Yearly 10-11
MATH
PAPER 1

QUEEN'S COLLEGE
Yearly Examination, 2010 – 2011

MATHEMATICS PAPER 1

Question-Answer Book

Secondary 5 **Date : 16/6/2011**
Time: 10:45 am – 12:45 am

LABOR OMNIA VINCIT
HONG KONG

This paper must be answered in English

INSTRUCTIONS

1. Write your Name, Class and Class Number in the spaces provided on Page 1.
2. This paper consists of THREE sections, A(1), A(2) and B. Section A(1) carries 30 marks. Section A(2) carries 30 marks. Section B carries 40 marks.
3. Attempt ALL questions in Sections A(1), A(2) and Section B. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins.
4. Graph paper and supplementary answer sheets will be supplied on request. Write your Name on each sheet, and fasten them with string INSIDE this book.
5. Write the question numbers of the questions you have attempted in Section B in the spaces provided on Page 1.
6. Unless otherwise specified, all working must be clearly shown.
7. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.
8. The diagrams in this paper are not necessarily drawn to scale.

Name	
Class	( )

		Examiner's Use Only
		Examiner No.
Section A Question No.	Total Marks	Marks
1 , 2	4 + 5	
3 , 4	5 + 5	
5 , 6, 7	4 + 4 + 3	
8	6	
9	6	
10	6	
11	6	
12	6	
Section A Total	60	

Checker's Use Only	Section A Total		

Section B Question no.	Total Marks	Marks
13	10	
14	10	
15	10	
16	10	
Section B Total	40	

Checker's Use Only	Section B Total		

Checker No.	

FORMULAS FOR REFERENCE

SPHERE	Surface area	=	$4\pi r^2$
	Volume	=	$\frac{4}{3}\pi r^3$
CYLINDER	Area of curved surface	=	$2\pi rh$
	Volume	=	$\pi r^2 h$
CONE	Area of curved surface	=	πrl
	Volume	=	$\frac{1}{3}\pi r^2 h$
PRISM	Volume	=	base area $\times$ height
PYRAMID	Volume	=	$\frac{1}{3}\times$ base area $\times$ height

Page total

SECTION A(1) (30 marks)

Answer ALL questions in this section and write your answers in the spaces provided.

1. A number is picked at random from a set of numbers 1,2,3,4,5,6,7,8,9,10.

Let E = {Picking an even number} , F = {Picking a number which is a multiple of 3}

(a) Find $E \cup F$ and $E \cap F'$.

(b) Find $P(E \cup F)$ and $P(E \cap F')$. **(4 marks)**

2. If $y \propto \frac{1}{x+1}$, $y = 9$ when $x = r$, and $y = 7$ when $x = t$, find

(a) r in terms of t .

(b) the value of r and t when $r + t = 2$. **(5 marks)**

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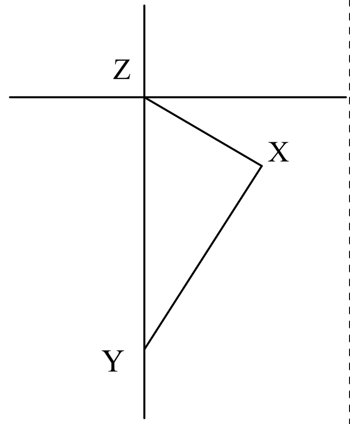
Page total

3. X is 028° from Y and 122° from Z, Y is 34 km due south of Z.

(a) Use the above given to mark all angle(s) and length(s) in the diagram in the right. **(2 marks)**



(b) Find the distance of Y from X. **(3 marks)**

4. **(a)** Factorize $y^2 - 2y - 3$.

(b) Hence solve the equation for x : $(x^2 + 4x)^2 - 2(x^2 + 4x) - 3 = 0$. **(5 marks)**

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5. A game shop sells 3 sports games, 6 board games and 10 action games.

(a) Sandy is going to buy a game, how many different games can she choose from?

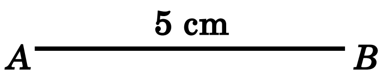
(b) Dick is going to buy 2 different kinds of games, how many different ways can he choose from?

(4 marks)

6. Solve the inequality for all integral values of x : $3 \le \frac{-x+1}{-2} < 4$ **(4 marks)**

7. In the figure, the length of the line segment *AB* is 5 cm. A moving point *P* maintains a fixed distance of 3 cm from the line segment *AB*. Sketch the locus of *P* below.

