

NAME.....ADM NO.....CLASS .....

SCHOOL ..... INDEX NO.....

Candidate's Signature.....

DATE:.....

**HEPTAGON JOINT EXAMINATION  
MARCH 2016  
121/1  
MATHEMATICS  
PAPER 1  
TIME: 2 ½ HOURS**

**Instructions to Candidates**

- a) Write your name and index number in the spaces provided above.
- b) Sign and write the date of examination in the spaces provided above.
- c) This paper consists of **TWO** sections: **Section I** and **Section II**.
- d) Answer **ALL** the questions in **Section I** and only **five** questions from **Section II**.
- e) All answers and working must be written on the question paper in the spaces provided below each question.
- f) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- g) Marks may be given for correct working even if the answer is wrong.
- h) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.
- i) Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.

**For Examiner's use only**

**Section I**

<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>Total</b>

**Section II**

<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>	<b>23</b>	<b>24</b>	<b>Total</b>

<b>GRAND TOTAL</b>	
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**SECTION I: (50 Marks)** *Answer all questions in this section*

1. Use factor method to evaluate  $\sqrt[3]{\frac{0.064}{0.216}}$  leaving your answer in fraction form. (3mks)

2. Express  $0.\dot{0}10\dot{5}$  in the form of  $\frac{P}{Q}$  (3mks)

3. Find the reciprocal of 2.754 and 32.84 hence evaluate  $\frac{2}{2.754} + \frac{1}{32.84}$  (3mks)

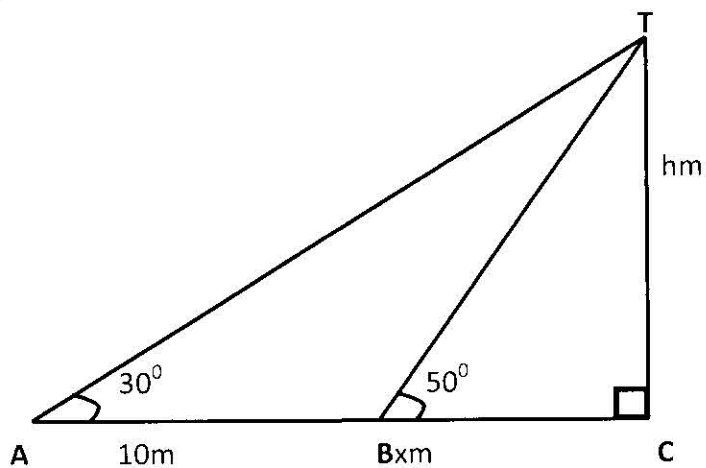
4. A two digit number is such that when the digits are reversed, the value of the number increases by 36. If the sum of the unit digit and twice the tens digit is 16, find the number. (3mks)

5. Use substitution method to solve the simultaneous equations. (3mks)

$$3a - 5b = 11$$

$$6a + 2b = 10$$

6. In the figure below  $AB=10\text{m}$ ,  $BC=x\text{m}$  and  $CT=h\text{m}$ .  $BCT$  is a right angle. Write down two expressions for  $h$  in terms of  $x$  and hence calculate the value of  $h$ . (4mks)



7. The perimeter of a triangle is 32cm. The lengths of two sides of the triangle are 11cm and 8cm respectively. Calculate the area of the triangle correct to 2 decimal places.

(3mks)

8. Solve for  $y$  in the equation  $36^{(y-1)} \times 6^{(2y-2)} = 1$

(3mks)

9. ABCD is a parallelogram with vertices A (0, 3), B (5, 5), C (3, 1) and D (X, Y). Given that M is the mid-point of AD, use vector method to find the coordinates of M

(4mks)

10. Two similar containers are such that the larger container has a base area of  $630\text{cm}^2$  while that of the smaller container is  $280\text{cm}^2$ . Given that the height of the smaller container is 20cm, find the height of the larger container.

(3mks)

11. Factorize the expression  $a^2 - b^2$  and hence find the exact value of  $4675^2 - 4665^2$  (3mks)

12. A straight line has the equation  $3x - 2y = 6$ . By writing its equation in the form  $\frac{x}{a} + \frac{y}{b} = 1$ , state the X- and Y- intercepts. (3mks)

13. Without using mathematical tables or calculators, evaluate: (3mks)

$$\log_3 729 - \log_3 27 + \log_3 9$$

14. Evaluate.

(3mks)

$$\frac{2x}{x-4} + \frac{2}{x+4} = 2$$

15. Solve the following pair of simultaneous inequalities and represent the solution on a single number line.

(3mks)

$$2x - 4 \leq 5x + 11$$

$$3x - 2 \leq 10 - x$$

16. Given  $\tan x^\circ = \frac{5}{12}$ , find without using tables or calculators, the value of ;

(3mks)

$$\cos (90-x^\circ)$$

**SECTION II(50 MARKS) Answer Only five questions from this section.**

17. From a piece of wire 42cm long a length  $10x$ cm is cut off and bent into a rectangle whose length is one and a half times its width. The remainder is bent to form a square. The combined area of the square and rectangle is  $63\text{cm}^2$ .

