Candidate Index Number				

Anglo	- Chines	e School
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(Independent)



FINAL EXAMINATIONS 2011

YEAR 3 INTEGRATED PROGRAMME

CORE MATHEMATICS PAPER 1

Tuesday

4 October 2011

1 h 30 min

INSTRUCTIONS TO STUDENTS

Write your index number in the boxes above.Do not open this examination paper until instructed to do so.You are not permitted access to any calculator for this paper.Answer all questions in the spaces provided.Unless otherwise stated in the question, all numerical answers must be given exactly or correct to three significant figures.

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 a correct method, provided this is shown by written working. You are therefore advised to show all working.

Answer **all** the questions in the spaces provided.

1 [Maximum mark: 6]

(a) Solve
$$3-2x < 2x+7 \le 10x-9$$
. [3 marks]

(b) Simplify
$$\frac{6-2y}{3x^2-12} \div \frac{1}{3y-9} \times \frac{x-2}{(y-3)^2}$$
. [3 marks]

Answer: a) _____

b) _____

2 [Maximum mark: 3]

Solve $x^2 + 2x - 16 = 0$ by completing the square, leaving your answer in the surd form.

Answer: _____

3 [Maximum mark: 7]

Both Alan and Benny invested in some stocks. Alan lost 84 in x months and Benny lost the same amount 4 months later .

i) Write an expression for the average monthly losses incurred by Alan.	[1 mark]
ii) Write an expression for the average monthly losses incurred by Benny	y. [1 mark]
iii) If Alan lost \$16 more than Benny per month, form an equation in x a reduces to $x^2 + 4x - 21 = 0$.	nd show that it [3 marks]
iv) Hence, calculate the average monthly losses incurred by Benny.	[2 marks]

Answer: i)	
ii)	
iii)	
iv) _	

4 [Maximum mark: 6]

Simplify each of the following:

i)
$$(y^{-4})(8y^{-2})^{-1} \div (4y^{4})^{-\frac{1}{2}}$$
 [3 marks]

ii)
$$\frac{3^{x-2}-3^{x+1}}{3^{x+2}-3^{x-1}}$$
 [3 marks]

Answer: i) _____

ii) _____

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5 [Maximum mark: 5]

John spent a total of \$7 on two burgers and three sandwiches. Each burger costs x and each sandwich costs y. Given that seven burgers cost \$13 more than a sandwich,

- (a) Write down two equations connecting *x* and *y*. [2 marks]
- (b) Use the matrix method to find the price of each burger and each sandwich. [3 marks]

Answer: a) _____

b) 1 burger is \$_____, 1 sandwich is \$_____

6 [Maximum mark: 7]

The line $\frac{x}{a} + \frac{y}{b} = 1$ passes through the points A(3,0) and B(0,-4). The point O is the origin.

- Find i) the value of a and of b; [2 marks]
 - ii) the gradient of the line *AB*; [2 marks]
 - iii) the area of the triangle *OAB*; [1 mark]
 - iv) the shortest distance between the origin *O* and the line *AB*. [2 marks]

Answer: i)	
ii)	
iii)	
iv)	

7 [Maximum mark: 8]

(a) Find the range of values of p for which the line $y = -2p + 12x$ will meet the	
curve $y = (p+3)x^2$.	[4 marks]

(b) Find the range of values of k for which $2x^2 + 4x + k$ is always positive for all real values of x.

Answer: a)_____

b)_____

[4 marks]

8 [Maximum mark: 6]

In the diagram, WZY is a straight line, ΔXYZ is a right angled triangle and VY is perpendicular to XZ. XZ = 4 cm and $\angle YXZ = 30^{\circ}$. Using the information given , find



Answer: i)			

ii) _____

iii) _____

9 [Maximum mark: 4]

The diagram shows three points *A*, *B* and *C* on level ground. Given that AB = AC, $\angle ACB = 40^{\circ}$ and the bearing of *B* from *A* is 115°, calculate the bearing of

- i) C from A,
- ii) A from B,

[2 marks]

[2 marks]

С 40° В

Answer: i) _____

ii) _____

10 [Maximum mark: 7]

(b) $\alpha - \beta$ and

If the roots of the equation $x^2 + 2x - 1 = 0$ are α and β where $\alpha > \beta$, find

(a)
$$\alpha + \beta$$
 and $\alpha\beta$; [2 marks]

(c) the quadratic equation whose roots are α^2 and β^2 . [3 marks]



c) _____

[2 marks]

11 [Maximum mark: 3]

Sketch the graphs of the following functions in the space provided. The point (1,1) is marked on the diagram. Label the intercepts (if any).