(3 marks)



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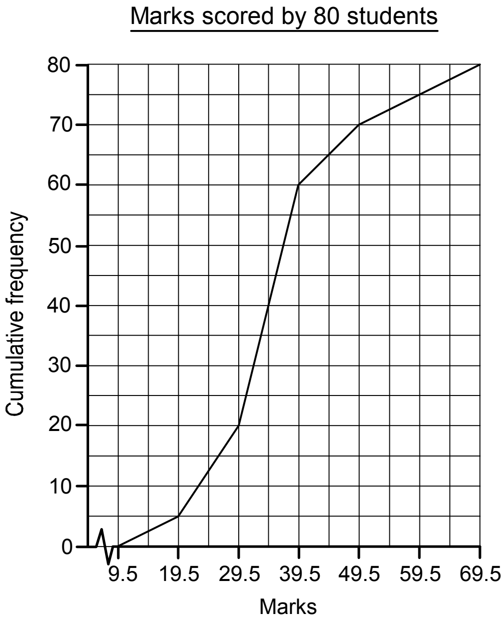
SECTION A(2) (30 marks)

Answer ALL questions in this section and write your answers in the spaces provided.

8. The cumulative frequency polygon below shows the distribution of the marks scored by 80 students in a test.



(a) Use the left diagram to complete the table below.

Marks	Class mark	Frequency
10 – 19	14.5	5
20 – 29		15
30 – 39		
40 – 49		10
50 – 59	54.5	
60 – 69		

(2 marks)

(b) From the table, find the mean and standard deviation of the distribution, giving your answers correct to 3 significant figures. (Working need not be shown.) **(2 marks)**

(c) The teacher added 15 to each mark. Write down the mean and the standard deviation of the new set of marks, giving your answers correct to 3 significant figures. (Working need not be shown.) **(2 marks)**

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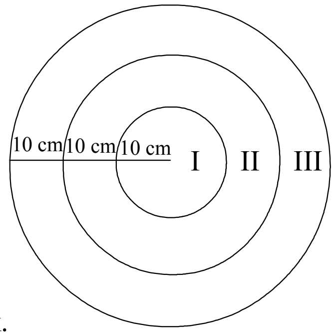
Go to **Section A(2)**

Page total

9. Darts are being thrown onto a circular dart board divided into 3 regions by 3 concentric circles of radii 10 cm, 20 cm and 30 cm as in the figure. If 2 marks are awarded to a dart landed on region I; 1 mark to region II and no mark to region III. Assume that no dart will land outside the board and the dart has equal chance to land on any place on the board.



(a) In throwing a dart, find the probability of scoring **(i)** 2 marks ; **(ii)** 1 mark.

(2 marks)

(b) Find the probability of scoring at least 1 mark in throwing a dart twice. **(2 marks)**

(c) If each of 2 men A and B throws 1 dart, find the probability of A getting a higher score. **(2 marks)**

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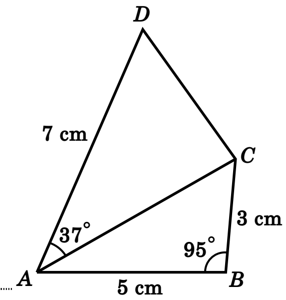
Page total

10. In quadrilateral $ABCD$, $\angle B = 95°$,
$AB = 5$ cm, $BC = 3$ cm, $AD = 7$ cm and $\angle DAC = 37°$.
Find the perimeter and area of quadrilateral $ABCD$.
(*Give the answer correct to 3 significant figures.*)

(6 marks)



11. Let $f(x) = x^2 + kx + (k + 3)$ and $g(x) = x^2 - 2kx + (8 - 2k)$, where k is a real number.

(a) Find the range of values of k such that

(i) $f(x) = 0$ has two distinct real roots,

(ii) $g(x) = 0$ has no real roots. **(4 marks)**

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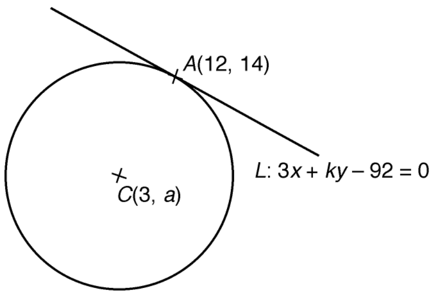
Page total

(b) Using the results of **(a)**, find the value(s) of k , if k is an integer. **(2 marks)**

12. In the figure, a circle has centre (3, a) and touches the line L : $3x + ky - 92 = 0$ at A(12, 14).



Find

(a) the value of k,

(b) the value of a,

(c) the equation of the circle in general form.

