International General Certificate of Secondary Education
CAMBRIDGE INTERNATIONAL EXAMINATIONS

MATHEMATICS **0580/4, 0581/4**

PAPER 4

MAY/JUNE SESSION 2002
2 hours 30 minutes

Additional materials:
- Answer paper
- Electronic calculator
- Geometrical instruments
- Graph paper (1 sheet)
- Mathematical tables (optional)
- Tracing paper (optional)

TIME 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces provided on the answer paper/answer booklet.

Answer **all** questions.

Write your answers and working on the separate answer paper provided.

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.

If you use more than one sheet of paper, fasten the sheets together.

INFORMATION FOR CANDIDATES

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.

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 π, use either your calculator value or 3.142.

This question paper consists of 8 printed pages.

SB (SC/DG) S07107/4

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

1 **(a)** One day Amit works from 08 00 until 17 00.
The time he spends on filing, computing, writing and having lunch is in the ratio

Filing: Computing: Writing: Lunch = 2: 5 : 4 : 1.

Calculate the time he spends

(i) writing, [1]

(ii) having lunch, giving this answer in minutes. [1]

(b) The amount earned by Amit, Bernard and Chris is in the ratio 2 : 5 : 3.
Bernard earns \$855 per week.
Calculate how much

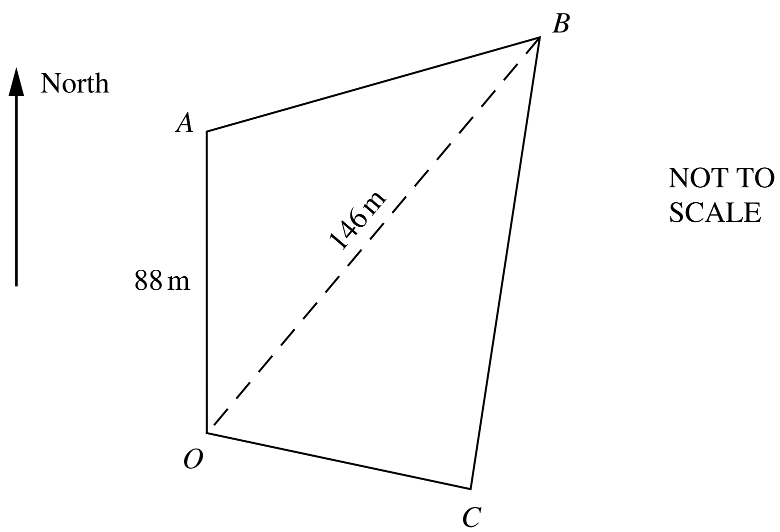
(i) Amit earns each week, [1]

(ii) Chris earns each week. [1]

(c) After 52 weeks Bernard has saved \$2964.
What fraction of his earnings has he saved?
Give your answer in its lowest terms. [2]

(d) Chris saves \$3500 this year. This is 40% more than he saved last year.
Calculate how much he saved last year. [3]

2



OABC is a field.
A is 88 metres due North of *O*.
B is 146 metres from *O* on a bearing of 040°.
C is equidistant from *A* and from *B*. The bearing of *C* from *O* is 098°.

(a) Using a scale of 1 centimetre to represent 10 metres, make an accurate scale drawing of the field *OABC*, by

(i) constructing the triangle *OAB*, [3]

(ii) drawing the locus of points equidistant from *A* and from *B*, [2]

(iii) completing the scale diagram of *OABC*. [2]

(b) Use your scale drawing to write down

(i) the distance *OC* correct to the nearest metre, [1]

(ii) the size of angle *OAB* correct to the nearest degree. [1]

(c) Find the bearing of *A* from *B*. [2]

(d) A donkey in the field is not more than 40 metres from *C* and is closer to *B* than to *A*.
Shade the area where the donkey could be and label it *D*. [3]

(e) A horse in the field is not more than 20 metres from the side *AB* and is closer to *A* than to *B*.
Shade the area where the horse could be and label it *H*. [3]

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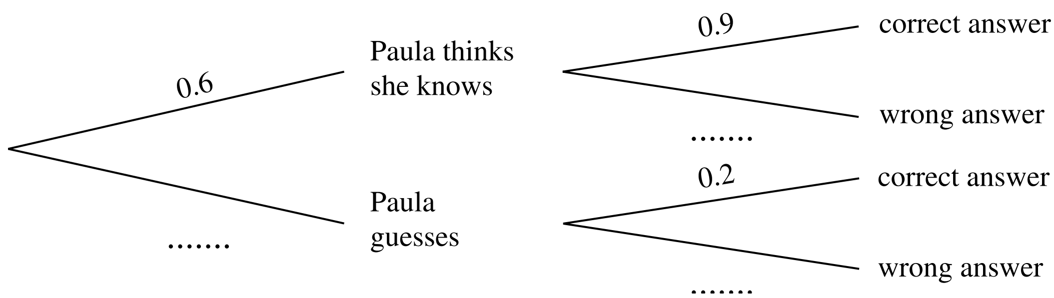
3 Paula and Tarek take part in a quiz.
The probability that Paula thinks she knows the answer to any question is 0.6.
If Paula thinks she knows, the probability that she is correct is 0.9.
Otherwise she guesses and the probability that she is correct is 0.2.

