UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS (SYLLABUS D) **4024/12**

Paper 1 **October/November 2012**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments

READ THESE INSTRUCTIONS FIRST

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 pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

If working is needed for any question it must be shown in the space below that question.
Omission of essential working will result in loss of marks.

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER.

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 80.

This document consists of **20** printed pages.

UNIVERSITY of CAMBRIDGE International Examinations

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER.

For Examiner's Use

1 **(a)** Evaluate $8 + 2 \times 1.3$.

Answer ..... [1]

(b) Express 0.06 as a fraction, giving your answer in its lowest terms.

Answer ..... [1]

---

2 **(a)** Evaluate $\frac{2}{3} + 2\frac{1}{4}$.

Answer ..... [1]

(b) Evaluate $3^0 + 3^1$.

Answer ..... [1]

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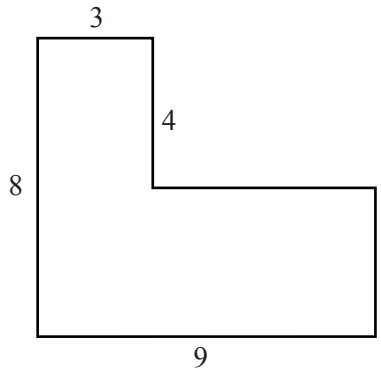
3 The diagram shows an L-shaped piece of card.

The measurements are in centimetres and all the angles are right-angles.



For Examiner's Use

(a) Calculate the perimeter of this card.

Answer ..... cm [1]

(b) Square pieces, each of side 2 cm, are cut from this card.

Find the greatest number of squares that can be obtained.

Answer ..... [1]

---

4 $f(x) = 5 + 3x$

(a) Evaluate $f\left(-\frac{1}{2}\right)$.

Answer ..... [1]

(b) Find $f^{-1}(x)$.

Answer $f^{-1}(x) =$ ..... [1]

---

5 Arrange these numbers in order, starting with the smallest.

For Examiner's Use

$$\frac{3}{4} \qquad 0 \qquad -1 \qquad -\frac{17}{20} \qquad -\frac{4}{5}$$

Answer ....., ..., ..., ..., ... [2]
smallest

---

6 A car travelled from *A* to *B* and then continued to *C*.
It travelled from *A* to *B* at an average speed of 30 km/h.
The distance from *A* to *B* is 90 km.

(a) How many hours did the journey from *A* to *B* take?

Answer .....[1]

(b) The distance from *B* to *C* is 50 km and took 1 hour.

Calculate the average speed of the whole journey from *A* to *C*.

Answer .....km/h [1]

---

7 Expand the brackets and simplify

(a) $6k - 2(1 - k) + 3$,

Answer ..... [1]

(b) $(2x - 3)(x + 4)$.

Answer ..... [1]

---

8 A ship travelled from P to Q.
It unloaded its cargo at Q and then returned to P.
The bearing of Q from P is 075°.

(a) Find the bearing of P from Q.

Answer ..... [1]

(b) The ship left P at 21 40 and returned to P at 05 33 the following day.

Find the length of time, in hours and minutes, between leaving P and returning to P.

Answer ..... hours ..... minutes [1]

---

9 The number of goals scored by some football teams during one weekend was recorded. The table shows the results.

Number of goals scored	0	1	2	3	4
Number of teams	x	1	5	4	2

(a) If the mode is 0, find the smallest possible value of x.

Answer $x =$ ..... [1]

(b) If the median is 1, find the value of x.

Answer $x =$ ..... [1]

---

10 **(a)** Express 180 as the product of its prime factors.

Answer ..... [1]

(b) $\sqrt{180}$ can be expressed in the form $p\sqrt{q}$, where p and q are integers.

Find the smallest value of $p + q$.

Answer ..... [1]

---

11 **(a)** Find the value of a when $3^a \div 3^4 = 3^2$.

For Examiner's Use

Answer $a =$ ..... [1]

(b) Find the value of b when $8^b = 2$.

Answer $b =$ ..... [1]

---

12 y is directly proportional to the square of x.

Given that $y = 32$ when $x = 4$, find y when $x = 3$.

Answer $y =$ ..... [2]

---

13 Sam and Tom ran 60 m.
Sam took 9.4 seconds, correct to the nearest tenth of a second.
Tom took 8 seconds, correct to the nearest second.

(a) Write down the upper bound for the time taken by Sam.

Answer ..... seconds [1]

(b) Calculate the greatest possible difference between the time taken by Sam and the time taken by Tom.

