**MATHEMATICS**                                                        **309/02**

Paper 2                                                        **NOVEMBER 2013**
                                                              **2 hours 30 minutes**

Additional materials:  Answer booklet
                        Graph paper (1 sheet)
                        Plain paper (1 sheet)
                        Geometrical instruments
                        3 figures tables (Optional)

## READ THESE INSTRUCTIONS FIRST

1.      Write your name and examination number on each answer sheet used.

2.      Write in dark blue or black pen.

3.      Answer **all** questions

4.      You may use soft pencil for diagrams or graphs.

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

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

7.      Number each question and parts of a question clearly.

8.      All necessary working must be shown beside the question being answered.
        **SCRAP PAPER IS NOT ALLOWED. FAILURE TO SHOW NECESSARY WORKING WILL RESULT IN LOSS OF MARKS.**

9.      If graph paper, plain paper or tracing paper is used, it must be handed in with your answer booklet.

10.     3-figure tables may be used in any question where necessary. Calculators are NOT allowed in this paper.

11.     Use 3.14 for $\pi$.

12.     **FAILURE TO FOLLOW THE ABOVE INSTRUCTIONS WILL RESULT IN THE LOSS OF MARKS.**

13.     The total of the marks for this paper is 100.

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

**1** In a shop a loaf of bread costs E7 and a packet of soap costs E15.

    **(a)** Calculate the total cost of 5 loaves of bread and 10 packets of soap.    (2)

    **(b)** On a particular day, 50 loaves of bread and $n$ packets of soap were sold.
        The total amount collected was E 665.

        Calculate the value of $n$.    (2)

    **(c)** On another day, the cost of a packet of soap was reduced by 20%.

        Calculate the price of a packet of soap on this day.    (2)

    **(d)** A loaf of bread costs 30% less than the previous year.

        Find the cost of a loaf of bread the previous year.    (3)
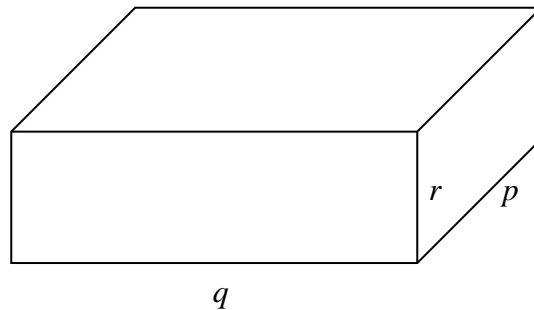
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**2**   **(a)** Solve the following equations.

        **(i)**    $3x - 5 = 7$    (2)

        **(ii)**    $4y - 6 = 8 - 3y$    (2)

        **(iii)**    $\dfrac{9a - 1}{2} = \dfrac{2a + 3}{5}$    (3)

    **(b)** Express as a single fraction

        **(i)**    $\dfrac{b}{3} + \dfrac{b}{4},$    (2)

        **(ii)**    $\dfrac{w - 4}{5} + \dfrac{2w + 5}{7}.$    (3)

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**3** **(a)** The diagram shows the net of a prism.

NOT TO SCALE

4 cm

3 cm        5 cm
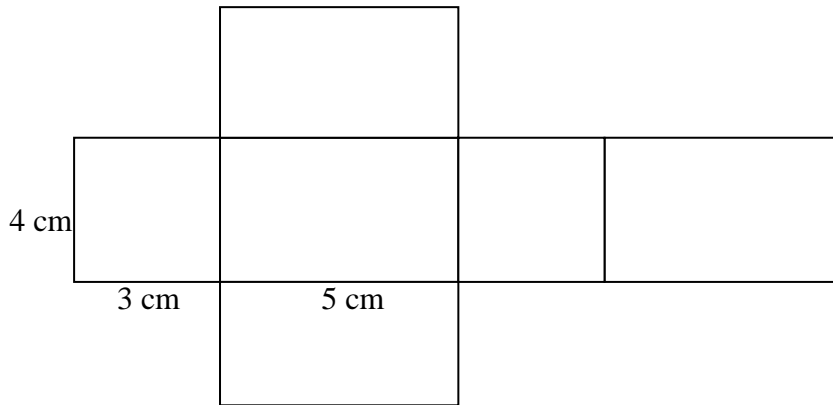
**(i)** Write down the name of the prism. (1)