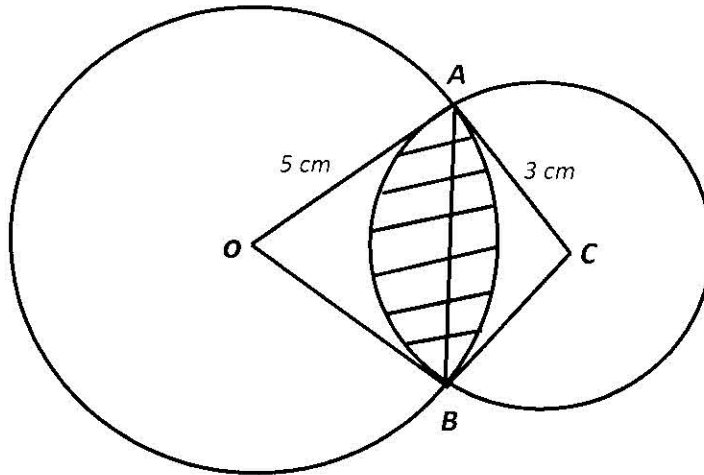
a) Find in terms of  $x$  the dimension of

i) The rectangle (2mks)

ii) The square (1mk)

b) Find the value of  $x$  and hence the dimension of the square and rectangle. (7mks)

18. In the figure  $OA = 5\text{cm}$ ,  $AC = 3\text{cm}$  and  $AB = 4.4\text{cm}$ .  $O$  and  $C$  are the centres of the two circles.



Calculate:

a) i)  $\angle AOB$

ii)  $\angle ACB$

(3mks)

b) The area of; (i) Sector  $OAB$

ii) Sector  $CAB$

c) The area of

i) Triangle  $AOB$

ii) Triangle  $CAB$

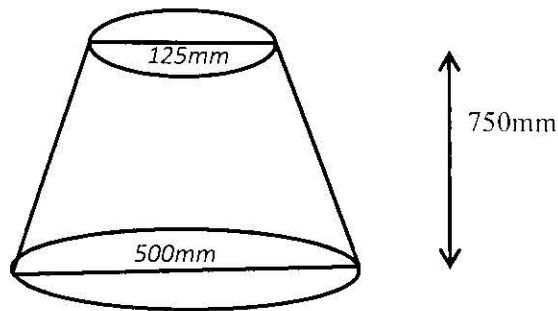
d) The shaded region.

(2mks)



19.a) A container on the road trailer carrying liquefied gas is in the shape of a cylinder 6m long together with 2 hemispherical ends. The total length is 7.8m and the diameter of the hemispherical ends which is equal to the diameter of the cylindrical part is 1.8m. What is its capacity in litres.(3mks)

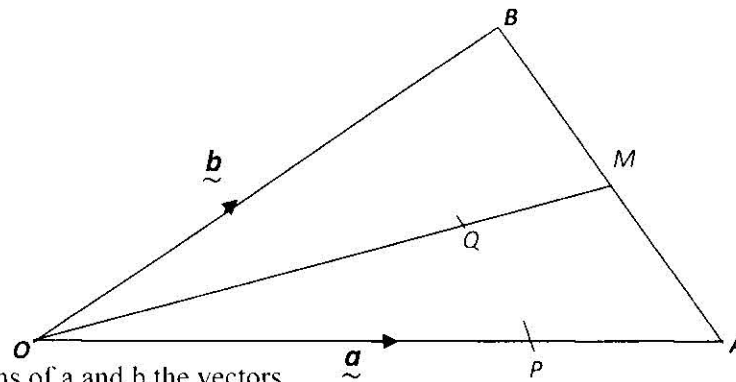
b)A cone of diameter 500mm and height 1000mm has its top chopped off, leaving a frustum. The diameter of the top of the frustum is 125mm and its height is 750mm.



