Anglo - Chinese School

(Independent)

FINAL EXAMINATION 2018

YEAR 3 INTEGRATED PROGRAMME

CORE MATHEMATICS
PAPER 2

MONDAY   **8th October 2018**   **1 hour 30 minutes**

ADDITIONAL MATERIALS:

Answer Paper (7 sheets)
Graph Paper (1 sheet)

INSTRUCTIONS TO STUDENTS

Do not open this examination paper until instructed to do so.
A calculator is required for this paper.
Answer all the questions on the answer sheets provided.
At the end of the examination, fasten the answer sheets together.
Unless otherwise stated in the question, all numerical answers must be given exactly
or correct to three significant figures. Answers in degrees are to be given to one decimal place.

INFORMATION FOR STUDENTS
The maximum mark for this paper is 80.

Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Where an answer is incorrect, some marks may be given for correct method, provided this is shown by written working. You are therefore advised to show all working.

Answer all the questions on the answer sheets provided. Begin each question on a new page.

1   *[Maximum mark: 6]*

(i)   Express $\dfrac{y-x}{x^2-xy-2y^2}+\dfrac{2}{3(x+y)}$ as a single fraction in its simplest form.

[3]

(ii) Hence or otherwise, find the value of x when $w = 1.25$ and $y = 0.03$ if

$$\frac{y-x}{x^2-xy-2y^2}+\frac{2}{3(x+y)}=w.$$

[3]

2   *[Maximum mark: 10]*

(a) Expand and simplify $3(y-x)+4[2x-y-2(3x-4y)]$.

[3]

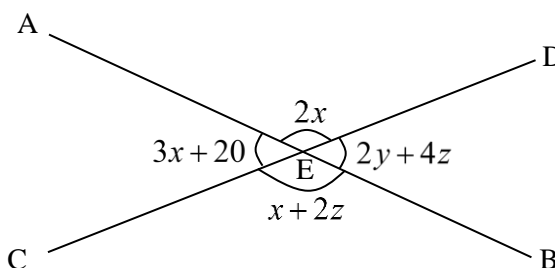(b) Solve the equation $\sqrt{11x^2+45}=4x$.

[3]

(c) The solution of $x\sqrt{5}=x\sqrt{3}+\sqrt{48}$ is $a+b\sqrt{15}$. Find the values of the integers a and b.

[4]

3   *[Maximum mark: 9]*

(a) AB and CD are straight lines intersecting at the point E. The angles between the lines are shown in the diagram below.

Find the value of $x+y-z$.

[4]

(b) Two squares have a combined area of 300 m². The sum of the perimeter of the squares is 80 m. Form and solve a pair of simultaneous equations. Hence, find the dimensions of the squares.

[5]

4 *[Maximum mark: 10]*

In the diagram, P, Q and R are points on level ground. The bearing of Q and R from P are 058° and 208° respectively. Given that $QR = 125$ m and the bearing of R from Q is 225°,
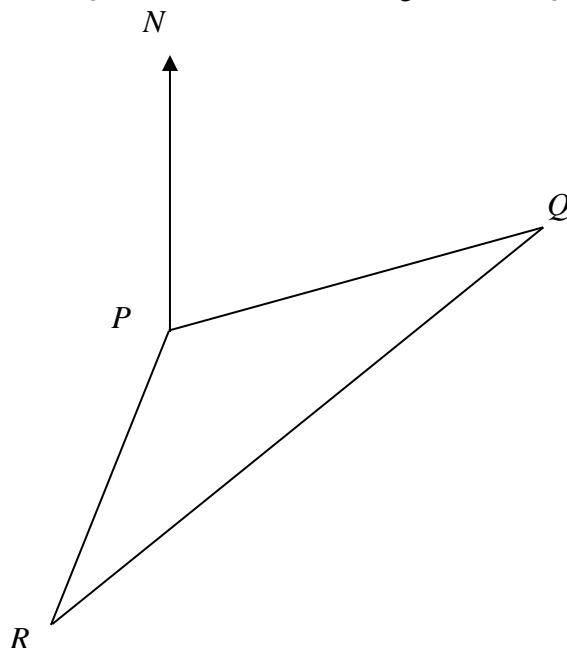
(a) find the bearing of P from R,

[2]

(b) find the length of PR,

[3]

(c) calculate the shortest distance from P to QR.

[3]

(d) A vertical tower of 30 m is built at P. Find the largest angle of elevation of the top of the tower from a point along RQ.

[2]

5 *[Maximum mark: 13]*

(a) Let $y = \log_3 \dfrac{x}{2} + \log_3 16 - \log_3 4$. Given that y can be written in the form $y = \dfrac{\ln ax}{\ln b}$, write down the value of a and of b.

[3]

(b) Given that $p = \lg x$, $q = \lg y$, $r = \lg z$. Write $\lg\left(\dfrac{y^2 \sqrt{x}}{z^4}\right)$ in terms of p, q and r.

[3]

(c) Solve the following equations:

(i) $13^{2p-3} = 6$

[3]

(ii) $\ln(2e^x + 3) = 2x$

[4]

6   *[Maximum mark: 12]*

(a) Given that the equation $x^2 - px + p + 3 = 0$ has real and distinct roots and the equation
$(p+1)x^2 + 4px = 8x - 2p$ has no real roots, find the possible value(s) of p if p is an integer.

[7]

(b) The equation $kx^2 - k^2x = x + k - 4$, where k is a constant, has roots which are reciprocal of each other. Find the value of k.

[5]

7   *[Maximum mark: 15]*

Answer the whole of this question on a sheet of graph paper.

The variables x and y are connected by the equation $y = 2x + \dfrac{5}{x}$. Some corresponding values of x

and y are given in the following table.

x	1	1.5	2	2.5	3	4	5	6	8
y	7.0	6.3	a	7.0	7.7	9.3	b	12.8	16.6

(a) Calculate the value of a and of b.

[2]

(b) Taking 2 cm to represent 1 unit on the horizontal axis and 1 cm to represent 1 unit on the vertical
axis, draw the graph of $y = 2x + \dfrac{5}{x}$ for $1 \le x \le 8$.

[4]

(c) By drawing a suitable line on the graph, solve the equation $3x + \dfrac{5}{x} - 10 = 0$.

[3]

(d) Using your graph, find the value(s) of x when $y = 9$.

[2]

(e) Find the minimum value of y and its corresponding value of x.

[2]

(f) The point P on the curve has the same gradient as the line $2y - x - 5 = 0$. Find the
x −coordinate of P.

[2]

8   *[Maximum mark: 5]*

Triangle PQR has $p = 8.1$ cm, $q = 12.3$ cm and area 15 cm². Find the largest possible perimeter of
triangle PQR.

[5]

--END OF PAPER--

1i) $\dfrac{1}{3(2y-x)}$

1ii) -0.207

2a) $31y - 19x$

2b) $x = \pm 3$

2c) $x = 6 + 2\sqrt{15}$

3a) 42

3b) 2.93, 17.1

4a) 28

4b) 56.2

4c) 16.4

4d) 61.3

5a) $y = \dfrac{\ln 2x}{\ln 3}$

5b) $2q + \dfrac{1}{2}p - 4r$

5ci) 1.85

5cii) 1.10

6a) 7

6b) 2

7a) 6.5, 11

7c) 2.72

7d) 3.85

7e) (1.58, 6.32)

7f) 1.83

8) 40.6