**EXAMINATIONS COUNCIL OF SWAZILAND**
**JUNIOR CERTIFICATE EXAMINATION**

**Additional Mathematics**                                                          **519**
**Oct /Nov 2014**
**2 hours 30 minutes**

**Additional materials:**          Answer Booklet/paper
                                   Geometrical instruments
                                   Mathematical tables (optional)
                                   Electronic calculators
                                   Graph paper (1 sheet)

**READ THESE INSTRUCTIONS FIRST**

Write your centre number, candidates number and name on all the work you hand in.

Follow the instructions on the cover of the Answer Booklet.

Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do **not** use 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 may 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.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is 100.

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[Turn over]

**1** **(a)** You are given the expression

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

Find the value of the expression when $a = -1$ and $b = 5$. [2]

**(b)** Find **three** consecutive integers that add to 84. [3]

**(c)** You are given the formula $S = \dfrac{n}{2}(a + L)$.

    **(i)** Make $n$ the subject of the formula. [3]

    **(ii)** Find the value of $n$ when $S = 1292$, $a = 7$ and $L = 69$. [2]

**[10]**

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**2** **(a)** $A = \begin{pmatrix} 1 & -1 & 3 \\ 5 & 2 & -2 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$.

    **(i)** Write down the order of matrix $A$. [1]

    **(ii)** What special name is given to matrix $B$? [1]

**(b)** Work out the following.

    **(i)** $\begin{pmatrix} -1 & 3 \\ 2 & -2 \end{pmatrix} - \begin{pmatrix} -8 & 9 \\ 7 & -5 \end{pmatrix}$ [2]

    **(ii)** $-\dfrac{1}{4}\begin{pmatrix} -1 & -4 \\ 2 & -2 \end{pmatrix}\begin{pmatrix} 4 \\ 2 \end{pmatrix}$ [2]

**(c)** You are given that $C = \begin{pmatrix} x & 1 & 3 \end{pmatrix}$, $D = \begin{pmatrix} 3 & y \\ 2 & -1 \\ 1 & 4 \end{pmatrix}$ and

$CD = \begin{pmatrix} 11 & 21 \end{pmatrix}$.

Find the values of $x$ and $y$. [3]

**[9]**

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**3** **(a)** You are given that $g(x) = 5 - x$ and $h(x) = 9 - 3x$.

    **(i)** Find g(2). [1]

    **(ii)** Find the value of $x$ when $h(x) = -3$. [3]

**(b)** The diagram shows two parallel lines and a straight line cutting across the two lines.



NOT TO SCALE

$(3x - y)°$

$(2x + y)°$

$50°$
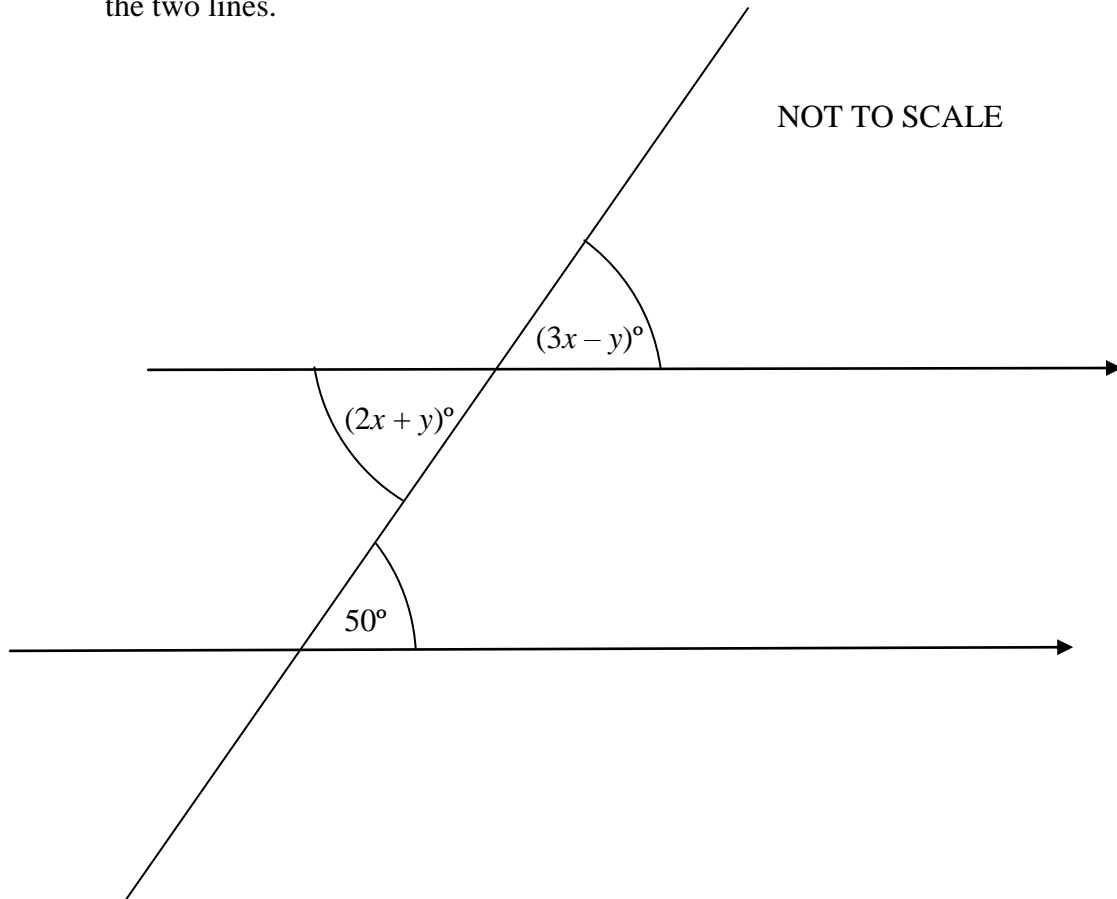
    **(i)** Using the diagram, write down two equations in $x$ and $y$. [2]

