



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

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**MATHEMATICS**

Paper 4 (Extended)

**0580/04, 0581/04**

**October/November 2007**

**2 hours 30 minutes**

Additional Materials:	Answer Booklet/Paper	Electronic calculator
	Geometrical instruments	Graph paper (1 sheet)
	Mathematical tables (optional)	Tracing paper (optional)

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**READ THESE INSTRUCTIONS FIRST**

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet.

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.

All working must be clearly shown. It should be done on the same sheet as the rest of the answer.

Marks will be given for working which shows that you know how to solve the problem even if you get the answer wrong.

Electronic calculators should be used.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures.

Give answers in degrees to one decimal place.

For  $\pi$  use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

The total of the marks for this paper is 130.

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This document consists of **10** printed pages and **2** blank pages.



DO NOT WRITE YOUR ANSWERS ON THIS QUESTION PAPER.

WRITE ALL YOUR WORKING AND ANSWERS ON THE SEPARATE ANSWER BOOK OR PAPER PROVIDED.

1 Each year a school organises a concert.

(a) (i) In 2004 the cost of organising the concert was \$385.

In 2005 the cost was 10% less than in 2004.

Calculate the cost in 2005.

[2]

(ii) The cost of \$385 in 2004 was 10% more than the cost in 2003.

Calculate the cost in 2003.

[2]

(b) (i) In 2006 the number of tickets sold was 210.

The ratio

Number of adult tickets : Number of student tickets was 23 : 19.

How many adult tickets were sold?

[2]

(ii) Adult tickets were \$2.50 each and student tickets were \$1.50 each.

Calculate the **total** amount **received** from selling the tickets.

[2]

(iii) In 2006 the cost of organising the concert was \$410.

Calculate the percentage profit in 2006.

[2]

(c) In 2007, the number of tickets sold was again 210.

Adult tickets were \$2.60 each and student tickets were \$1.40 each.

The total amount received from selling the 210 tickets was \$480.

How many student tickets were sold?

[4]

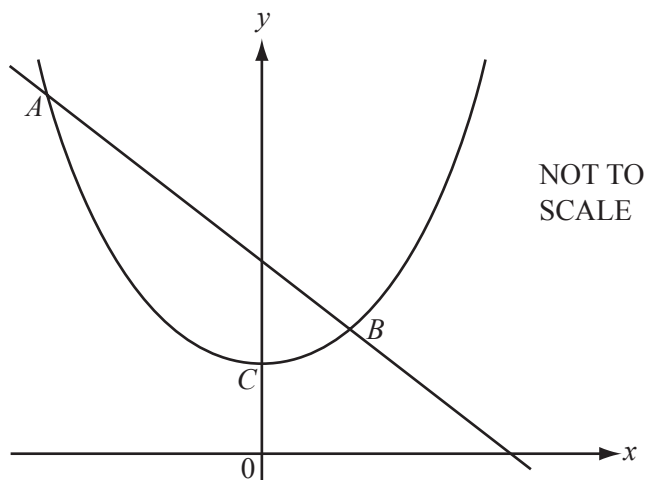
2 (a)

Grade	1	2	3	4	5	6	7
Number of students	1	2	4	7	4	8	2

The table shows the grades gained by 28 students in a history test.

- (i) Write down the mode. [1]
- (ii) Find the median. [1]
- (iii) Calculate the mean. [3]
- (iv) Two students are chosen at random.  
Calculate the probability that they both gained grade 5. [2]
- (v) From all the students who gained grades 4 or 5 or 6 or 7, two are chosen at random.  
Calculate the probability that they both gained grade 5. [2]
- (vi) Students are chosen at random, one by one, from the original 28, until the student chosen has a grade 5.  
Calculate the probability that this is the third student chosen. [2]
- (b) Claude goes to school by bus.  
The probability that the bus is late is 0.1 .  
If the bus is late, the probability that Claude is late to school is 0.8 .  
If the bus is not late, the probability that Claude is late to school is 0.05 .
- (i) Calculate the probability that the bus is late and Claude is late to school. [1]
- (ii) Calculate the probability that Claude is late to school. [3]
- (iii) The school term lasts 56 days.  
How many days would Claude expect to be late? [1]

3



The diagram shows a sketch of  $y = x^2 + 1$  and  $y = 4 - x$ .