Answer ..... seconds [1]

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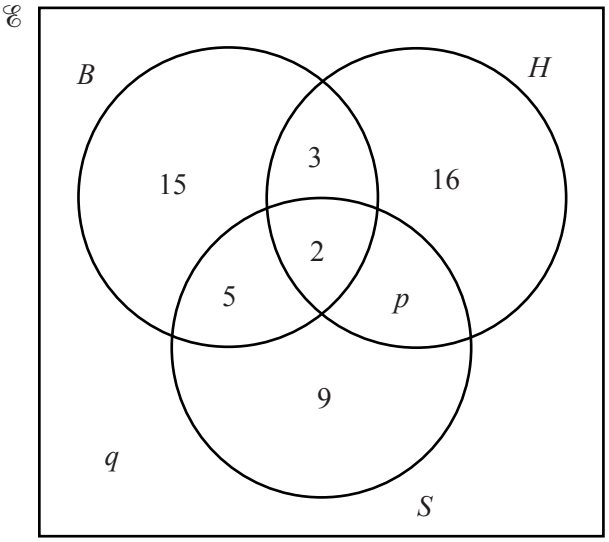
14 In a survey, 60 students are asked which of the subjects Biology (B), History (H) and Spanish (S) they are studying.

The Venn diagram shows the results.

27 students study History.



(a) Find the values of p and q.

Answer $p =$ .....

$q =$ ..... [1]

(b) Find $n(H')$.

Answer ..... [1]

(c) Find $n((B \cup H) \cap S')$.

Answer ..... [1]

---

15 Factorise completely

For Examiner's Use

(a) $16p + 4p^2$,

Answer .....[1]

(b) $xy + 2ay + 3ax + 6a^2$.

Answer .....[2]

16

Three cards, A, B and C are marked with the numbers 2, 3 and 4 respectively.
One card is chosen, at random.
A second card is then chosen, at random, from the remaining two cards.
The sum of the numbers on the two chosen cards is calculated.

(a) What is the probability that the sum is 3?

Answer .....[1]

(b) Complete the table to show all the possible outcomes.
You may not need all the columns. [1]

First card	A								
Second card	B								
Sum	5								

(c) What is the probability that the sum is 7?

Answer .....[1]

---

17 **(a)** Write the number 0.040 589 correct to 3 significant figures.

For Examiner's Use

Answer ..... [1]

(b) Giving your answer in standard form, evaluate $6 \times 10^{-4} + 8 \times 10^{-5}$.

Answer ..... [1]

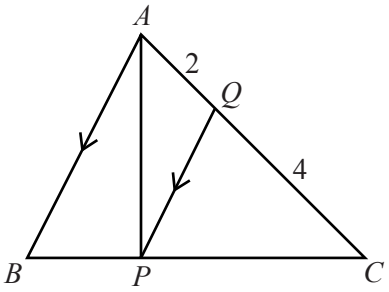
(c) **Estimate**, correct to the nearest whole number, the value of $\sqrt{97} - \sqrt{35}$.
Show clearly the approximate values you use.

Answer ..... [1]

18 In the diagram, the points P and Q lie on the sides BC and AC of triangle ABC.

AB is parallel to QP.
$AQ = 2$ cm and $QC = 4$ cm.

The area of triangle CPQ is $6\,\text{cm}^2$.



For Examiner's Use

Find the area of

(a) triangle AQP,

Answer ..... cm^2 [1]

(b) triangle ABC,

Answer ..... cm^2 [1]

(c) triangle ABP.

Answer ..... cm^2 [1]

19 $\mathbf{M} = \begin{pmatrix} 1 & 1 \\ -1 & 3 \end{pmatrix}$

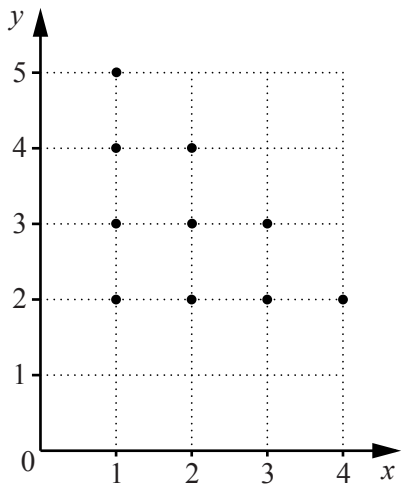
(a) Express as a single matrix $\begin{pmatrix} -4 & 2 \\ -4 & 0 \end{pmatrix} - 2\mathbf{M}$.

