SYDNEY BOYS HIGH SCHOOL
MOORE PARK, SURRY HILLS

Year 10 Yearly Examination 2004

Advanced Mathematics

Examiner: *P. Bigelow*

General Instructions

- Working time – $1\frac{3}{4}$ Hours
- Write using black or blue pen.
- *Approved* calculators may be used.
- All necessary working should be shown in every question if full marks are to be awarded.
- Marks may not be awarded for messy or badly arranged work.
- Clearly indicate your class by placing an **X**, next to your class

NAME:

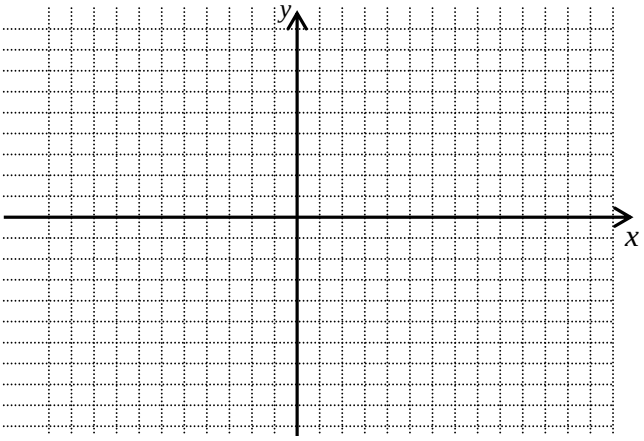
Class	Teacher	
10 A	Ms Opferkuch	
10 B	Mr Boros	
10 C	Mr Fuller	
10 D	Ms Ward	
10 E	Mr Hespe	
10 F	Mr Kourtesis	

Section	Mark
A	**/20**

QUESTION	ANSWER
(a) A square has area 196 m^2, what is its perimeter?	
(b) Expand and then simplify (i) $(2x-1)(2x+1)$ (ii) $(3y-1)(y+4)$	
(c) Solve $11-4x=-x$	
(d) Write $16\cdot97$ correct to 1 decimal place.	
(e) Convert $0\cdot016\ m^3$ to cubic centimetres.	
(f) Given the following scores 4, 7, –3, 1, 11, 0, –9, 6, 12 Write down the (i) median; (ii) mean.	
(g) If $\cos\theta=0\cdot7$ and θ is acute, find θ correct to the nearest degree.	

(h)	Find n if $3^n = \frac{1}{81}$.	
(i)	Express $\frac{4}{\sqrt{3}-1}$ with a rational denominator in *simplest* form.	
(j)	Write down the slope of the line $3x+2y-7=0$	
(k)	Factorise the following (i) $x^2+3x-10$ (ii) y^3-y^2-y+1	
(l)	If $ax+bx=c$, make x the subject of the formula.	

(m) Sketch $2x-3y+12=0$ on the number plane below.



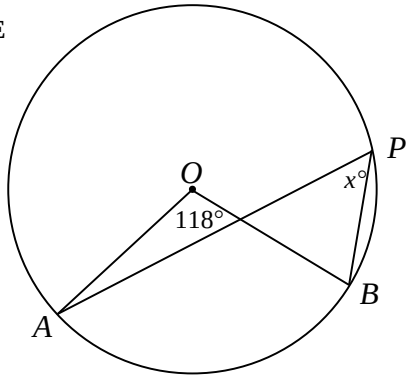
(n) What is the radius of the circle $x^2 + y^2 = 4$?

(o) Find the size of each internal angle in a regular 15 sided polygon.

(p) Write down the value of the pronumeral in the following diagrams.

