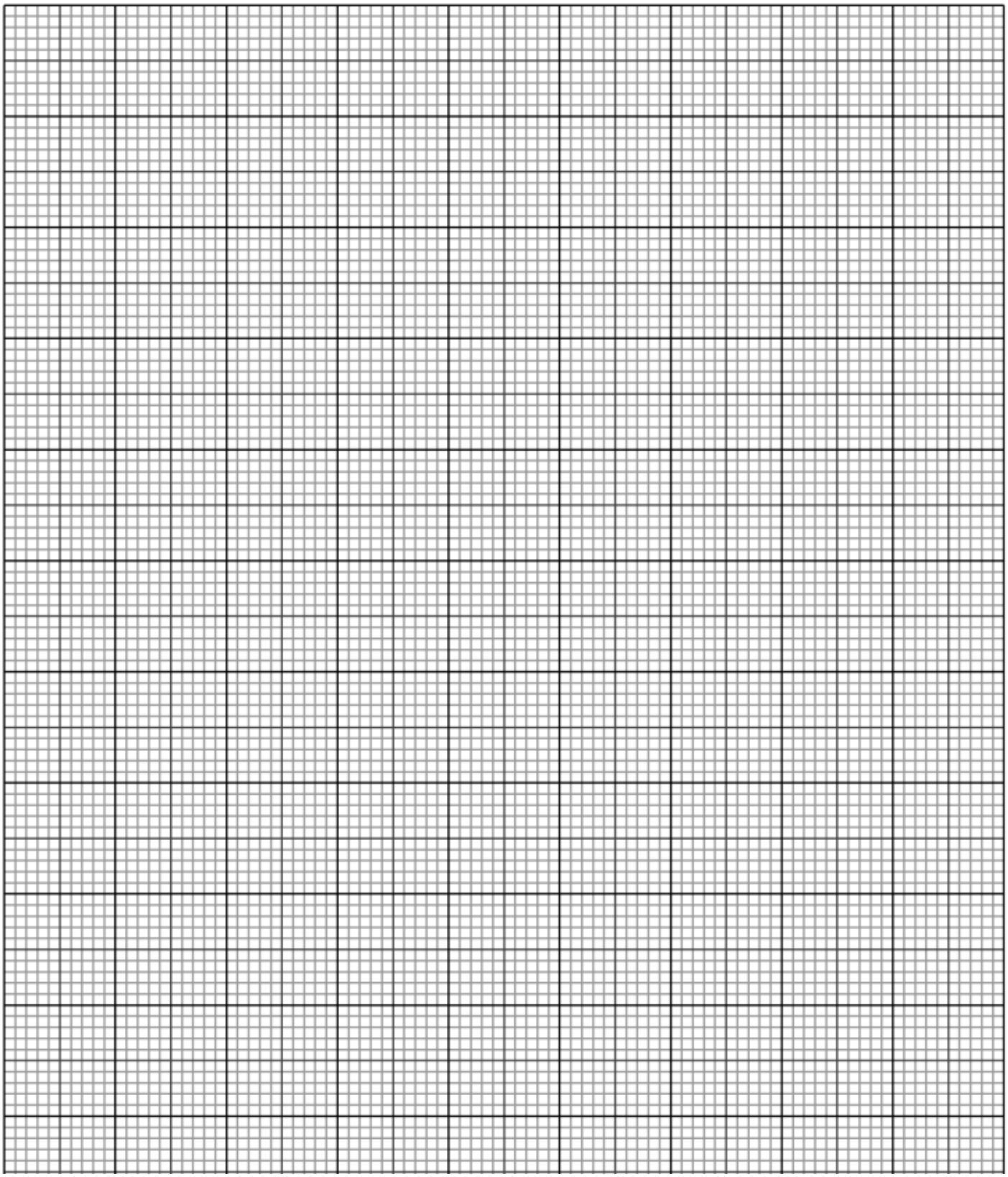
(a) Using a scale of 1 cm to 0.1 unit on each axis, draw the graph of $\lg(y - x)$ against $\lg x$ on a piece of graph paper. [3]

