UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

**MATHEMATICS**

Paper 2 (Extended)

**0580/02 0581/02**

Candidates answer on the Question Paper.
Additional Materials: Electronic calculator
Geometrical instruments
Mathematical tables (optional)
Tracing paper (optional)

October/November 2004

**1hour 30 minutes**

Candidate Name

Centre Number

Candidate Number

**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 in the spaces provided on the Question Paper.
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 THE BARCODE.
DO **NOT** WRITE IN THE GREY AREAS BETWEEN THE PAGES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
The number of marks is given in brackets [ ] at the end of each question or part question.

| For Examiner's Use |
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| |

The total number of marks for this paper is 70.
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. Given answers in degrees to one decimal place.
For $\pi$, use either your calculator value or 3.142.

This document consists of **11** printed pages and **1** blank page.

*For Examiner's Use*

**1** A pattern of numbers is shown below.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1 | | | | | | | |
| | | | | 1 | | 1 | | | | | | |
| | | | 1 | | 2 | | 1 | | | | | |
| | | 1 | | 3 | | 3 | | 1 | | | | |
| | 1 | | 4 | | 6 | | 4 | | 1 | | | |
| 1 | | 5 | | 10 | | 10 | | 5 | | 1 | | |
| 1 | | 6 | | $x$ | | 20 | | $x$ | | 6 | | 1 |

Write down the value of $x$.

*Answer* ..... [1]

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**2** Calculate $\left(3+3\sqrt{3}\right)^3$ giving your answer correct to 1 decimal place.

*Answer* ..... [2]

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**3** From the list of numbers $\frac{22}{7}$, $\pi$, $\sqrt{14}$, $\sqrt{16}$, 27.4, $\frac{65}{13}$ write down

**(a)** one integer,

*Answer(a)* ..... [1]

**(b)** one irrational number.

*Answer(b)* ..... [1]

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**4** Solve the inequality

$$5-3x<17.$$

*Answer* ..... [2]

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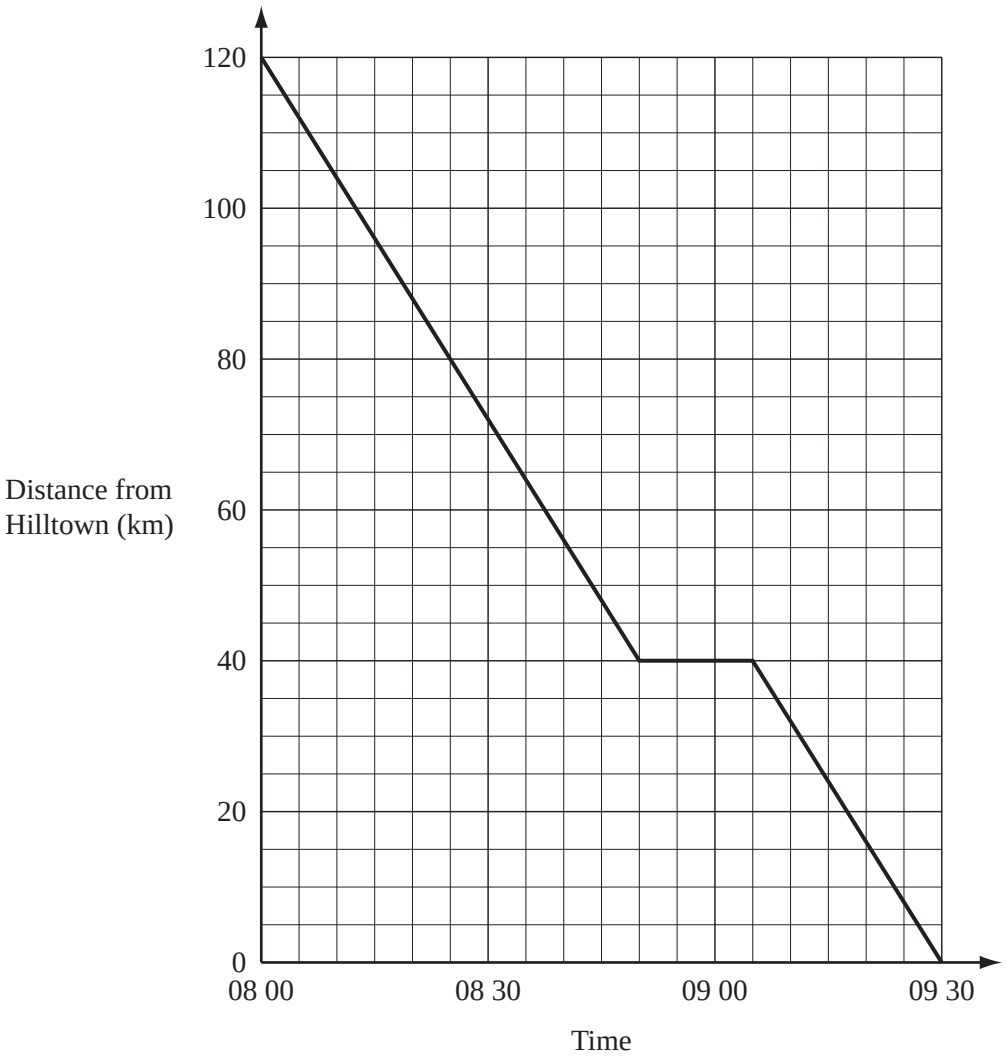
*For Examiner's Use*