Giving your answers to four significant figures:

- i) What is the volume of the small cone cut off? (2mks)
  
  
  
  
  
  
  
  
  
  
- ii) What is the height of the frustum? (2mks)
  
  
  
  
  
  
  
  
  
  
- iii) What is the volume of the frustum (3mks)

20. In the figure below, the position vectors of A and B relative to an origin O are  $\mathbf{a}$  and  $\mathbf{b}$  respectively. M is the midpoint of AB.  $OP:OA = 3:5$  and  $OQ:QM$  is  $3:1$ .



a) Express in terms of  $\mathbf{a}$  and  $\mathbf{b}$  the vectors (4mks)

i)  $\mathbf{OM}$

ii)  $\mathbf{OQ}$

iii)  $\mathbf{PQ}$

iv)  $\mathbf{PB}$

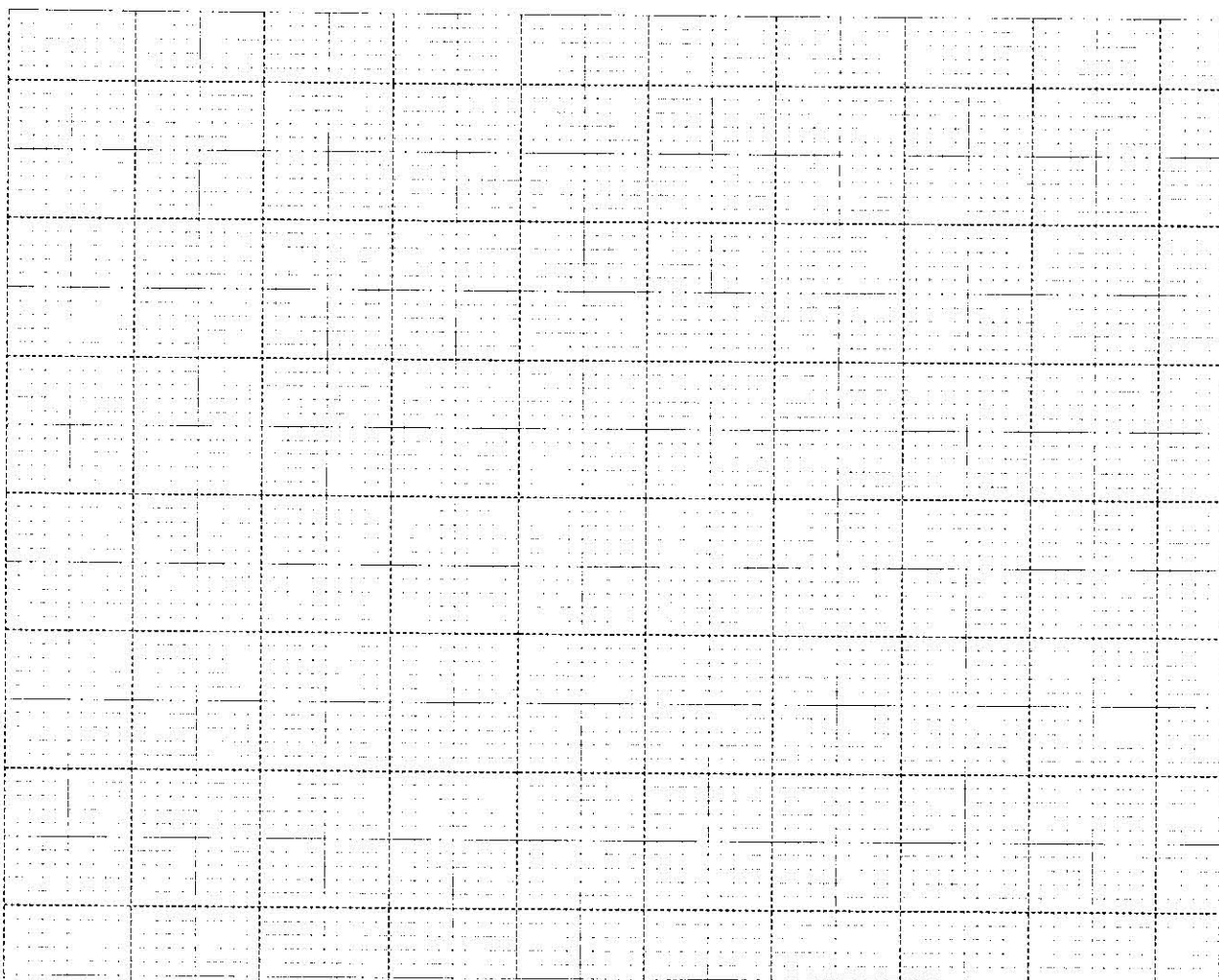
Hence show that P, Q and B are collinear. (3mks)

b) The line joining the points A (3, 6) and B (9, 15) is divided by the point M internally in the ratio 1:2. Find the co-ordinates of M. (3mks)

21. A rectangle ABCD has vertices A(2,0), B(4,0), C(4,3) and D(2,3). The rectangle  $A_1B_1C_1D_1$  is the image of ABCD under a translation given by the vector  $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$ .  $A_2B_2C_2D_2$  is the image of  $A_1B_1C_1D_1$  under negative quarter turn about the origin.