**(ii)** Work out the total surface area of the prism. (3)

**(iii)** Calculate the volume of the prism. (2)

**(b)** Another prism has edges of lengths *p*, *q* and *r*.
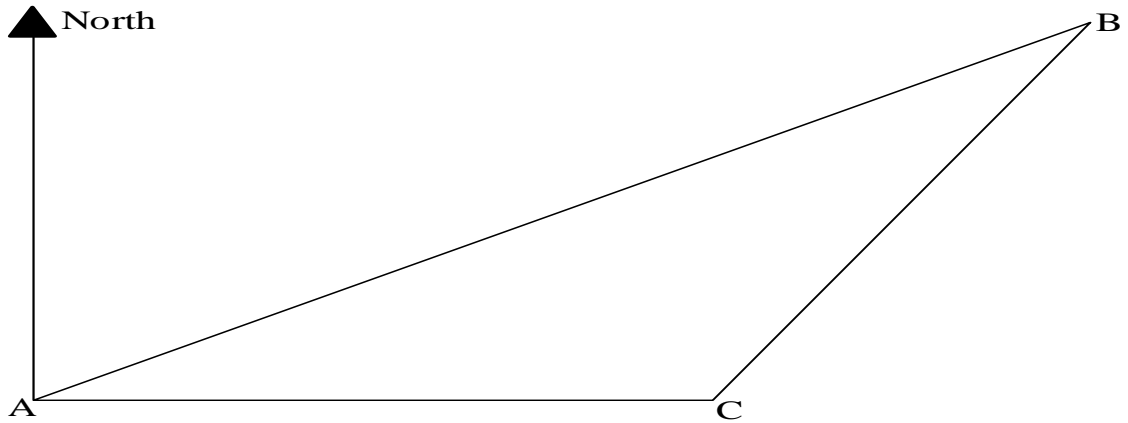
*r*    *p*

*q*

Find an expression for

**(i)** the total surface area of the prism. (2)

**(ii)** the volume of the prism. (2)

**4**     The diagram below shows the positions of points A, B and C.

The diagram is drawn to scale.



**(a)**     The actual distance from B to C is 140 km.
On the diagram BC = 7 cm.

   **(i)**     How many kilometres are represented by 1 cm on the diagram?     (1)

   **(ii)**     The scale of the diagram is 1 : *n*.
   Find the value of *n*.     (2)

**(b)**     Use the diagram to find:

   **(i)**     the actual distance from A to C,     (2)

   **(ii)**     the bearing of C from A,     (1)

   **(iii)**     the bearing of A from B.     (2)

**5**     The table shows marks scored by a class of 30 students in a quiz.
        The quiz was marked out of 10.

| Mark | Number of students |
|------|--------------------|
| 2 | 2 |
| 3 | 5 |
| 4 | 11 |
| 5 | 6 |
| 6 | 3 |
| 7 | 2 |
| 8 | 1 |

**(a)**     What was the highest mark in the class?                                              (1)

**(b)**     Students who scored 5 marks or more passed the quiz.

        How many students passed the quiz?                                               (1)

**(c)**      Find the median mark.                                                             (2)

**(d)**     What percentage of the class scored 6 marks?                                    (2)

**(e)**     A pie chart is to be drawn showing the information in the table.

        Calculate the size of the angle representing students who scored 5 marks.   (2)

**(f)**     A student is chosen at random from the class.

        Find the probability that the student scored

        **(i)**     exactly 2 marks,                                                         (1)
        **(ii)**    more than 8 marks.                                                       (1)

**6** **Answer the whole of this question on a sheet of plain paper.**

ABCD is a quadrilateral. AB = 4 cm, BC = 3 cm, AD = 8 cm, CD = 6 cm and $A\hat{D}C = 60°$.