**5** Solve the equation

$$\frac{3x-2}{5} = 8 .$$

*Answer* $x =$ ..... [2]

**6**




The graph shows the distance, in kilometres, of a train from Hilltown.

Find the speed of the train in kilometres per hour at

**(a)** 08 30,

*Answer(a)* ..... km/h [2]

**(b)** 09 00.

*Answer(b)* ..... km/h [1]

*For Examiner's Use*

**7** The air resistance ($R$) to a car is proportional to the square of its speed ($v$).
When $R = 1800$, $v = 30$.
Calculate $R$ when $v = 40$.

*Answer* $R =$ ..... [3]

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**8** In 1997 the population of China was $1.24 \times 10^9$.
In 2002 the population of China was $1.28 \times 10^9$.
Calculate the percentage increase from 1997 to 2002.

*Answer* ..... % [2]

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**9** 8, 15, 22, 29, 36, ……..

A sequence of numbers is shown above.

**(a)** Find the 10th term of the sequence.

*Answer(a)* ..... [1]

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

*Answer(b)* ..... [1]

**(c)** Which term of the sequence is equal to 260?

*Answer(c)* ..... [1]

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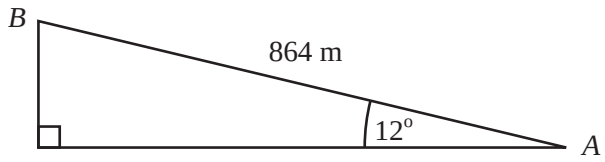
*For Examiner's Use*

**10** A mountain railway $AB$ is of length 864 m and rises at an angle of $12^o$ to the horizontal.
A train is 586 m above sea level when it is at $A$.
Calculate the height above sea level of the train when it reaches $B$.




NOT TO SCALE

*Answer* ..... m [3]

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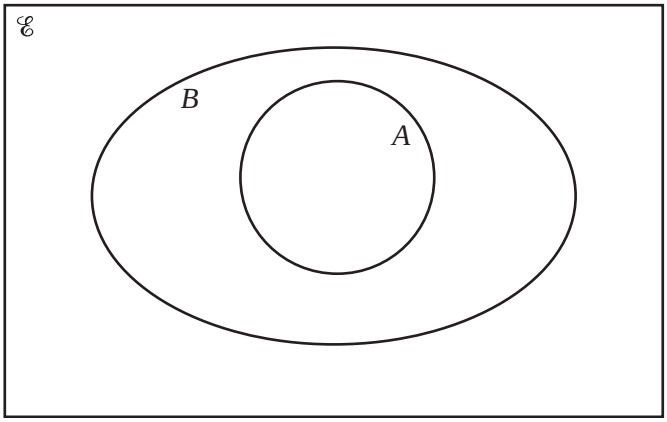
**11** $\mathscr{E}$ = {40, 41, 42, 43, 44, 45, 46, 47, 48, 49}
$A$ = {prime numbers}
$B$ = {odd numbers}