    **(ii)** Solve the equations to find the values of $x$ and $y$. [3]

    **[9]**

**4**    A box contains 2 red pens and 2 blue pens.
Another box contains 3 red pens and 1 green pen.
A pen is chosen at random from each box.

**(a)**    Draw a possibility space diagram to show all the possible outcomes.    [3]

**(b)**    Find the probability of getting

**(i)**    a blue pen and a green pen,    [1]

**(ii)**    two pens of the same colour,    [2]

**(iii)**    at least one red pen.    [2]

**[8]**

**5**    **(a)**    Factorise the following.

**(i)**    $p^2 + 14p + 49$    [2]

**(ii)**    $x^2 - 144$    [2]

**(b)**    Simplify    $(y - 5)^2 + 4(y + 2)$.    [3]

**(c)**    Express as a single fraction    $\dfrac{2}{d + 2} - \dfrac{3}{d - 5}$ .    [3]

**(d)**    Solve the equation the following equation.

$$\frac{2 + 3h}{2} + \frac{h - 3}{4} = 2$$    [3]

**(e)**    Solve the following inequality.

$$\frac{3(2a - 5)}{5} > \frac{a + 1}{2}$$    [3]

**[16]**

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

**6** The variables $x$ and $y$ are connected by the equation $y = 2x^2 + 2x + 5$.

| $x$ | $-4$ | $-3$ | $-2$ | $-1$ | $0$ | $1$ | $2$ | $3$ |
|---|---|---|---|---|---|---|---|---|
| $y = 2x^2 + 2x + 5$ | 29 | 17 | 9 | 5 | $p$ | 9 | $q$ | 29 |

**(a)** Find the values of $p$ and $q$. [2]

**(b)** Using a scale of 1cm to represent 1 unit on the $x$-axis and 2cm to represent 5 units on the $y$-axis, plot the points and draw the graph of $y = 2x^2 + 2x + 5$ for values of $x$ from $-4$ to 3. [4]