(b) Use the graph to

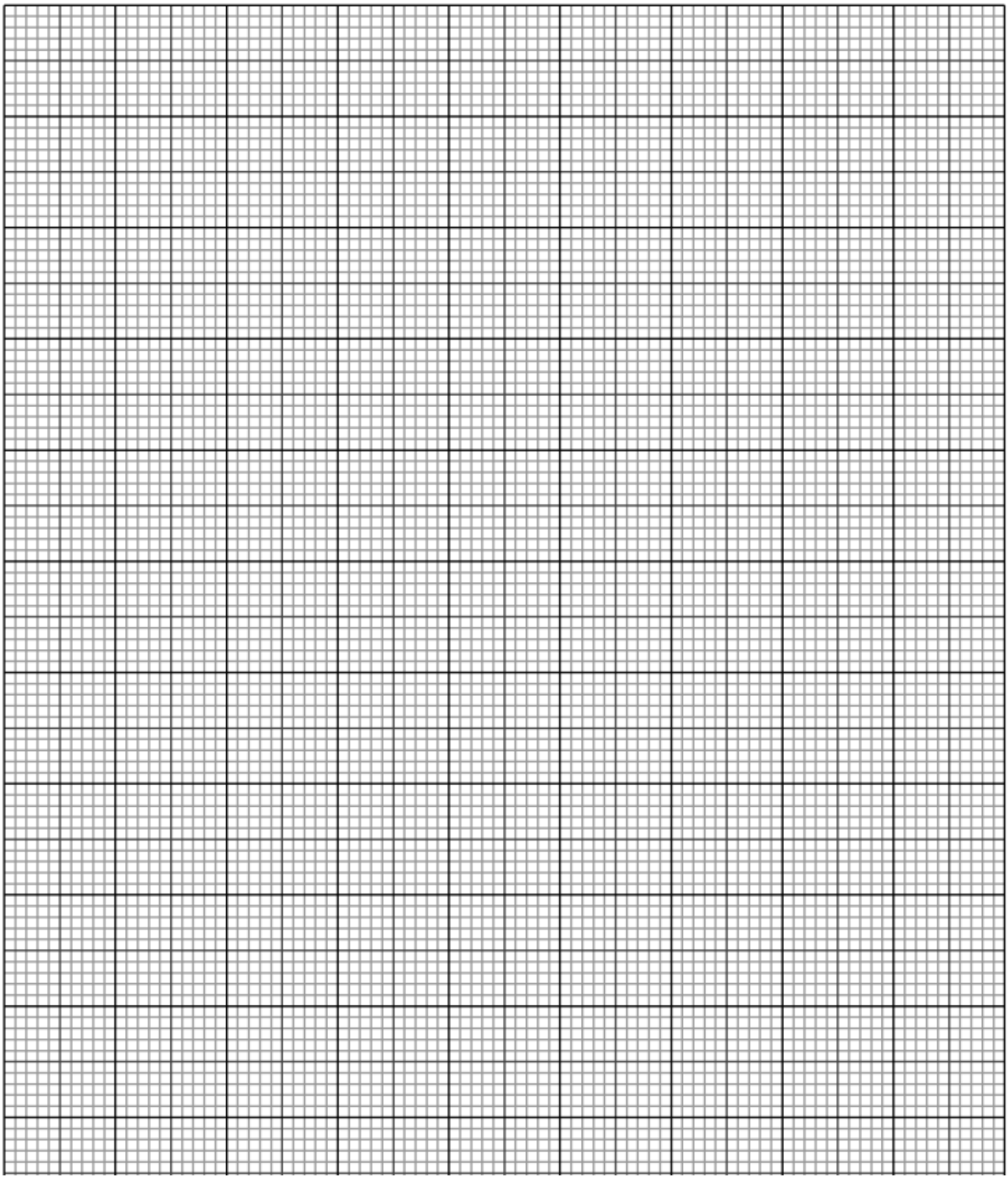
i) find the value of a and of b, [3]

ii) find the value of y when $x = 15$, and [3]

iii) identify the abnormal reading of y, and estimate its correct value. [2]



[Turn Over



----------End of Paper 2 ----------

Answers:

1) i) $p = 2$ ii) $(-4, -3)$

2) $b = 2, c = 1$

3) $(0.794, 1.26)$

4) $\left(-4 + 5\sqrt{3}\right)\text{cm}^2$

5) $\dfrac{2x^3 - x^2 + 3x - 4}{x\left(x^2 + 4\right)} = \dfrac{1}{x} + \dfrac{5}{x^2 + 4}$

6) ii) $m = 9$ iii) $y = -1, y = \dfrac{1}{2} or\ y = 3$

7) a) $m > 8$

8) a) $x = \dfrac{14}{9}$ b) $x = 0$ c) $x = -1.16$

9) bi) $a = 4.17$ $b = \dfrac{5}{13}$ bii) $y = 26.75$ biii) $y = 7.50$