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) Find $\mathbf{M}^{-1}$.

Answer $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

20 The diagram shows 10 points, with coordinates (h, k), where h and k are integers.



For Examiner's Use

(a) For these 10 points find

(i) the maximum value of $k - h$,

Answer .....[1]

(ii) the value of k, for the point that lies on the line $y = \frac{1}{2}x$.

Answer $k =$ .....[1]

(b) The coordinates of the 10 points satisfy the inequalities

$$h \geqslant a, \qquad k \geqslant b, \qquad h + k \leqslant c.$$

Write down the values of a, b and c.

Answer $a =$ .....

$b =$ .....

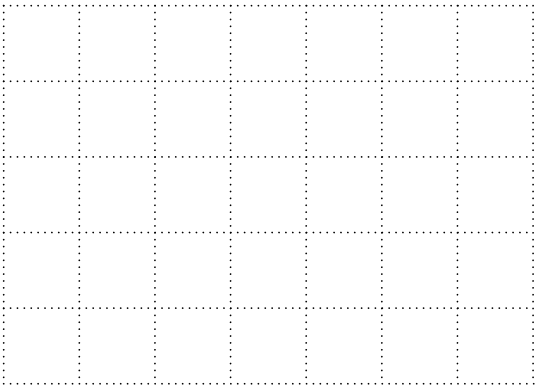
$c =$ .....[2]

21 The matrix $\begin{pmatrix} 1 & 0 \\ 0 & \frac{1}{2} \end{pmatrix}$ represents the transformation T.

(a) Find $\begin{pmatrix} 1 & 0 \\ 0 & \frac{1}{2} \end{pmatrix}\begin{pmatrix} 0 & 0 & -1 \\ 0 & 2 & 2 \end{pmatrix}$.

Answer [2]

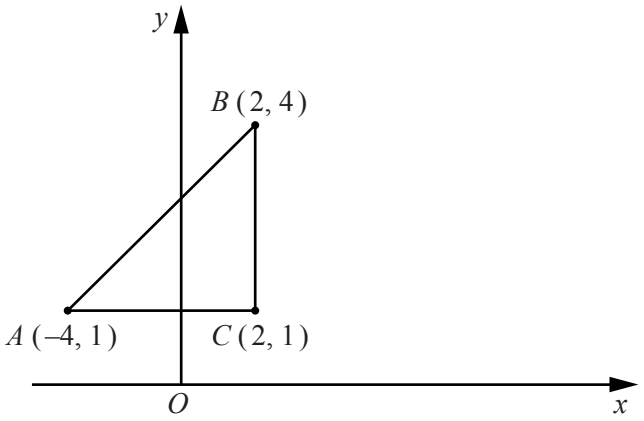
(b) Describe fully the transformation T.
You may use the grid below to help you answer this question.



Answer .....

..... [2]

22 The diagram shows triangle ABC.



Triangle ABC is translated by $\begin{pmatrix} 9 \\ 2 \end{pmatrix}$ onto triangle $A'B'C'$.

(a) Find the coordinates of C'.

Answer (..... , ...) [1]

(b) What special type of quadrilateral is $BCC'B'$?

Answer ..... [1]

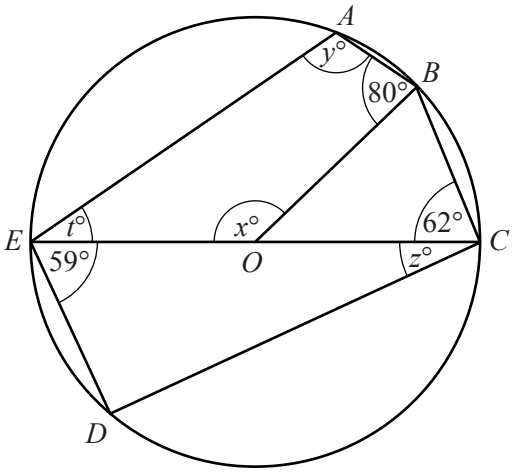
(c) Find the area of quadrilateral $BCC'B'$.

Answer ..... units^2 [2]

23 In the diagram, the points A, B, C, D and E lie on the circle centre O.

EC is a diameter.

$O\hat{B}A = 80°$, $D\hat{E}C = 59°$ and $B\hat{C}E = 62°$.