12 [Maximum mark: 4]

The sketch below shows a quadratic curve. The turning point is at C(1,18) and the curve cuts the *x*- axis at A(-2,0) and *B*. Find the equation of the curve in the form $y = ax^2 + bx + c$.



Answer:

13 [Maximum mark: 6]

A rectangle has a perimeter 32 cm and the square of the length of its diagonal is 136 cm^2 . The rectangle has a length of x cm and width of y cm.

i) Write down two equations connecting x and y .	[2 marks]
ii) Hence, find the length and width of the rectangle.	[4 marks]

Answer: i)_____

ii)_____

14 [Maximum mark: 8]

(a) Express
$$2\log_x 4 - \log_x 2 + \frac{3}{\log_2 x}$$
 as a single logarithm of base x. [3 mark]

(b) Solve the equation
$$\lg(2x+1) -1 = \lg x^2 - \lg(5x+2)$$
. [5 mark]

Answer: a) _____

b) _____

End of Paper

Answers

1 a	$-1 < x$, $2 \le x$	
11	so $x \ge 2$	
Ib		
	x + 2	
2		
2	$r = \pm \sqrt{17} = 1$	
	$x = \pm \sqrt{1} / - 1$	
3		
	$i)\frac{84}{2}$	
	$\frac{1}{x}$	
	$ii) \frac{84}{3}$	
	x+4	
	$iii) \frac{84}{2} - \frac{84}{2} = 16$	
	x + 4	
	(x-3)(x+7) = 0	
	x = 3	
	0.4	
	$iv)\frac{84}{2+4} = 12	
	5 + 4	
4		
	$(a)\frac{1}{b}\frac{-1}{-b}$	
	4 3	
5-)		
5a)	2x + 3y = 7	
	7x - y = 13	
b)	$\begin{vmatrix} A^{-1} = \frac{1}{22} \begin{vmatrix} -1 & -5 \\ 7 & 2 \end{vmatrix}; \dots, \begin{vmatrix} 2 & 5 \\ 7 & -1 \end{vmatrix} \begin{vmatrix} x \\ 7 & -1 \end{vmatrix} = \begin{vmatrix} 1 \\ 12 \end{vmatrix}$	
	-25(-7, 2) $(7, -1)(y)$ (13)	
	Answer $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$	
	(1)	
6	a = 3. $b = -4$	
	aradient - 4	
	$\frac{3}{3}$	
	Area = 6unts	
	<i>Dist</i> = 2.4	

7a)	$-6 \le p \le 3$		
L)	For $2x^2 + 4x + k > 0$ $b^2 - 4ac < 0$		
D)	Answer: $2 < k$		
8	$\sin 30^\circ = \frac{YZ}{4} \Longrightarrow YZ = \frac{1}{2} \times 4 = 2cm$		
	$\cos 30^\circ = \frac{XY}{4} \Longrightarrow XY = \frac{\sqrt{3}}{2} \times 4 = 2\sqrt{3} \ cm$		
	$\sin 30^\circ = \frac{VI}{XY} \Longrightarrow VY = \frac{1}{2} \times 2\sqrt{3} = \sqrt{3} \ cm$		
9	i) 215° ii) 295°		
10	$x^2 + 2x - 1 = 0$		
	sum $\alpha + \beta = -2$		
	$\alpha\beta = -1$		
	$\alpha - \beta = \sqrt{8} \sqrt{8}NA$		
	$x^2 - 6x + 1 = 0$		
11	$y = \frac{2}{x}, x > 0$ $y = 2x^2 - 1$		
	\bullet (1, 1) x		
	→ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓		
	X I		
	Ι		
12	$y = -2x^2 + 4x + 16$		
13	$2x + 2y = 32 \Longrightarrow x + y = 16 eqn$		
	$x^2 + y^2 = 136 eqn^2$		
	Dimensionsis 10 cm by 6 cm		
14	$a)\log_x 64$ or $6\log_x 2$		
	$b)x = \frac{-2}{2}$		
	9		