**(c)** What is the special name given to a quadratic curve? [1]

**(d)** Write down the equation of the line of symmetry of the graph. [2]

**(e)** **(i)** On the same axes, draw the graph of the line y = 11 − 2$x$ for values of $x$ from $-4$ to 3. [2]

  **(ii)** Hence solve the equation $2x^2 + 2x + 5 = 11 - 2x$. [2]

**[13]**

**7** The cumulative frequency curve shows the time, in minutes, it took a number of people to walk a distance of 7 km.
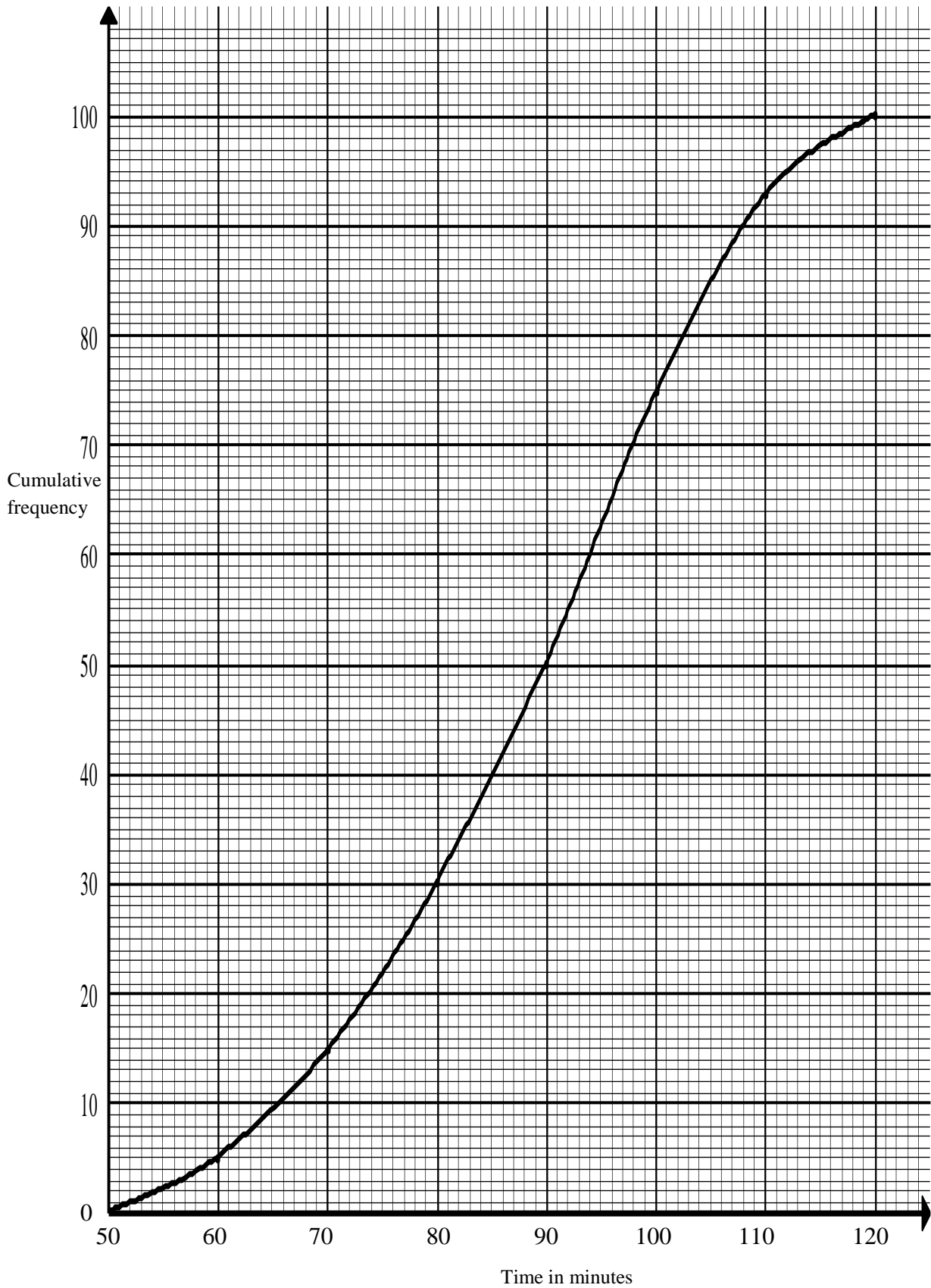
**(a)** Use the graph to

  **(i)**  find the total number of people that were in the survey,  [1]

  **(ii)**  estimate the median time,  [2]

  **(iii)**  find the number of people who took 75 minutes or more.  [2]

**(b)** Copy and complete the cumulative frequency table.

| Time up to (minutes) | Number of people (cumulative frequency) |
|---|---|
| 50 | 0 |
| 60 | 5 |
| 70 | 15 |
| 80 | 30 |
| 90 | |
| 100 | |
| 110 | |
| 120 | |

  [2]