**(a)** Place the 10 numbers in the correct places on the Venn diagram.




[2]

**(b)** State the value of $\mathrm{n}(B \cap A')$.

*Answer(b)* ..... [1]

---

**12** Make $c$ the subject of the formula

$$\sqrt{3c-5} = b\,.$$

*Answer* $c$ = ..... [3]

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*For Examiner's Use*

**13** A square has sides of length $d$ metres.
This length is 120 metres, correct to the nearest 10 metres.

**(a)** Complete the statement in the answer space.

*Answer(a)* ..... $\leqslant d <$ ..... [1]

**(b)** Calculate the difference between the largest and the smallest possible areas of the square.

*Answer(b)* ..... $m^2$ [2]

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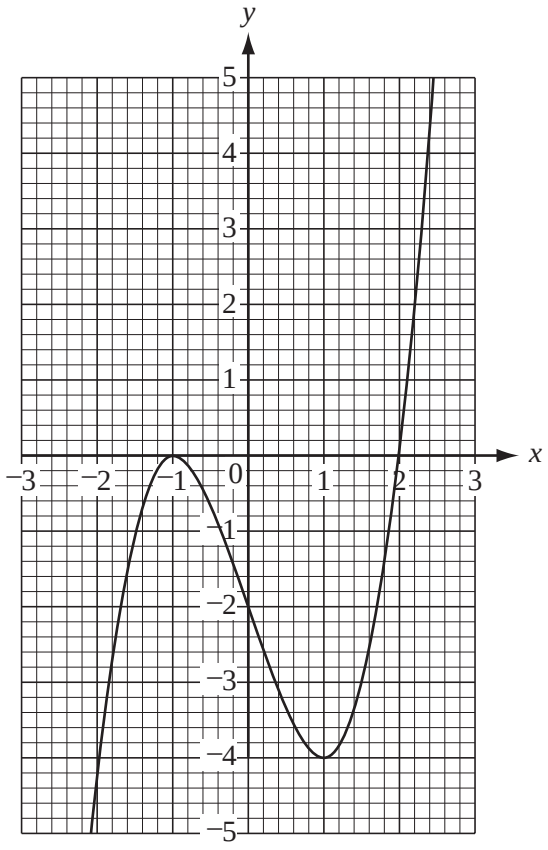
**14**




**(a)** Write down the coordinates of the points where the gradient of the curve is zero.

*Answer(a)* ( ....., ..... ) and ( ....., ..... ) [2]

**(b)** Write down the range of values of $x$ when the gradient of the curve is negative.

*Answer(b)* ..... [1]

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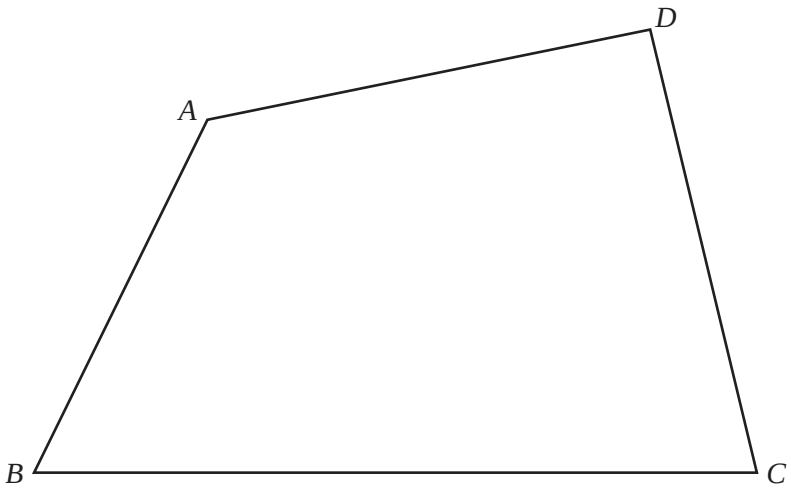
**15**

*For Examiner's Use*




The diagram shows a quadrilateral *ABCD*.