(a) **Copy and complete** the tree diagram.



[3]

(b) Find the probability that Paula

(i) thinks she knows the answer and is correct, [1]

(ii) gets the correct answer. [2]

(c) The probability that Tarek thinks he knows the answer to any question is 0.55.
If Tarek thinks he knows, he is always correct.
Otherwise he guesses and the probability that he is correct is 0.2.

(i) Draw a tree diagram for Tarek. Write all the probabilities on your diagram. [3]

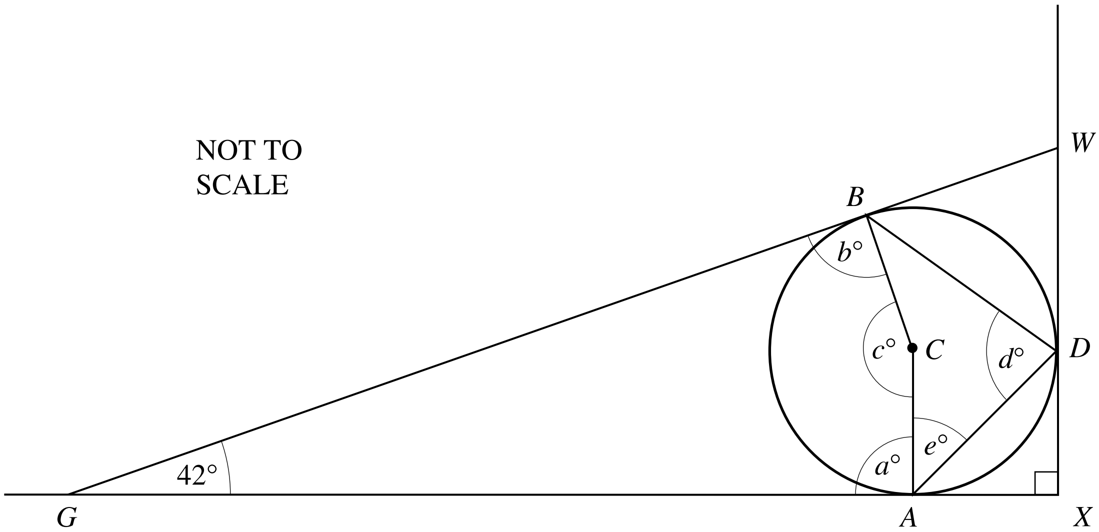
(ii) Find the probability that Tarek gets the correct answer. [2]

(d) There are 100 questions in the quiz.
Estimate the number of correct answers given by

(i) Paula, [1]

(ii) Tarek. [1]

4



A sphere, centre C, rests on horizontal ground at A and touches a vertical wall at D.
A straight plank of wood, GBW, touches the sphere at B, rests on the ground at G and against the wall at W.
The wall and the ground meet at X.
Angle $WGX = 42°$.

(a) Find the values of a, b, c, d and e marked on the diagram. [5]

(b) Write down one word which completes the following sentence.

'Angle CGA is 21° because triangle GBC and triangle GAC are …………………'. [1]

(c) The radius of the sphere is 54 cm.

(i) Calculate the distance GA. Show all your working. [3]

(ii) Show that $GX = 195$ cm correct to the nearest centimetre. [1]

(iii) Calculate the length of the plank GW. [3]

(iv) Find the distance BW. [1]

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5 **Answer the whole of this question on a sheet of graph paper.**

Dimitra stands by a river and watches a fish.
The distance (d metres) of the fish from Dimitra after t minutes is given by

$$d = (t+1)^2 + \frac{48}{(t+1)} - 20.$$

Some values for d and t are given in the table below.

t	0	0.5	1	1.5	2	2.5	3	3.5	4	5	6	7
d	p	14.3	8	5.5	5	6	8	10.9	14.6	q	35.9	r

(a) Find the values of p, q and r. [3]