**[7]**

**8** **Diagram I** shows a park *ABCD*.
*AC* is a path in the park.
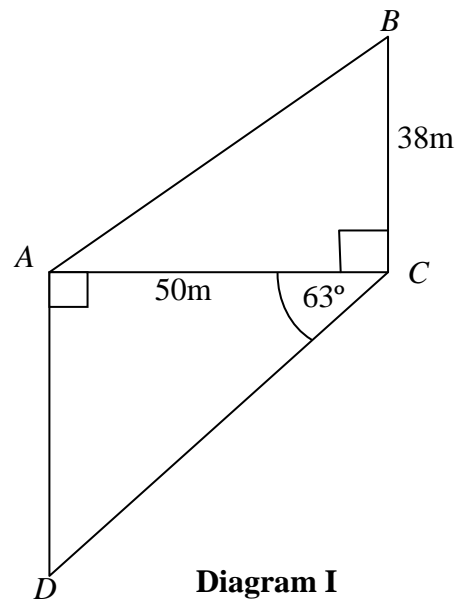
NOT TO SCALE

**Diagram I**

**(a)** You are given that *AC* = 50m, *BC* = 38m and angle *ACB* = 90º.
Calculate angle *ABC*, correct to 1 decimal place. [3]

**(b)** Given also that angle *ACD* = 63º and angle *CAD* = 90º,
calculate the length of *CD*. [3]

**(c)** **Diagram II** shows two other paths AE and *CE* in the park *ABCD*.
Angle *CAE* = 22º and angle *AEC* = 90º.
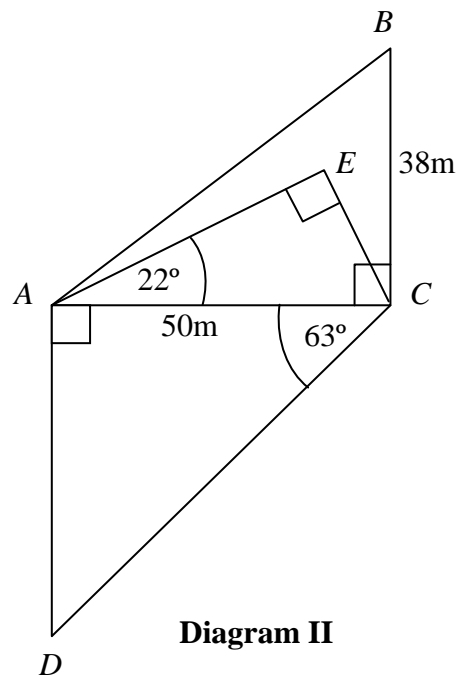
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**Diagram II**

Calculate the length of *CE*. [3]

**(d)** A vertical electricity pole, *BT*, is fixed at a point *B*.
The angle of elevation of the top of the electricity pole when
viewed from *C* is 14º.

  **(i)** Draw a sketch of the diagram. [2]

  **(ii)** Calculate the height of the electricity pole. [3]

  **[14]**

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**9** Given $p=\begin{pmatrix} -1 \\ -3 \end{pmatrix}$ and $q=\begin{pmatrix} 1 \\ -2 \end{pmatrix}$, calculate

  **(a)** $q - 2p$, [3]
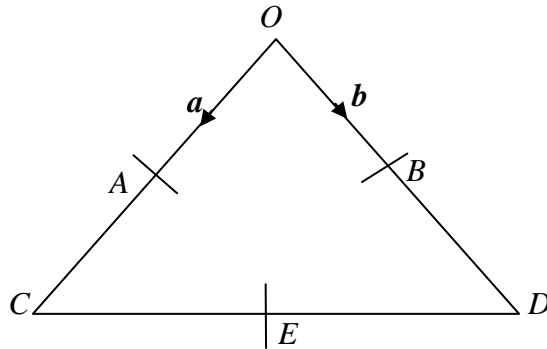
  **(b)** magnitude of $p$. [2]

  **[5]**

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**10** The diagram shows triangle *OCD*.
*A* is the midpoint of *OC*.
*B* is the midpoint of *OD*.
*E* is the midpoint of *CD*.
$\overrightarrow{OA}=a$ and $\overrightarrow{OB}=b$



  **(a)** Express the each of the following vectors in terms of *a* and *b*.

  **(i)** $\overrightarrow{AB}$ [2]

  **(ii)** $\overrightarrow{CD}$ [2]

  **(iii)** $\overrightarrow{OE}$ [2]

  **(b)** Show that $\overrightarrow{AB}$ is parallel to $\overrightarrow{CD}$. [3]

  **[9]**

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