For Examiner's Use

Find

(a) x,

Answer $x =$ ..... [1]

(b) y,

Answer $y =$ ..... [1]

(c) z,

Answer $z =$ ..... [1]

(d) t.

Answer $t =$ ..... [1]

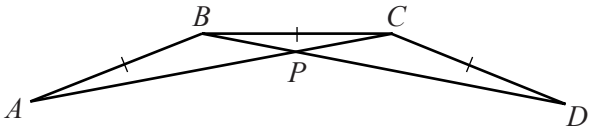
24 A regular polygon has an interior angle of 160°.

For Examiner's Use

(a) Find the number of sides of the polygon.

Answer ..... [2]

(b) The diagram shows three sides AB, BC and CD of the regular polygon.



AC and BD meet at P.

(i) Calculate $B\hat{C}A$.

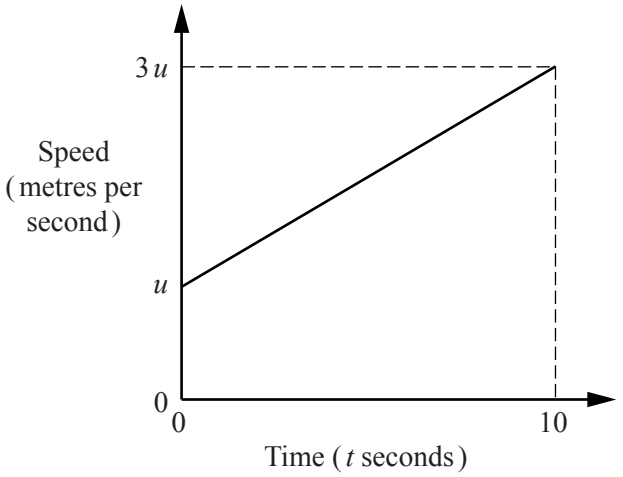
Answer ..... [1]

(ii) Calculate $D\hat{P}C$.

Answer ..... [1]

25 The diagram is the speed-time graph of a cyclist.

The cyclist accelerates uniformly from a speed of u metres per second to a speed of $3u$ metres per second in a time of 10 seconds.



(a) Find an expression, in terms of u, for the acceleration.

Answer ..... m/s^2 [1]

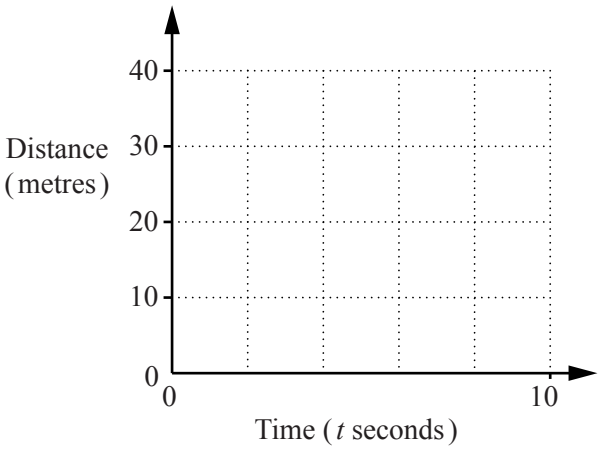
(b) The distance travelled by the cyclist from $t = 0$ to $t = 10$ is 40 m.

(i) Find the value of u.

Answer $u =$ ..... [2]

(ii) On the grid below, sketch the distance-time graph of the cyclist.

Answer



[2]

26 The nth term of a sequence is $9n + 4$.

For Examiner's Use

(a) Calculate the value of the term that is closest to 2012.

Answer ..... [2]

(b) Calculate the difference between the 10th term and the 6th term.

Answer ..... [1]

(c) **(i)** Find an expression, in terms of x and y, for the difference between the xth term and the yth term.

Answer ..... [1]

(ii) **Hence** explain why it is not possible for any two terms of this sequence to differ by 123.

Answer .....

..... [1]

Question 27 is printed on the following page.

27 The diagram at the bottom of the page shows the lines AB and BC.

For Examiner's Use

(a) Measure $A\hat{B}C$.

Answer ..... [1]

(b) The point D is above AB.
AD and CD are each equal to AB.
On the diagram, construct quadrilateral $ABCD$. [1]

(c) On the diagram, construct the locus of points, **inside** the quadrilateral $ABCD$, that are

(i) 7 cm from C, [1]

(ii) equidistant from AB and BC. [1]

(d) These two loci meet at the point P.

Label the point P on the diagram and measure DP.

Answer $DP =$ ..... cm [1]