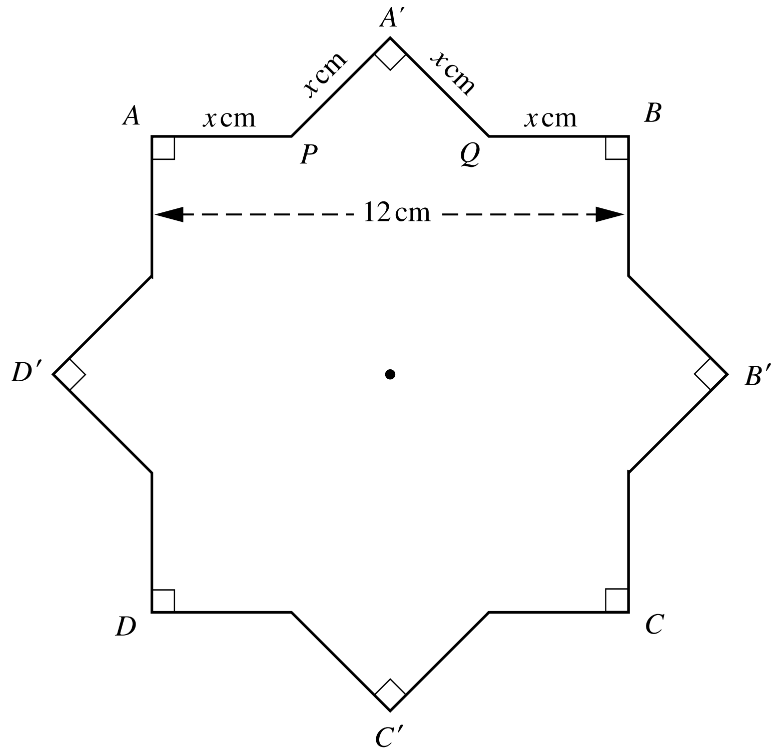
(b) Using a scale of 2 cm to represent 1 minute on the horizontal t-axis and 2 cm to represent 10 metres on the vertical d-axis, draw the graph of $d = (t + 1)^2 + \dfrac{48}{(t + 1)} - 20$ for $0 \leqslant t \leqslant 7$. [6]

(c) Mark and label F the point on your graph when the fish is 12 metres from Dimitra and swimming **away** from her. Write down the value of t at this point, correct to one decimal place. [2]

(d) For how many minutes is the fish less than 10 metres from Dimitra? [2]

(e) By drawing a suitable line on your grid, calculate the speed of the fish when $t = 2.5$. [4]

6



An equilateral 16-sided figure $APA'QB$ …… is formed when the square $ABCD$ is rotated 45° clockwise about its centre to position $A'B'C'D'$.
$AB = 12$ cm and $AP = x$ cm.

(a) **(i)** Use triangle $PA'Q$ to explain why $2x^2 = (12 - 2x)^2$. [3]

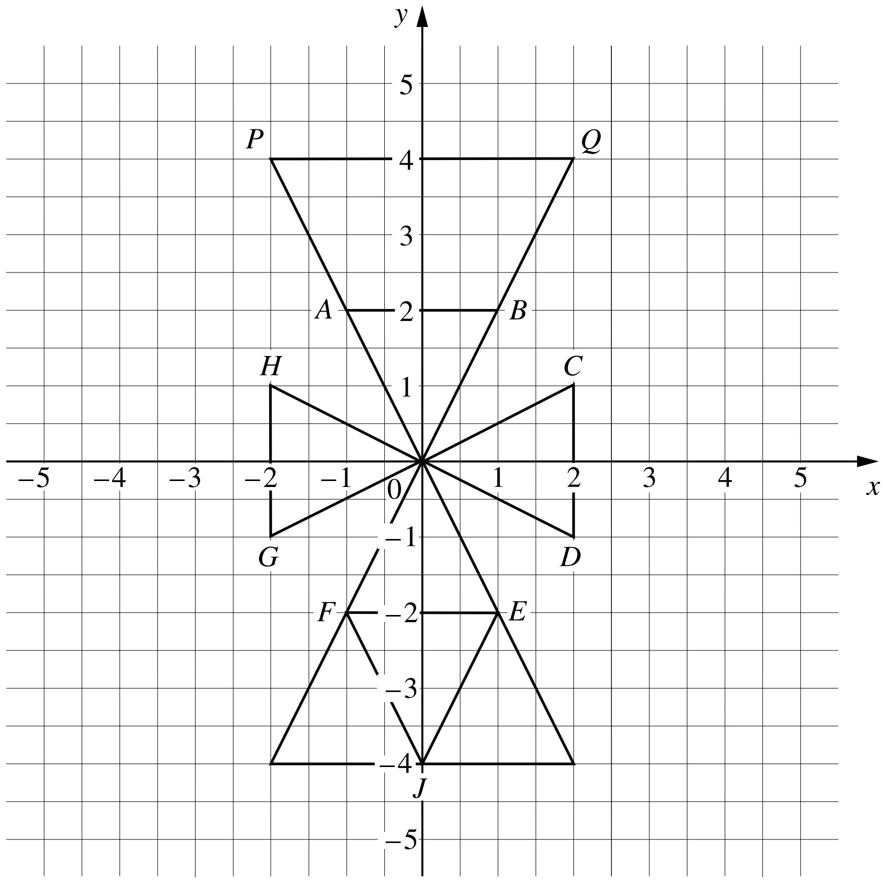
(ii) Show that this simplifies to $x^2 - 24x + 72 = 0$. [3]

