Anglo - Chinese School
(Independent)

FINAL EXAMINATION 2016

YEAR 3 INTEGRATED PROGRAMME

CORE MATHEMATICS
PAPER 2

MONDAY **10th October 2016** **1 hour 30 minutes**

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: 9]*

(a) Simplify $\frac{36-p^2}{3p+18}$. [2]

(b) Solve for x, given that $\frac{2}{x-5}-\frac{4}{3x+2}=0$ [2]

(c) Make k the subject of the formula $m=\frac{h^2+k^2}{h}$. [2]

(d) Simplify $\frac{1}{3}\left(2x+\frac{1}{2}\right)-\left(\frac{2}{3}-\frac{1}{2}x\right)$ as a single fraction. [3]

2 *[Maximum mark: 7]*

(a) Solve the inequality $x+6<38-2\frac{1}{2}x\leq 21$. [5]

(b) Hence, write down
(i) the least value of x, [1]
(ii) the greatest integer value of x. [1]

3 *[Maximum mark: 6]*

(i) Sketch the curve $y=(x-1)(x+6)$, indicating clearly the x- and y-intercepts and the coordinates of the turning point of the curve. [3]

(ii) The tangent to the curve $y=(x-1)(x+6)$ at the point where $x=-1$ has a gradient of 3. Find the equation of the line perpendicular to the tangent at this point. [3]

4 *[Maximum mark: 7]*

(a) If $16^{x+1}=64$, find the value of $3^{\frac{1}{x}+1}$. [3]

(b) Solve $5+x^2+\sqrt{4x+3}=(x+1)^2$ [4]

5 *[Maximum mark: 5]*

(a) Find the range of values of x for which $4x+12>x^2$. [2]

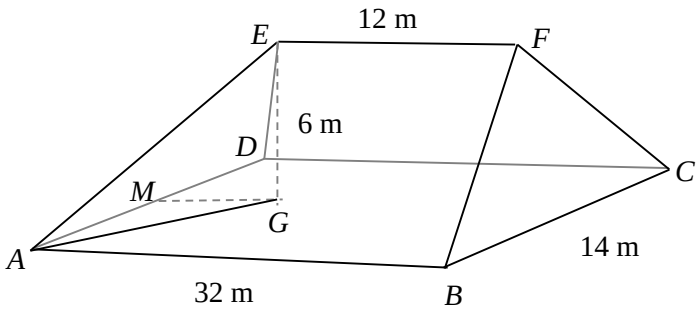
(b) Find the range of values of m for which the expression $mx^2+2(m+2)x+m+3$ is negative for all real values of x. [3]

6 *[Maximum mark: 6]*

(i) The points of intersection of the graphs of $y=x^3$ and $y=\frac{1}{2x}$ are A and B. Find the coordinates of A and B. [3]

(ii) Sketch the graphs of $y=x^3$ and $y=\frac{1}{2x}$ on the same axes for $-3<x<3$. Indicate clearly the points of intersection. [3]

7 *[Maximum mark: 9]*



The diagram represents the roof of a house and EF is parallel to the rectangular base $ABCD$. EG is perpendicular to the base $ABCD$ and M is the midpoint of AD. $EA = ED = FB = FC$.

Given that EF = 12m, BC = 14m, EG = 6m and AB = 32m, calculate

(i) the length of AG, [3]
(ii) $\angle EAG$, [2]
(iii) the length of BE. [4]

8 *[Maximum mark: 8]*

(a) Given that the line $2y=x-p$ does not intersect the curve $y=2x^2-3x-4$, find the range of values of p. [4]

(b) Given that $y=3x^2+qx+21$ and that $y>0$ only when $x<r$ or $x>7$, find the value of q and of r. [4]