- (a) Write down the co-ordinates of
- (i) the point  $C$ , [1]
  - (ii) the points of intersection of  $y = 4 - x$  with each axis. [2]
- (b) Write down the gradient of the line  $y = 4 - x$ . [1]
- (c) Write down the range of values of  $x$  for which the gradient of the graph of  $y = x^2 + 1$  is negative. [1]
- (d) The two graphs intersect at  $A$  and  $B$ .  
Show that the  $x$  co-ordinates of  $A$  and  $B$  satisfy the equation  $x^2 + x - 3 = 0$ . [1]
- (e) Solve the equation  $x^2 + x - 3 = 0$ , giving your answers correct to 2 decimal places. [4]
- (f) Find the co-ordinates of the mid-point of the straight line  $AB$ . [2]
-

4 [The surface area of a sphere of radius  $r$  is  $4\pi r^2$  and the volume is  $\frac{4}{3}\pi r^3$ .]

(a) A solid metal sphere has a radius of 3.5 cm.

One cubic centimetre of the metal has a mass of 5.6 grams.

Calculate

(i) the surface area of the sphere, [2]

(ii) the volume of the sphere, [2]

(iii) the mass of the sphere. [2]

(b)

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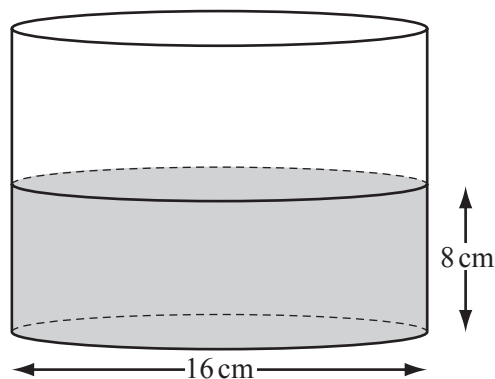


Diagram 1

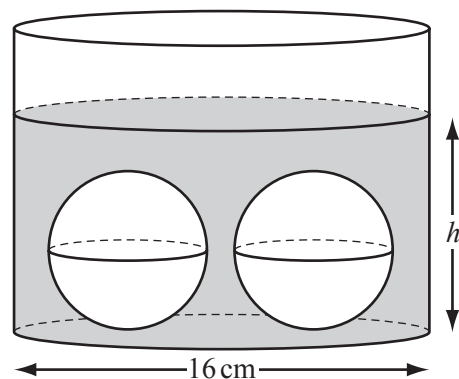


Diagram 2

Diagram 1 shows a cylinder with a **diameter** of 16 cm.

It contains water to a depth of 8 cm.

Two spheres identical to the sphere in **part (a)** are placed in the water. This is shown in Diagram 2.

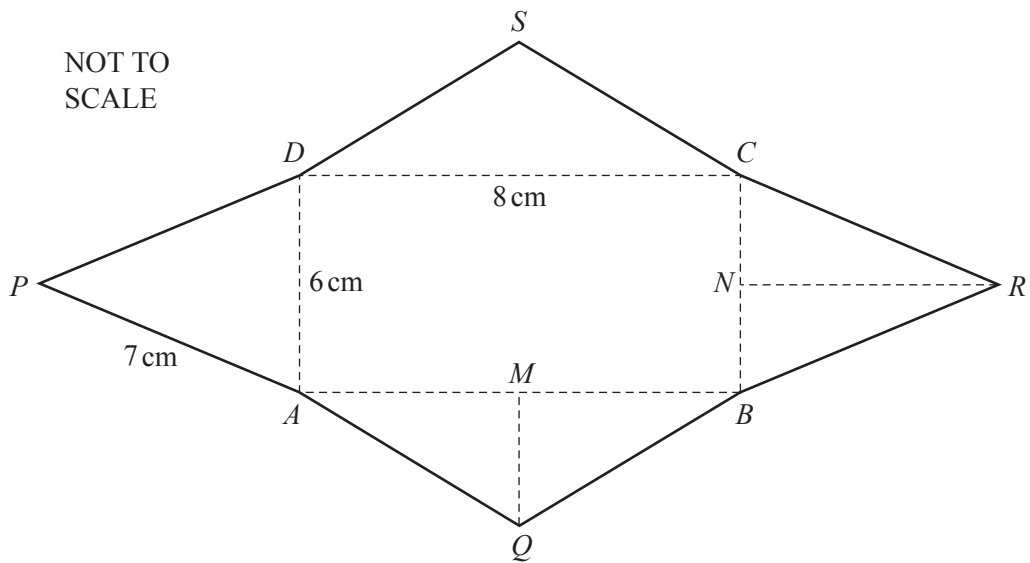
Calculate  $h$ , the new depth of water in the cylinder. [4]