NOT TO SCALE
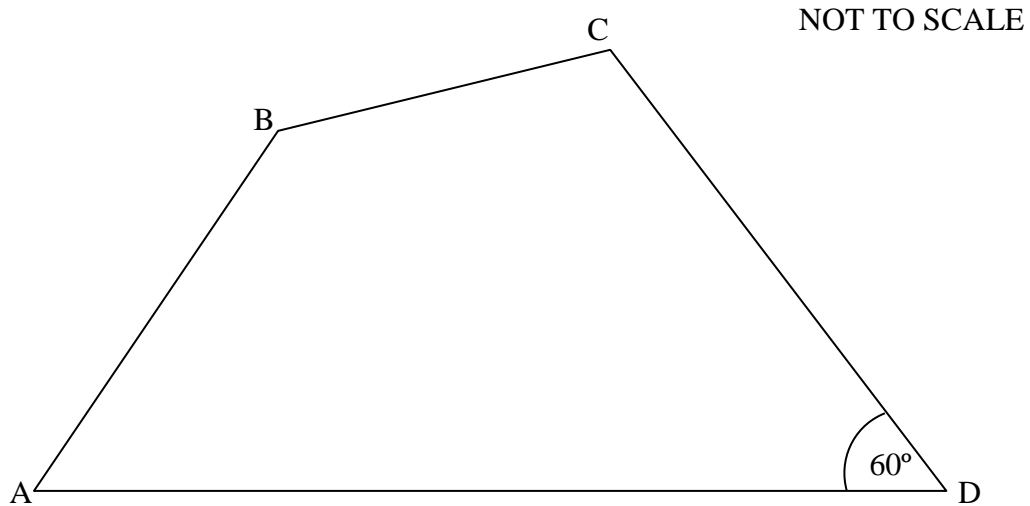
**(a)** Approximately halfway down your page, draw line AD of length 8 cm. (1)

**(b)** Measure a 60° angle at D. (1)

**(c)** Complete an accurate drawing of the quadrilateral ABCD. (2)

**(d)** On your diagram, draw the locus of points

  **(i)** equidistant from B and C, (2)

  **(ii)** equidistant from AB and AD, (2)

  **(iii)** 3 cm from BC and inside the quadrilateral. (2)

**(e)** E is a point inside the quadrilateral such that it is 3cm from BC and equidistant from AB and AD.
Mark and label point E. (1)

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

    **(a)** Draw *x*-axis and *y*-axis. Number both axes from –6 to 6.
        Use the scale 1 cm represents 1 unit for both axes.     (1)

    **(b)** Triangle ABC has coordinates A(2, 0); B(2, 4) and C(5, 2).
        Draw and label triangle ABC.     (2)

    **(c)** Triangle ABC is mapped onto triangle DEF by a reflection in the *y* – axis.
        Draw and label triangle DEF.     (2)

    **(d)** Triangle ABC is mapped onto LMN by a translation, vector $\begin{pmatrix} -6 \\ -4 \end{pmatrix}$.

        Draw and label triangle LMN.     (2)

    **(e)** The coordinates of triangle PQR are P(0, –2); Q(4, –2) and R(5, –2).

       **(i)** Draw and label triangle PQR.     (1)

       **(ii)** Describe completely a transformation which maps triangle
            ABC onto triangle PQR.     (3)

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**8** The diagram below shows two identical rectangles.