(iii) Solve $x^2 - 24x + 72 = 0$. Give your answers correct to 2 decimal places. [4]

(b) **(i)** Calculate the perimeter of the 16-sided figure. [2]

(ii) Calculate the area of the 16-sided figure. [3]

7



(a) Describe fully a single transformation which maps both

(i) A onto C **and** B onto D, [2]

(ii) A onto D **and** B onto C, [2]

(iii) A onto P **and** B onto Q. [3]

(b) Describe fully a single transformation which maps triangle $0AB$ onto triangle JFE. [2]

(c) The matrix **M** is $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$.

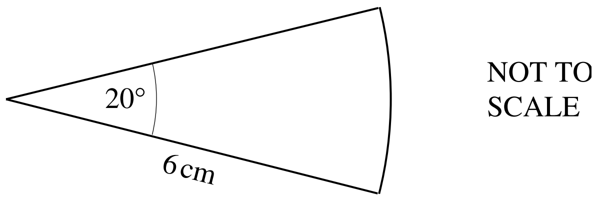
(i) Describe the transformation which **M** represents. [2]

(ii) Write down the co-ordinates of P after transformation by matrix **M**. [2]

(d) **(i)** Write down the matrix **R** which represents a rotation by 90° anticlockwise about 0. [2]

(ii) Write down the letter representing the new position of F after the transformation **RM**(F). [2]

8 **(a)** A sector of a circle, radius 6 cm, has an angle of 20°.

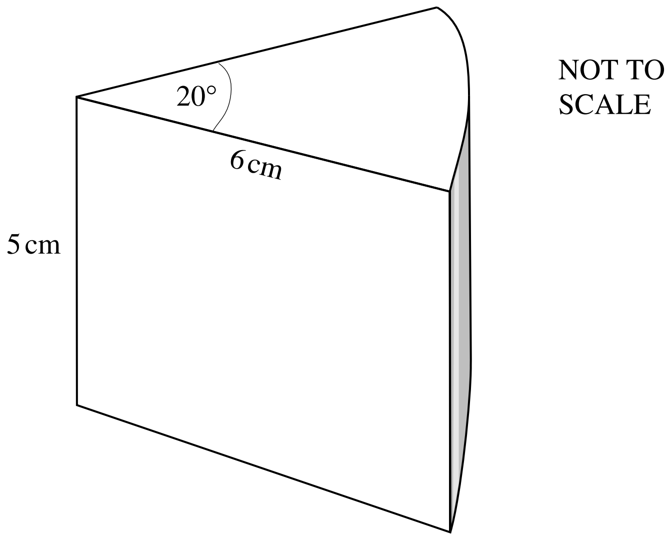


Calculate

(i) the area of the sector, [2]

(ii) the arc length of the sector. [2]

(b)



A whole cheese is a cylinder, radius 6 cm and height 5 cm.
The diagram shows a slice of this cheese with sector angle 20°.

Calculate

(i) the volume of the slice of cheese, [2]

(ii) the **total** surface area of the slice of cheese. [4]

(c) The radius, r, and height, h, of cylindrical cheeses vary but the volume remains constant.

(i) Which one of the following statements *A, B, C* or *D* is true?

A: h is proportional to r.

B: h is proportional to r^2.

C: h is inversely proportional to r.

D: h is inversely proportional to r^2. [2]

(ii) What happens to the height h of the cylindrical cheese when the volume remains constant but the radius is doubled? [2]

[Turn over

9 **(a)** The number of people living in six houses is

$$3, \quad 8, \quad 4, \quad x, \quad y \quad \text{and} \quad z.$$

The median is $7\frac{1}{2}$.

The mode is 8.

The mean is 7.

Find a value for each of x, y and z. [5]

(b) The grouped frequency table below shows the amount ($$A$) spent on travel by a number of students.

Cost of travel ($$A$)	$0 < A \leqslant 10$	$10 < A \leqslant 20$	$20 < A \leqslant 40$
Frequency	15	m	n

(i) Write down an estimate for the total amount in terms of m and n. [2]

(ii) The calculated estimate of the mean amount is $13 exactly.

Write down an equation containing m and n.

Show that it simplifies to $2m + 17n = 120$. [3]

(iii) A student drew a histogram to represent this data.

The area of the rectangle representing the $0 < A \leqslant 10$ group was equal to the sum of the areas of the other two rectangles.

Explain why $m + n = 15$. [1]

(iv) Find the values of m and n by solving the simultaneous equations

$$2m + 17n = 120,$$
$$m + n = 15.$$ [3]