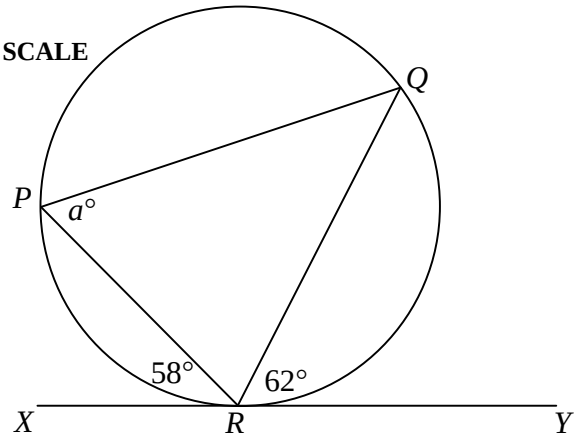
(i) O is the centre of the circle. $A\hat{O}B = 118°$, $A\hat{P}B = x°$

NOT TO SCALE



(ii) $P\hat{R}X = 58°, Q\hat{R}Y = 62°, R\hat{P}Q = a°$

NOT TO SCALE



End of Section A

Use this space if you wish to **REWRITE** or
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Clearly *indicate* the **QUESTION** number.

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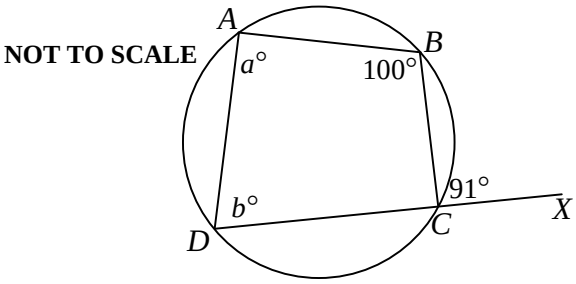
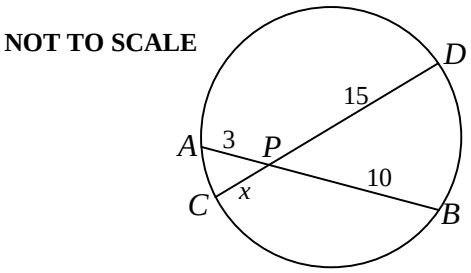
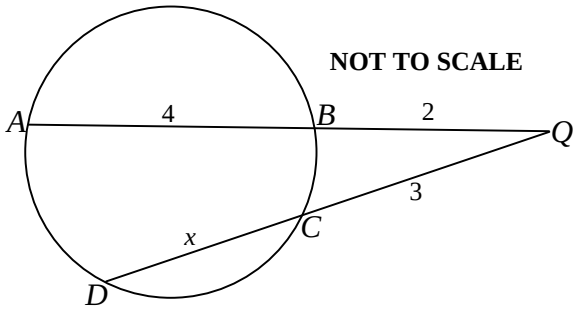
Section	Mark
B	**/20**

QUESTION	ANSWER
(a) Write down the value(s) of the pronumeral (i) $\angle BCX = 91°, \angle ABC = 100°,\ \angle DAB = a°$ and $\angle ADC = b°$  (ii) $AP = 3, BP = 10, DP = 15, CP = x.$  (iii) $AB = 4, CQ = 3, BQ = 2, CD = x$  	
(b) Simplify $\dfrac{4ab-16a}{8a}$	
(c) Simplify $\sqrt{150}-\sqrt{54}$	

(d) Find the equation of the line, in *general* form, through $(-4,6)$ and passing through -8 on the y axis.

(e) Find the coordinates of the vertex of the parabola $y = x^2 + 4x + 9$.

(f) Solve the following pair of equations

$$4x + y + 19 = 0$$
$$2x + 3y + 17 = 0$$

(g) Three cards labelled **4**, **5** and **6** are placed in a hat. The cards are withdrawn, one at a time, and placed on a table to form a 3 digit number.

(i) Draw a tree diagram to illustrate all the possible outcomes.

(ii) Find the probability that the 3 digit number is:

(α) 546

(β) greater than 400

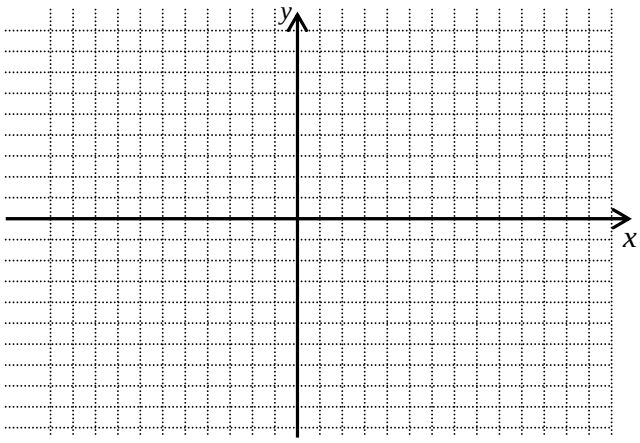
(γ) even

(δ) divisible by 3

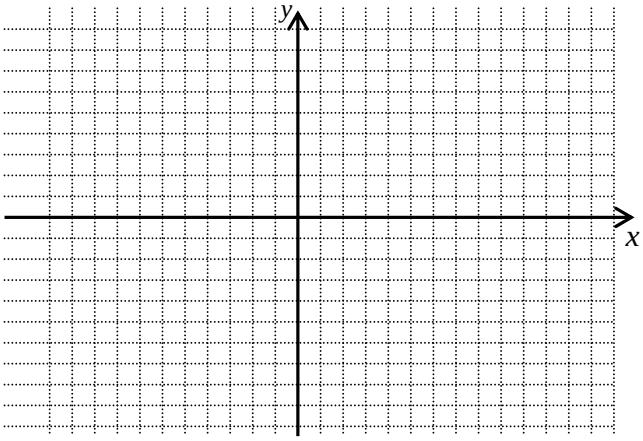
(h) The point $\left(2\sqrt{3}, -2\right)$ lies on a circle centred at the origin. Write down the equation of the circle.

(i) Sketch the following on the number planes provided.

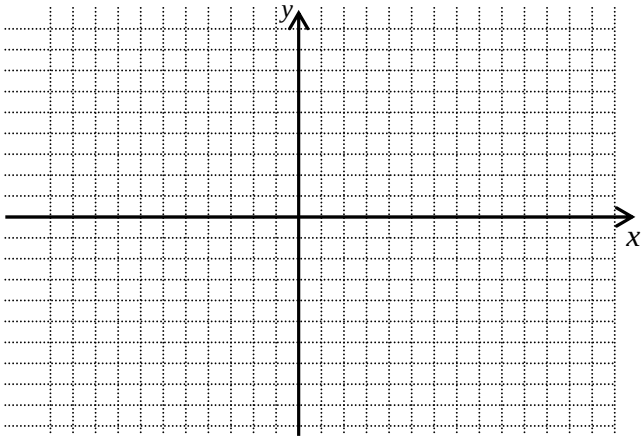
(i) $y = x^2 - 6x$



(ii) $xy = -2$



(iii) $y = 2^x$



End of Section B

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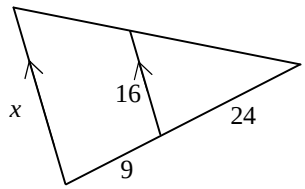
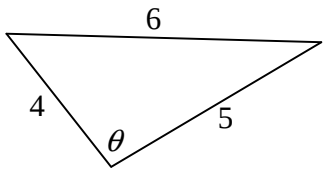
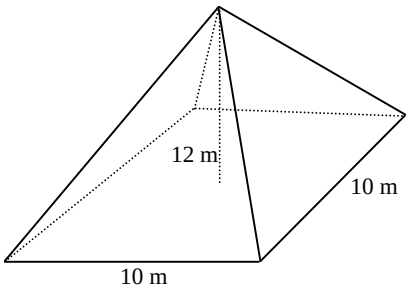
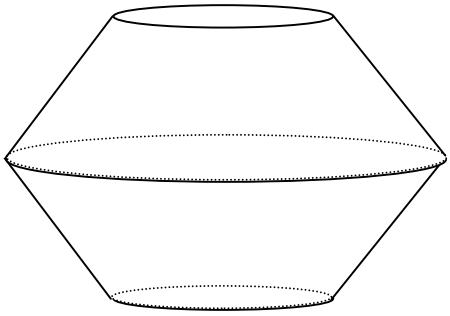
Section	Mark
C	**/20**