(6 marks)

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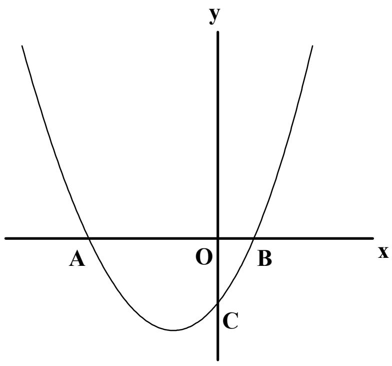
Page total

SECTION B (40 marks)

Answer ALL questions in this section and write your answers in the spaces provided.
Each question carries 10 marks.

13. The graph of $y = x^2 + 2x - 24$, intersects the x-axis at A, B and y-axis at C.



(a) Find the co-ordinates of A, B, C. **(3 marks)**

(b) Express $x^2 + 2x - 24$ in the form $(x + a)^2 + b$, where a and b are constants. **(2 marks)**

(c) **(i)** Find the minimum value of $x^2 + 2x - 28$.

(ii) Find the maximum value of $-2(x^2 + 2x - 24) + 1$

(iii) Find the minimum value of $2(x^2 + 2x - 24)^2 + 1$

(5 marks)

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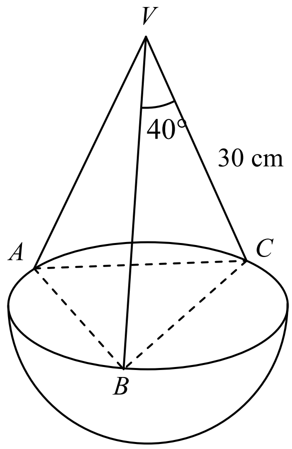
Go to **Section B**

14. A hemispherical flower pot is hanged from a point V in the ceiling by three strings, each of 30 cm long as shown in the figure. The strings are attached to the points A , B and C on the rim of the pot such that ΔABC is an equilateral triangle. The angle between each pair of adjacent strings is $40°$.



(a) Find the length of BC . **(2 marks)**

(b) Find the radius of the pot. **(3 marks)**

(c) Use **(b)** to find the angle between VC and the horizontal. **(3 marks)**

(d) How high is V above ΔABC ? **(2 marks)**

(correct all your answers to 3 significant figures)

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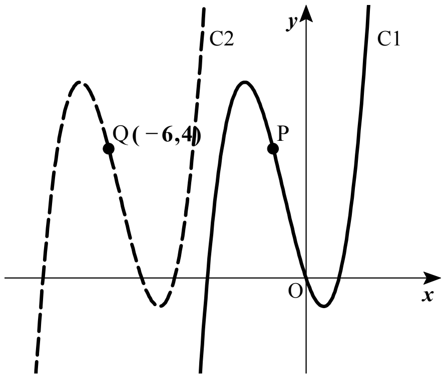
15. In the figure, the graph $C_1: \; y = x(x+3)(x+k)$ is translated 5 units to the left to obtain the graph $C_2: \; y = g(x)$.



(a) If $Q(-6, 4)$ is the image of P, find P and the value of k. **(3 marks)**

(b) Find C_2. **(2 marks)**

(c) If $C_2: \; y = g(x)$ is reflected about x-axis and then reflected about y-axis to obtain the graph $C_3: \; y = h(x)$. Find C_3. **(2 marks)**

(d) Are there any intersection point(s) of C_1 and C_3? Explain your answer. **(3 marks)**

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Page total

16. ***(Assume that in a normal distribution, 68%, 95% and 99.7% of the data lie within one, two and three standard deviations respectively from the mean.)***

In a public examination, the scores of the candidates are normally distributed with mean 61 and standard deviation 11.5.

(a) Find the percentage of candidates with scores above 84. **(3 marks)**

(b) If the standard score of Tom in this examination is –2.1, find his score. **(3 marks)**

(c) If 84% of candidates pass the examination,

(i) find the passing mark of the examination, **(2 marks)**

(ii) can Tom pass the examination? Explain shortly. **(2 marks)**

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