**(a)** Draw the locus of points in the quadrilateral which are 5 cm from *A*. [1]

**(b)** Using a straight edge and compasses only, draw the locus of all points inside the quadrilateral which are equidistant from *C* and *D*.
**Show all your construction lines.** [2]

**(c)** Shade the region which contains points in the quadrilateral that are more than 5 cm from *A* and nearer to *D* than to *C*.

[1]

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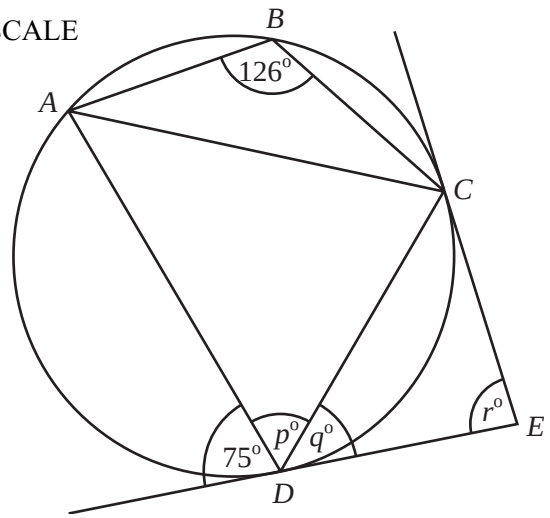
**16**

*ABCD* is a cyclic quadrilateral.
The tangents at *C* and *D* meet at *E*.
Calculate the values of *p*, *q* and *r*.

NOT TO SCALE




*Answer p* = ..... [1]

*q* = ..... [1]

*r* = ..... [2]

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*For Examiner's Use*

**17** Solve the equation

$$x^2 + 4x - 22 = 0\,.$$

Give your answers correct to 2 decimal places.
**Show all your working**.

*Answer* $x =$ ..... or $x =$ ..... [4]

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**18**

$$\mathbf{C} = \begin{pmatrix} 5 & -2 \\ 1 & 4 \end{pmatrix} \qquad \mathbf{D} = \begin{pmatrix} 4 & 2 \\ -1 & 5 \end{pmatrix}$$

**(a)** Write as a single matrix

**(i)** $\mathbf{C} - 3\,\mathbf{D}$,

*Answer(a)*(i) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

**(ii)** $\mathbf{CD}$.

*Answer(a)*(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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

*Answer(b)* $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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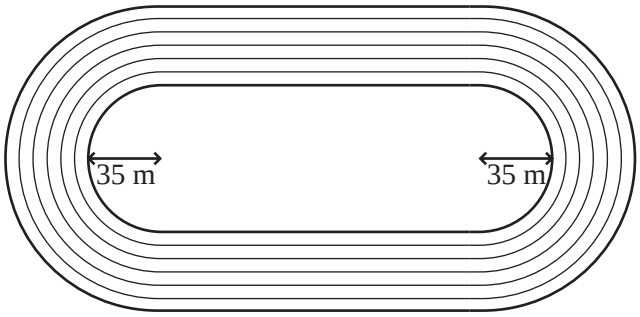
**19**

*For Examiner's Use*




NOT TO SCALE

The diagram shows an athletics track with six lanes.
The distance around the inside of the inner lane is 400 metres.
The radius of each semicircular section of the inside of the inner lane is 35 metres.

