MATHEMATICS

309/02

November 2011

2 hours 30 minutes

Additional materials: Answer booklet

Geometrical instruments

2 sheets of graph paper

READ THESE INSTRUCTIONS FIRST

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

2.   Answer **all** questions.

3.   Write in dark blue or black pen.

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 π.

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.

2

Answer all questions

1   Sibusiso sells oranges and apples at a market.

  (a)   The number of oranges and the number of apples Sibusiso sells is in the ratio 4 : 3 respectively. He sells 84 apples.

How many oranges does he sell?   (2)

  (b)   The amount of money Sibusiso receives from selling oranges and apples is in the ratio, oranges : apples = 5 : 7.

Sibusiso receives a **total** of E420 from selling oranges and apples.

Calculate how much Sibusiso receives from selling oranges.   (2)

  (c)   **(i)**   Sibusiso sells one orange for E1.60.

He reduces this price by 30%.

Calculate the new price of one orange.   (2)

   (ii)   The new price of E1.60 for one orange shows an increase of 25% on the previous week's price.

Calculate the previous week's price.   (3)

[9]

2   **(a)**   Solve

   (i) $\dfrac{4}{x} = 5$ (2)

   (ii) $3x - 4 = 2(x-1) + 3$ (3)

   (iii) $\dfrac{4x}{3} - \dfrac{2x+1}{2} = \dfrac{3}{5}$ (4)

   (iv) $2 - 5x < -3$ (2)

  (b)   Factorise completely

   (i) $4x + 12$ (2)

   (ii) $10a^2 y - 15ax^2$ (2)

[15]

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3 (a) $A = \begin{pmatrix} -1 & 0 & 6 \\ 4 & 9 & -7 \\ -3 & 2 & 8 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & -2 \end{pmatrix}$

    (i) Write down the element in the 2nd row, 3rd column in A. (1)

    (ii) Write down the order of B. (1)

    (iii) Find $-3B$. (1)

(b) A normal die is thrown.

What is the probability of getting a

    (i) 2, (1)

    (ii) 5 or 6, (2)

    (iii) 7, (1)

    (iv) number less than 7. (1)

[8]

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

(a) Copy and complete the tables for the mappings shown.

x	$2 + x$
−2	
0	
2	

x	$3x + 1$
−1	
0	
1	

(4)

(b) Draw the x-axis and y-axis using a scale of 2 cm to 1 unit for each axis.

Number the x − axis from −2 to 4 and the y − axis from −1 to 7.

On the same axes, draw the graphs of $y = 2 + x$ and $y = 3x + 1$. (3)

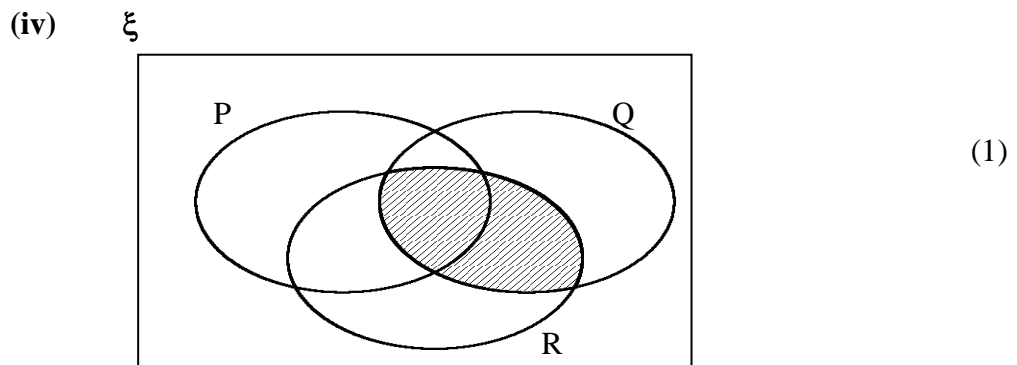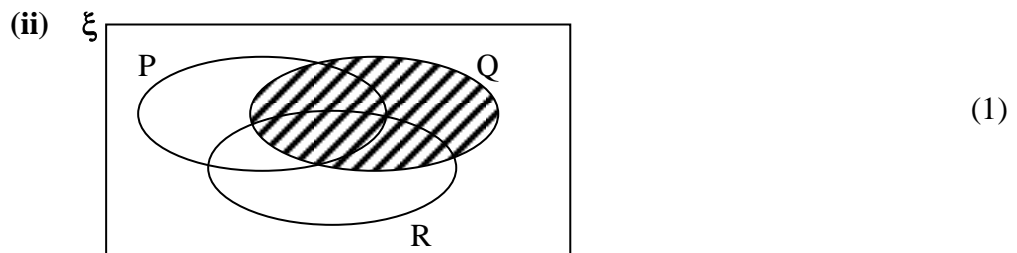(c) Write down the coordinates of the point of intersection of the two graphs in part **(b)**. (2)

[9]

5   **(a)**   The following Venn diagram shows elements in each region.

