Exam Number			

Form 3 Mathematics Paper 1

Section C

Page No.	Marks
1	(4)
2	(5)
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6	(6)
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8	(6)
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10	
Section C	
Total	(40)

Question – Answer Book

Instructions

1. Write your examination number in the spaces provided on this cover.

2. The total mark of this section is 40.

3. Attempt ALL questions in this section. Do not write in the margins. Answers written in the margins will not be marked.

4. Supplementary answer sheets will be supplied on request. Write your Examination Number on each sheet and put them INSIDE this book.

5. Unless otherwise specified, all working steps must be clearly shown.

6. Unless otherwise specified, numerical answers should either be exact or correct to 3 significant figures.

7. The diagrams in this paper are not necessarily drawn to scale.

Section C **[40 marks]**

1. There are 3 balls inside box *A* and box *B*. The balls in box *A* are marked with 1, 2, and 2; while the balls in box *B* are marked with 2, 3 and 4.   John randomly draws one ball from box *A* and one ball from box *B*.

    (a)   Draw a tree diagram to show all the possible outcomes.   (2 marks)

    (b)   Find the probability that the two numbers are the same.   (1 mark)

    (c)   Find the probability that the difference of the two numbers is 1.   (1 mark)

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(d) Let x be the difference of the two numbers. Find the expected value of x. (2 marks)

(e) John has to pay \$10 to draw the balls from the boxes. If the numbers of the balls are the same, he will be given a \$$k$ coupon (k is an integer). He will get nothing if the numbers are different. Find the minimum value of k if the game is favourable to John. (3 marks)

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2. In the figure, L_1 is a straight line passing through $A(-3, 2)$ and $B(2, 6)$. L_2 is another straight line perpendicular to L_1 and passes through B and C. L_3 is a horizontal line which intersects L_1 and L_2 at A and C respectively.
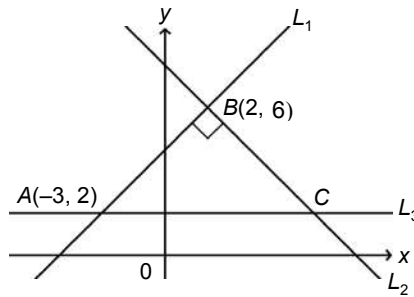
(a) Find the equation of L_2 in the form $y = mx + c$. (3 marks)

(b) Find the coordinates of C. (2 marks)

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(c)   Given that line L_2 intersects the y-axis at point D, find the ratio $DB:BC$.

(2 marks)

(d)   Find the coordinates of the orthocentre of ΔDAC.   (2 marks)

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3. (a) In **Fig. (a)**, a piece of wood in the form of an inverted right circular cone is cut into two portions by a plane parallel to its base. The upper portion is a frustum with height 12cm, the radii of the two parallel faces are 9 cm and 3 cm respectively.

(i) Find the volume of frustum in terms of π.

(ii) Find the exact value of the curved surface area of the frustum in terms of π.
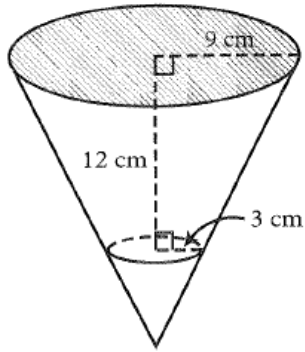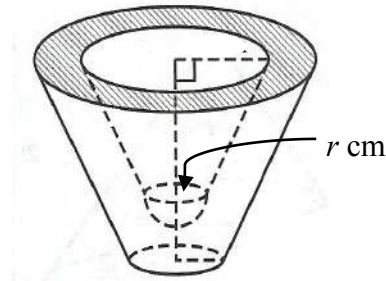
(6 marks)

Fig. (a)

r cm

Fig. (b)

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(b) The wooden paper clip dispenser shown in **Fig. (b)** is made from the frustum in Fig. (a) by drilling a hole in the middle. The upper part of the hole is a frustum similar to the outer frustum. The lower part of the hole is a hemisphere of the same radius as the smaller base of the frustum hole.   Given that the capacity of the hole is equal to the volume of wood of the paper clip dispenser.   The hole is covered with magnetic material. Let r cm be the radius of hemispherical base.

(i)   Find the value of r.

(ii) Find the area of the magnetic surface.

(6 marks)

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4.
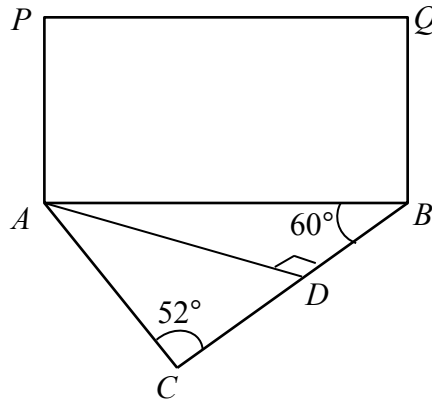
In the figure, the rectangle *PABQ* represents a vertical wall of height 56m and ΔABC represents part of a horizontal plane. The horizontal plane meets the vertical wall along the horizontal line *AB*.   *D* is a point on *BC* such that *AD* is perpendicular to *BC*.

Given that *B* is due east of *A*, *AC* = 100m, $\angle ABC = 60°$, and $\angle ACB = 52°$.

(a) Find the compass bearing of *C* from *A*. (1 mark)

(b) Find the distance of *B* from *A*. (3 mark)

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(c) Given that M is the incentre of ΔABC.   Mary claims that M lies on AD.   Do you agree?
Explain your answer briefly.

(2 marks)

(d) A man walks along the top of the wall from P to Q.   Find the largest possible value of
the angle of elevation from M during his walk.   (4 marks)

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Supplementary Answer Sheet

- End of Section C -

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