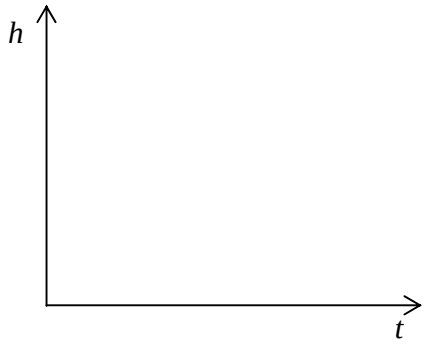
QUESTION	ANSWER
(a) Write down the exact values of: (i) $\tan 60°$ (ii) $\cos 150°$	 (i) (ii)
(b) Find x, giving reasons  	
(c) A bin contains 4 white and 3 red marbles. A marble is withdrawn, the colour noted and then replaced. A second marble is withdrawn and the colour noted. Find the probability that (i) both are white; (ii) at least one is white	
(d) Use the Cosine rule to find the value of θ, correct to the nearest minute.  	
(e) Solve $u^2 + u = 56$	

(f)	Find the interest on \$7200 over 4 years at 6% pa, compounded annually. Leave your answer correct to the nearest dollar.	
(g)	Robin earns \$48 000 pa. Holiday loading is calculated as $17\frac{1}{2}\%$ of 4 weeks pay. What is the value of Robin's holiday loading? (Assume 1 year = 52 weeks)	
(h)	The square pyramid below has a base 10 m×10 m and an altitude of 12 m, calculate  (i) its volume (ii) its total surface area	

(i) Water is poured into this container at a constant rate.



Complete the graph below to illustrate the *relationship* between the height (h) of the water level against time (t).



(j) Use the quadratic formula to solve

$$2x^2 + 6x - 11 = 0 .$$

Leave your answers correct to 1 decimal place.

End of Section C

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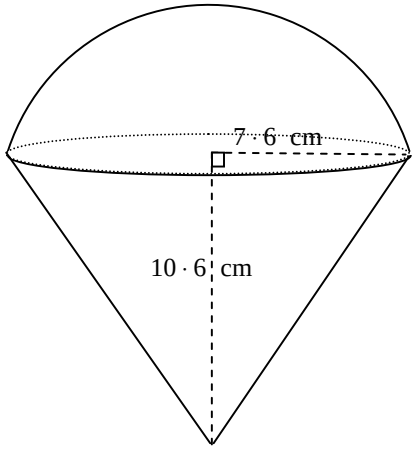
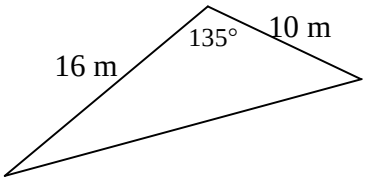
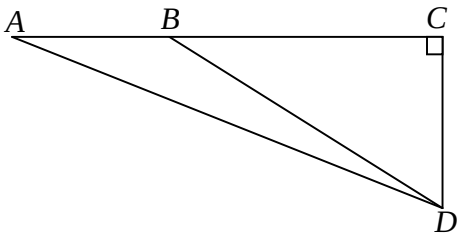
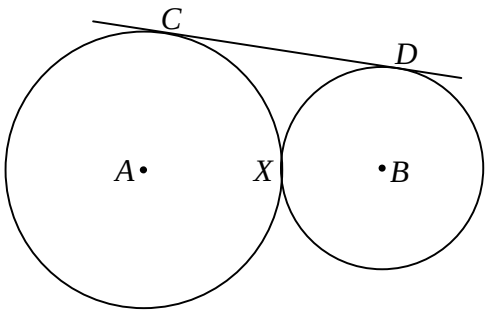
Section	Mark
D	**/20**

QUESTION	ANSWER
(a) Calculate the volume of this solid, correct to three significant figures.  	
(b) Find the exact area of the triangle below  	