ξ
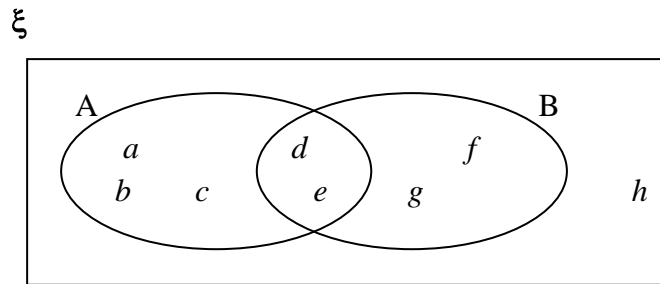
List all elements of the following sets.

(i)   A (2)

(ii)   A ∪ B (2)

(iii)   A' ∩ B (2)

(b)   Use set notation to describe the following shaded regions.

(i)   ξ

(1)

(ii)   ξ

(1)

(iv)   ξ

(1)

(c)   A and B are sets such that A ∩ B = A.
How are the two sets related? (2)

[11]

6   PQR is a triangle such that PQ = 6 cm, QR = 9 cm and PR = 12 cm.

    (a)   Using a ruler and compasses only, draw accurately triangle PQR.   (3)

    (b)   Draw a perpendicular bisector of QR.   (2)

    (c)   Draw the locus of points that are

        (i)   5 cm from Q,   (2)

        (ii)   equidistant from QR and PR.   (2)

    [9]

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

    The figure ABCD has vertices A(1, 2) ; B(3, 5) ; C(5, 2) and D(3, 3).

    (a)   Using a scale of 1 cm represents 1 unit for both axes,

        draw and label figure ABCD.   (3)

    (b)   **(i)**   Draw the line of symmetry of figure ABCD.   (1)

        (ii)   Write down the equation of the line of symmetry.   (1)

    (c)   Figure ABCD is mapped onto figure EFGH by a rotation of 180º

        about (2, 1).

        Draw and label figure EFGH.   (4)

    (d)   Figure ABCD is enlarged by scale factor –2 with centre (0, 2).

        Find the coordinates of the image of point A(1, 2).   (1)

    (e)   Figure ABCD is mapped onto figure PQRS by a translation.

        The coordinates of R, the image of C, are R(4, –3).

        Find the translation vector for this translation.   (2)

    [12]

8 **(a)** The table below shows favourite colours of a class of 40 pupils.

| Colour	Number of pupils
Black	8
Red	14
Yellow	12
White	6

   (i)   Draw a clearly labelled bar chart showing this information.   (3)

   (ii)   A pie chart is to be drawn showing this information.

   Calculate the angle of the sector representing those who liked

   the white colour.   (2)

   (iii)   What percentage of the class liked the red colour?   (2)

(b) The mean of 3 numbers is 44.

Another number is then included.

The fourth number is 68.

Find the mean of the 4 numbers.   (3)

[10]

9   Candle wax is used to form a triangular prism.

The triangular prism has the following properties.

Base	4 m
Length	18 m
Height	h
Area of cross-section	12 m^2
Density	20 kg/m^3
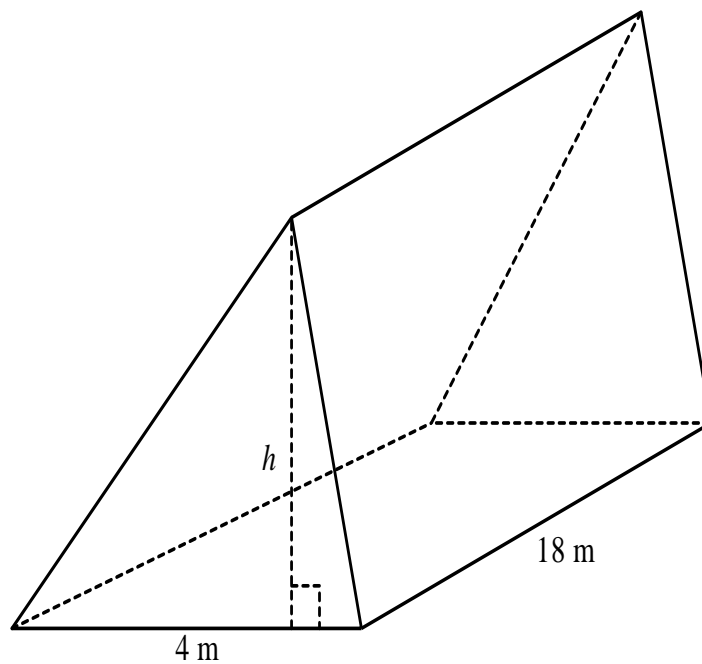
(a)   Calculate its

    (i)   height, h,   (2)

    (ii)   volume,   (2)

    (iii)   mass in tonnes.   (3)

(b)   The triangular prism is melted down and the all wax is remoulded to
    form a cube.

Find the length of an edge of the cube.   (2)

                                                                       [9]

10   A hardware shop sells shovels and spades.

    (a)   A shovel costs E120.

        Write down an expression for the cost, in Emalangeni, for x shovels.   (1)

    (b)   **(i)**   The number of spades sold is twice the number of shovels sold.

                Write down an expression for the number of spades sold when x shovels are sold.   (1)

        (ii)   Each spade costs E80.

                Write down an expression for the total cost, in Emalangeni, of the spades and shovels sold.   (2)

        (iii)   The shop received a total of E2240 from the sale of spades and shovels.

                Form an equation and solve it to find the number of spades that the shop sold.   (4)

                                                      [8]