(c) A different metal sphere has a mass of 1 kilogram.

One cubic centimetre of this metal has a mass of 4.8 grams.

Calculate the radius of this sphere. [3]

5



The diagram above shows the net of a pyramid.

The base  $ABCD$  is a rectangle  $8\text{ cm}$  by  $6\text{ cm}$ .

All the sloping edges of the pyramid are of length  $7\text{ cm}$ .

$M$  is the mid-point of  $AB$  and  $N$  is the mid-point of  $BC$ .

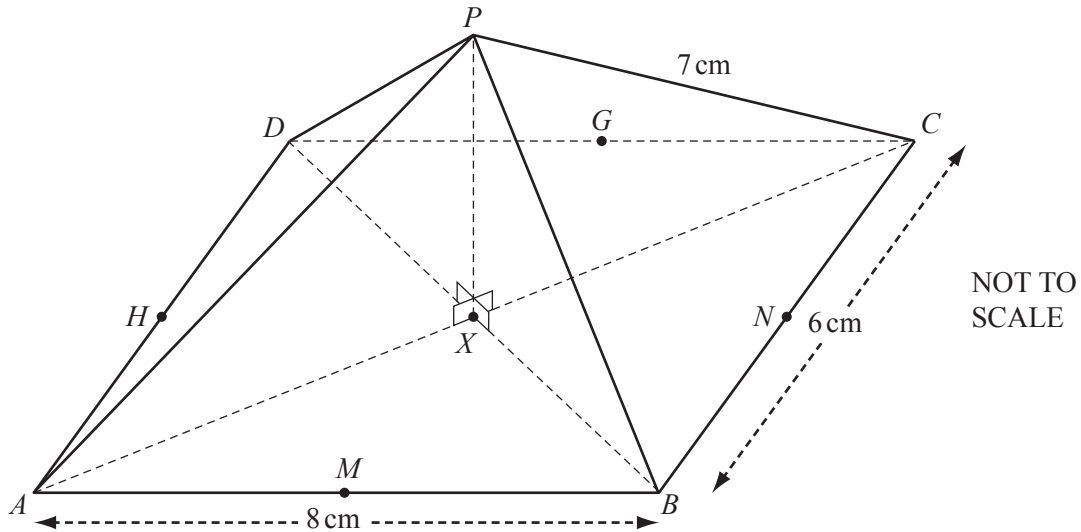
(a) Calculate the length of

(i)  $QM$ , [2]

(ii)  $RN$ . [1]

(b) Calculate the surface area of the pyramid. [2]

(c)



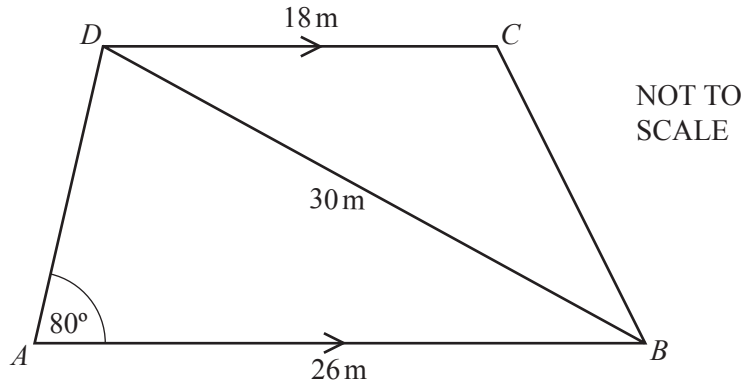
The net is made into a pyramid, with  $P, Q, R$  and  $S$  meeting at  $P$ .