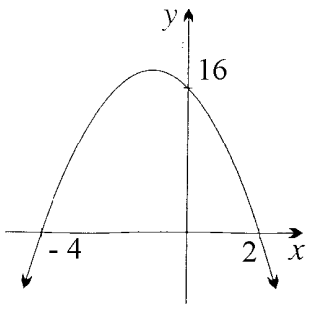
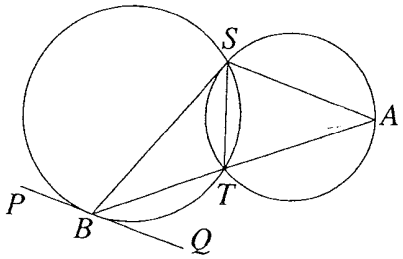
(c) The points A, B and C lie on a horizontal line and D lies directly below C.
The angles of depression of D from A and B are $34°$ and $62°$ respectively.
$AB = 75 \cdot 4$ m.
Find the height of C above D, in metres, correct to 1 decimal place.



(d) Two circles, with centres A and B touch externally at X.
If $AX = 9$ and $BX = 4$ find the length of CD along the common tangent, giving reasons.
(You do **NOT** need to prove that AXB is a straight line.)



(e) Solve for x: $2 \times 2^{2x} = 4^x + 64$

(f)	Write down the equation of the parabola drawn below.  	
(g)	Use the *Completing the Square* technique to solve $x^2 + 6x + 2 = 0$. Leave your answers as surds in simplest form.	
(h)	In the diagram below *SB* and *PBQ* are tangents. Prove that $SA \parallel PBQ$.  	

End of Section D

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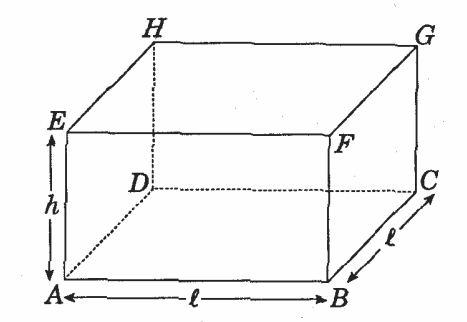
Section	Mark
E	/20

QUESTION	ANSWER
(a) The heights of two similar figures are $1 \cdot 6$ m and $1 \cdot 8$ m. (i) If the volume of the smaller figure is $10 \cdot 08\ \text{m}^3$, find the volume of the larger figure. (ii) If 800 mL of paint is needed to give the smaller figure two coats of paint. How much is required to give the larger figure 2 coats of paint?	
(b) A painting is 18 cm by 12 cm. It is to be surrounded by a border of uniform width whose area is equal to that of the painting. Find the width of the border.	
(c) Solve $\frac{k+10}{k-5} - \frac{10}{k} = \frac{11}{6}$	

(d) A building is in the shape of a square prism with base edges l metres and height h metres.
It stands on level ground.
NB $AB = BC = l$.

A base diagonal AC is produced to a point K.
From K it is found that the angles of elevation of F and G are $30°$ and $45°$ respectively.

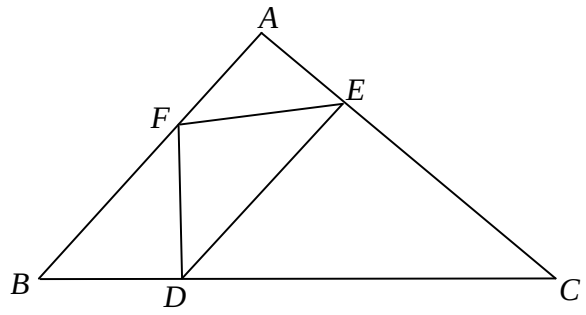


(i) Show that $BK = h\sqrt{3}$ metres.

(ii) Hence, or otherwise, show that $2h^2 = l^2 + \sqrt{2}hl$.

(iii) Hence, or otherwise, prove that $\frac{h}{l} = \frac{\sqrt{2}+\sqrt{10}}{4}$

(e) In ΔABC, the points D, E and F are on sides BC, CA and AB respectively, such that $\angle AFE = \angle BFD$, $\angle BDF = \angle CDE$ and $\angle CED = \angle AEF$.



(i) Prove that $\angle BDF = \angle BAC$

(ii) If $AB = 5$, $BC = 8$ and $CA = 7$ show that $\frac{BD}{BF} = \frac{5}{8}$.

(iii) Find the length of BD.

End of paper

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