NOT TO SCALE

$5y + 4$

$x + 8$                                            $3x + 4$

$10y – 1$
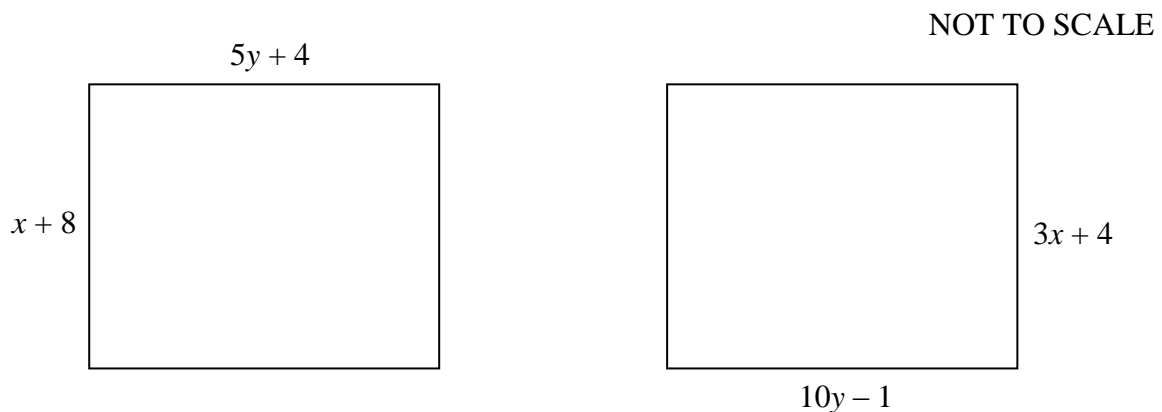
    **(a)** **(i)** Form an equation in *x*.     (1)

       **(ii)** Solve the equation to find the value of *x*.     (2)

    **(b)** **(i)** Form an equation in *y*.     (1)

       **(ii)** Solve the equation to find the value of *y*.     (2)

    **(c)** Hence find the dimensions of the rectangle.     (2)
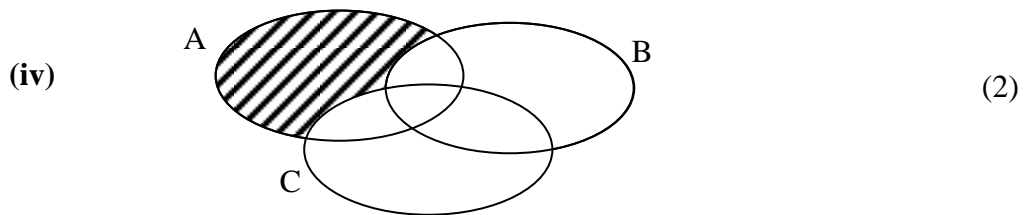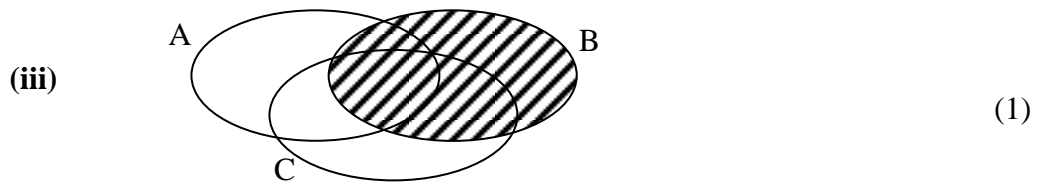
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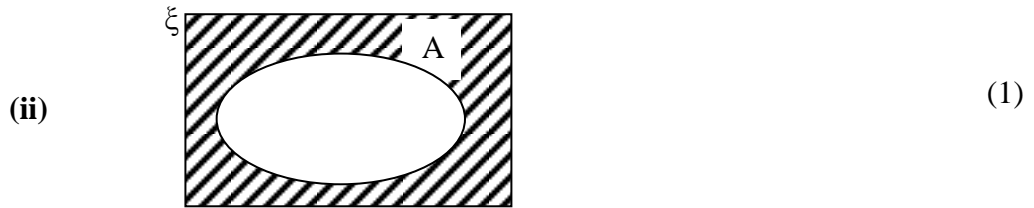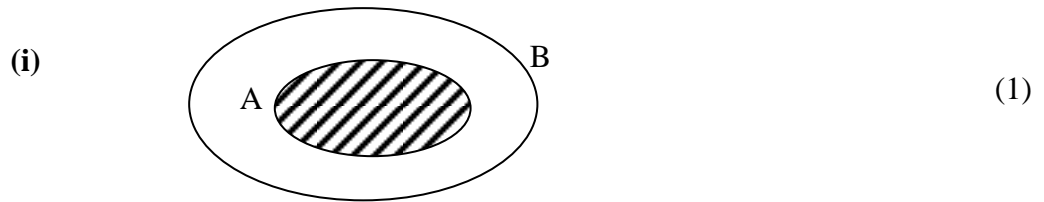**9**    The graph below shows three straight lines.
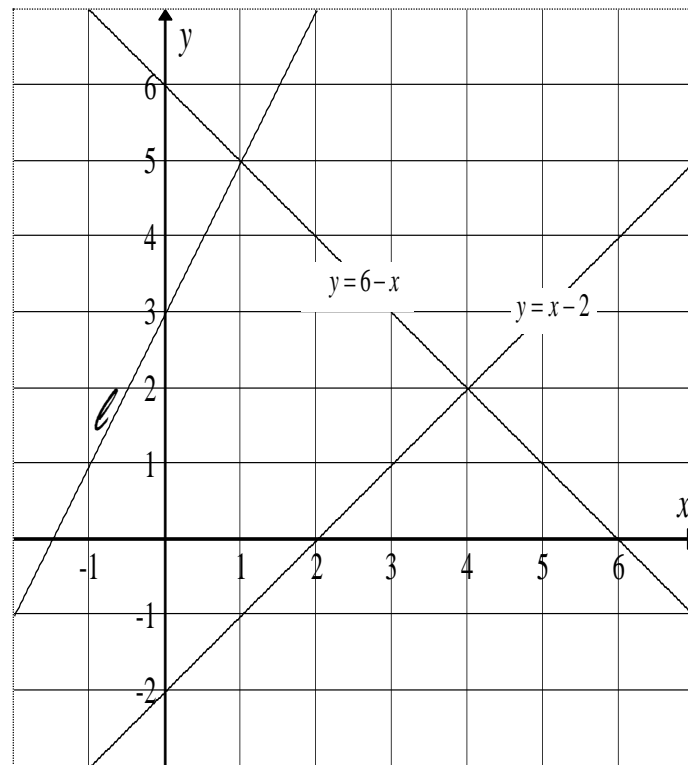