The mid-point of  $CD$  is  $G$  and the mid-point of  $DA$  is  $H$ .

The diagonals of the rectangle  $ABCD$  meet at  $X$ .

- (i) Show that the height,  $PX$ , of the pyramid is 4.90 cm, correct to 2 decimal places. [2]
- (ii) Calculate angle  $PNX$ . [2]
- (iii) Calculate angle  $HPN$ . [2]
- (iv) Calculate the angle between the edge  $PA$  and the base  $ABCD$ . [3]
- (v) Write down the vertices of a triangle which is a plane of symmetry of the pyramid. [1]

6



The diagram shows the plan of a garden.

The garden is a trapezium with  $AB = 26$  metres,  $DC = 18$  metres and angle  $DAB = 80^\circ$ .

A straight path from  $B$  to  $D$  has a length of 30 metres.

- (a) (i) Using a scale of 1 : 200, draw an **accurate** plan of the garden. [3]
- (ii) **Measure** and write down the size of angle  $ADB$  and the size of angle  $DCB$ . [2]
- (iii) A second path is such that all points on it are equidistant from  $AB$  and from  $AD$ .  
Using a straight edge and compasses only, construct this path on your plan. [2]
- (iv) A third path is such that all points on it are equidistant from  $A$  and from  $D$ .  
Using a straight edge and compasses only, construct this path on your plan. [2]
- (v) In the garden, vegetables are grown in the region which is nearer to  $AB$  than to  $AD$  **and** nearer to  $A$  than to  $D$ .  
Shade this region on your plan. [1]
- (b) Use **trigonometry**, showing all your working, to calculate
- (i) angle  $ADB$ , [3]
- (ii) the length of  $BC$ , [4]
- (iii) the area of the garden. [3]



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

(a) Draw  $x$  and  $y$  axes from 0 to 12 using a scale of 1 cm to 1 unit on each axis. [1]

(b) Draw and label triangle  $T$  with vertices (8, 6), (6, 10) and (10, 12). [1]

(c) Triangle  $T$  is reflected in the line  $y = x$ .

(i) Draw the image of triangle  $T$ . Label this image  $P$ . [2]

(ii) Write down the matrix which represents this reflection. [2]

(d) A transformation is represented by the matrix  $\begin{pmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{pmatrix}$

(i) Draw the image of triangle  $T$  under this transformation. Label this image  $Q$ . [2]

(ii) Describe fully this single transformation. [3]

(e) Triangle  $T$  is stretched with the  $y$ -axis invariant and a stretch factor of  $\frac{1}{2}$ .

Draw the image of triangle  $T$ . Label this image  $R$ . [2]

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8  $f(x) = 2x - 1$ ,  $g(x) = \frac{3}{x} + 1$ ,  $h(x) = 2^x$ .

(a) Find the value of  $fg(6)$ . [1]

(b) Write, as a **single fraction**,  $gf(x)$  in terms of  $x$ . [3]

(c) Find  $g^{-1}(x)$ . [3]

(d) Find  $hh(3)$ . [2]

(e) Find  $x$  when  $h(x) = g\left(-\frac{24}{7}\right)$  [2]

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Question 9 is printed on the next page.

9 The table shows some terms of several sequences.

Term	1	2	3	4		8	
Sequence P	7	5	3	1		$p$	
Sequence Q	1	8	27	64		$q$	
Sequence R	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{4}{5}$		$r$	
Sequence S	4	9	16	25		$s$	
Sequence T	1	3	9	27		$t$	
Sequence U	3	6	7	-2		$u$	

(a) Find the values of  $p, q, r, s, t$  and  $u$ . [6]

(b) Find the  $n$ th term of sequence

(i) P, [1]

(ii) Q, [1]

(iii) R, [1]

(iv) S, [1]

(v) T, [1]

(vi) U. [1]

(c) Which term in sequence P is equal to  $-777$ ? [2]

(d) Which term in sequence T is equal to 177 147? [2]



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