**(a)** Calculate the total length of the two straight sections at the inside of the inner lane.

*Answer(a)* ..... m [3]

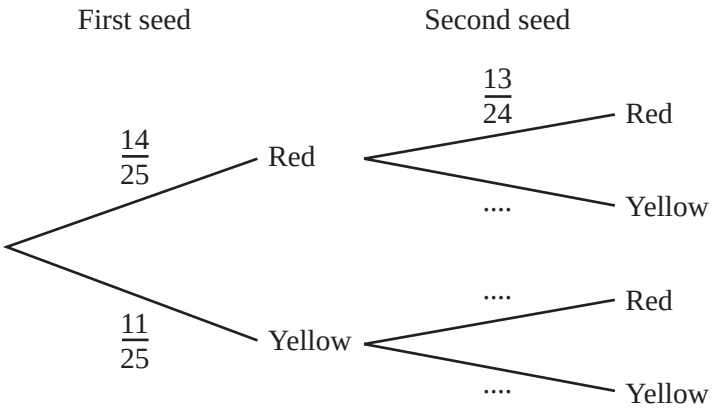
**(b)** Each lane is one metre wide.
Calculate the difference in the distances around the outside of the outer lane and the inside of the inner lane.

*Answer(b)* ..... m [2]

*For Examiner's Use*

**20** A gardener plants seeds from a packet of 25 seeds.
14 of the seeds will give red flowers and 11 will give yellow flowers.
The gardener chooses two seeds at random.

**(a)** Write the missing probabilities on the tree diagram below.




[2]

**(b)** What is the probability that the gardener chooses two seeds which will give

**(i)** two red flowers,

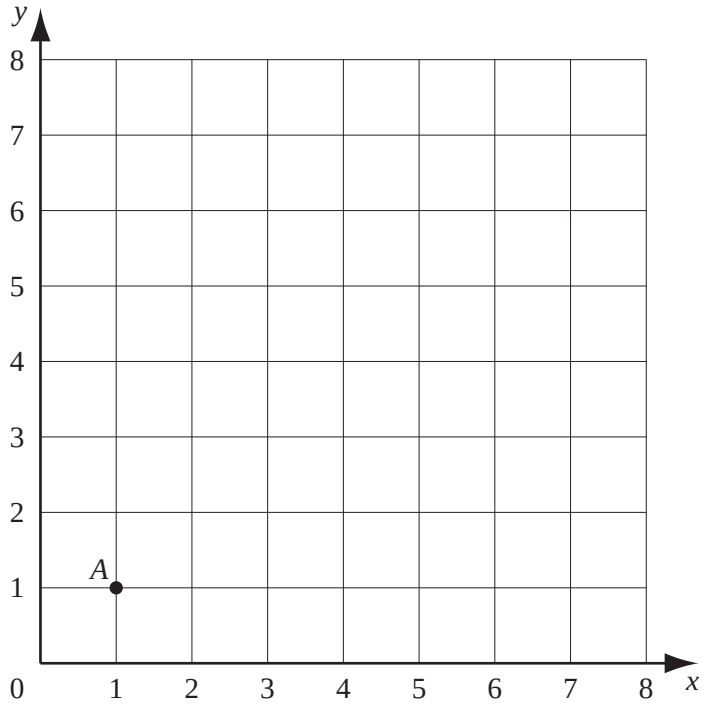
*Answer(b)*(i) ..... [2]

**(ii)** two flowers of a different colour?

*Answer(b)*(ii) ..... [2]

**21**

*For Examiner's Use*




**(a)** Using a scale of 1cm to represent 1 unit, draw the vectors

$\overrightarrow{AB} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$ and $\overrightarrow{BC} = \begin{pmatrix} 4 \\ 0 \end{pmatrix}$ on the grid above. [2]

**(b)** *ABCD* is a parallelogram.
Write down the coordinates of *D*.

*Answer(b)* (.....,.....) [2]

**(c)** Calculate $|\overrightarrow{AB}|$.

*Answer(c)* ..... [2]

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