The equations of two of the lines are $y = 6 - x$ and $y = x - 2$.

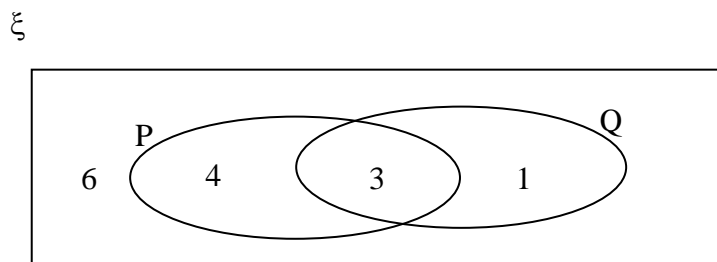**(a)**    Find the equation of the third line, $\ell$.    (3)

**(b)**    Use the graph to solve the simultaneous equations

$$y = 6 - x$$
$$y = x - 2$$    (2)

**(c)**    The point $(-7, w)$ lies on the line $y = 6 - x$.

Find the value of $w$.    (1)

**10** **(a)** Use set notation to describe the shaded regions below.

**(i)** (1)

**(ii)** (1)

**(iii)** (1)

**(iv)** (2)

**(b)** The Venn diagram below shows the number of elements in each region.

Find

**(i)** $n(P)$ (1)

**(ii)** $n(P \cap Q)$ (1)

**(iii)** $n(P \cup Q)$ (1)

**(iv)** $n(P \cup Q)'$ (1)

**11** Students in a class were asked to name their favourite colours.

The results are shown in the table below.

|  |  | COLOURS | | | |
|---|---|---|---|---|---|
|  |  | Red | Yellow | Green | Black |
| STUDENTS | Male | 2 | 4 | 3 | 7 |
|  | Female | 5 | 8 | 3 | 2 |

**(a)** How many female students liked yellow? (1)

**(b)** How many male students did not like green? (1)

**(c)** What was the total number of students who liked black? (1)

**(d)** What was the total number of students in the class? (1)

**(e)** A student is chosen from the whole class.
Find the probability that the student likes yellow.
Give your answer in its simplest form. (2)