9 *[Maximum mark: 9]*

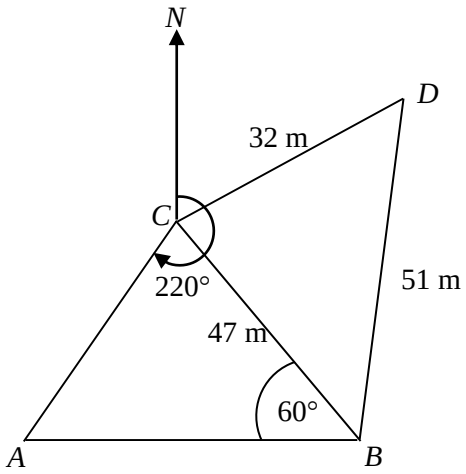
Solve the equations

(i) $\log_3\left(2x^2-27\right)-\log_3 x = 2+\log_9 4$, [5]

(ii) $3(5^x) = 7(2^{2x})$. [4]

10 *[Maximum mark: 14]*

The points *A*, *B*, *C* and *D* represent the foot of four blocks of flats on ground level. It is given that *B* is due east of *A*, the bearing of *A* from *C* is 220°, $A\hat{B}C = 60°$, *BC* = 47 m, *BD* = 51 m and *CD* = 32 m.



(a) Prove that $\angle BAC = 50°$. [2]

(b) Calculate

(i) the distance between *A* and *C*, [3]

(ii) $\angle CBD$, [3]

(iii) the bearing of *D* from *B*. [2]

(c) A boy walks directly from *C* to *A*. Calculate the distance he has walked when he is closest to *B*. [2]

(d) If the block of flats at *C* is 65 m high, find the angle of depression of *B* from the top of the building at *C*. [2]

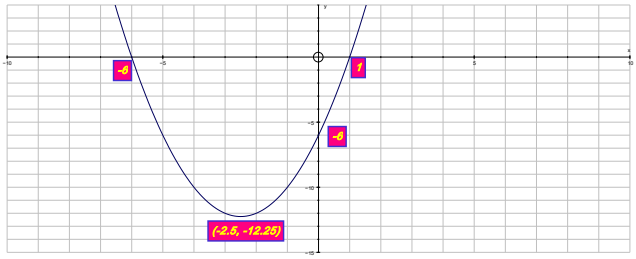
End of Paper

ANSWER KEY

1 (a) $\frac{6-p}{3}$ (b) -12 (c) $k=\pm\sqrt{h(m-h)}$ (d) $\frac{7x-3}{6}$

2 (a) $6\frac{4}{5}\le x<9\frac{1}{7}$ (b) (i) $6\frac{4}{5}$ (c) 9

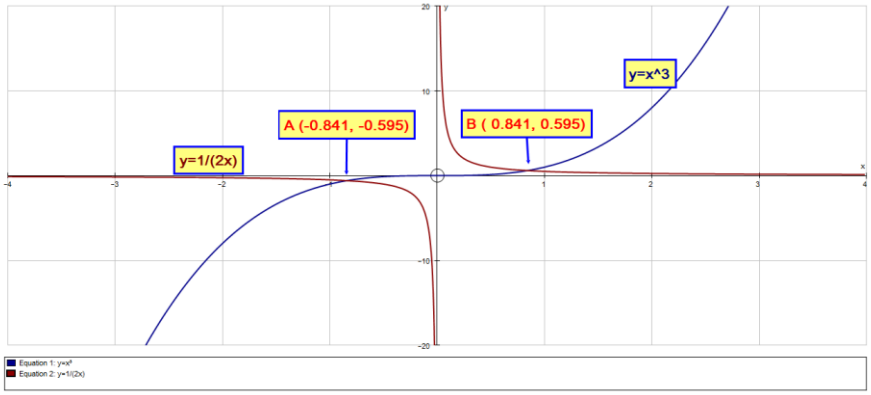
3 (i) (ii) $3y+x=-31$



4 (a) 27 (b) 4.23

5 (a) $-2<x<6$ (b) $m<-4$

6 (i) (- 0.841, - 0.595) , (0.841, 0.595)
(ii)



7 (i) 12.2 m (ii) 26.2° (iii) 23.9 m

8 (a) $p>11\frac{1}{16}$ (b) $r=1$, q = -24

9 (i) 10.3 (ii) 3.80

10 (b) (i) 53.1 m (ii) 37.8° (iii) 007.8° (c) 16.1 m (d) 54.1°