- a) Draw the rectangle ABCD,  $A_1B_1C_1D_1$  and  $A_2B_2C_2D_2$  on the grid provided.
- b) Describe fully the transformation which maps ABCD onto  $A_2B_2C_2D_2$ .

c)  $A_3B_3C_3D_3$  is the image of  $A_2B_2C_2D_2$  under a reflection in the line. Write down the coordinates of  $A_3B_3C_3D_3$ . (4mks)



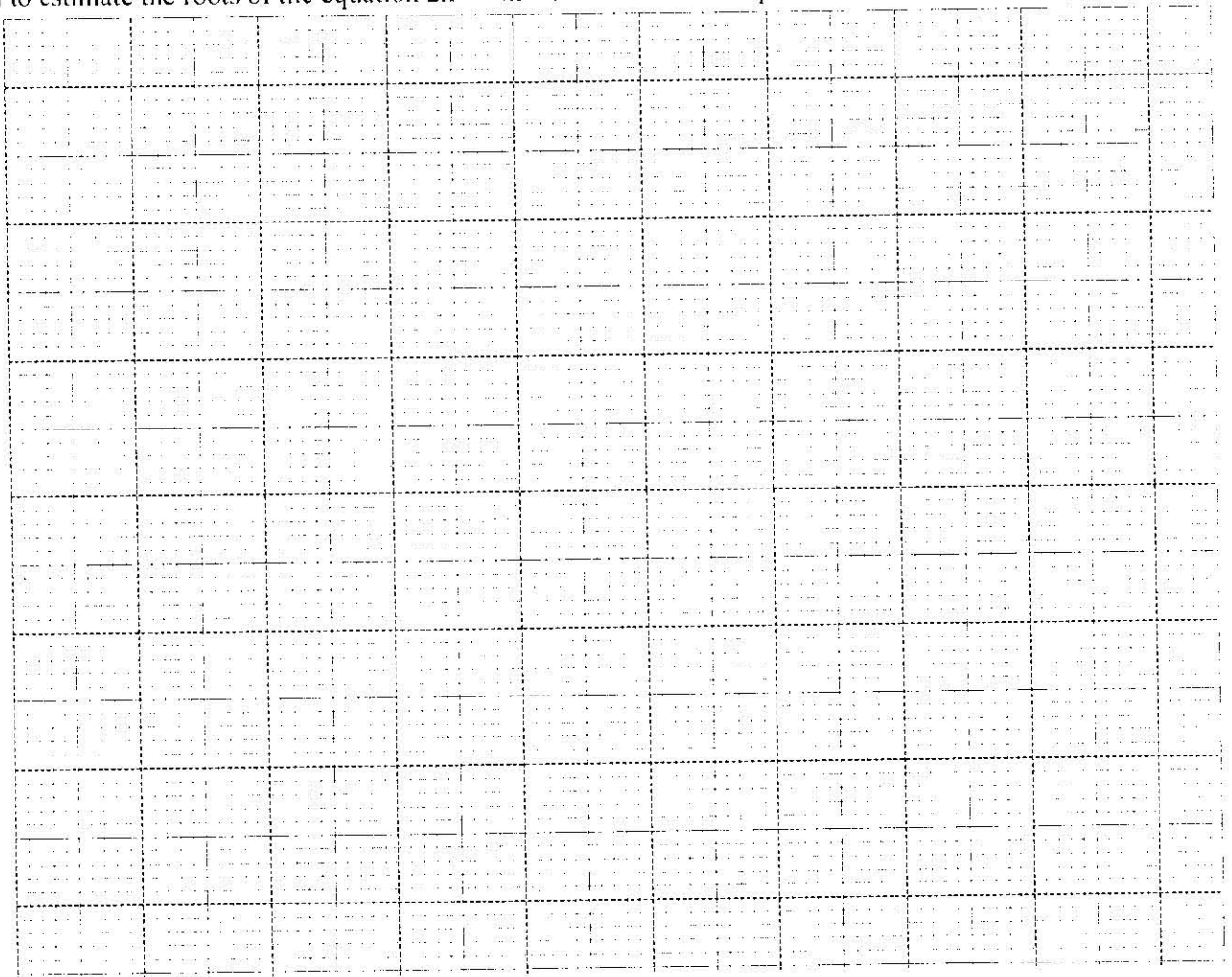
22.

a) Complete the table below for the Function  $y = 2x^2 + 4x - 3$

(2mks)

x	-4	-3	-2	-1	0	1	2
$2x^2$	32		8	2	0	2	
$4x$			-8		0		8
-3	-3	-3	-3	-3	-3	-3	-3
y			-3		-3		

(b) On the grid provided, draw the graph of the function  $y = 2x^2 + 4x - 3$  for  $-4 \leq x \leq 2$  and use the graph to estimate the roots of the equation  $2x^2 + 4x - 3 = 0$  to 1 decimal place. (5mks)



(c) Use the graph to solve the equation  $2x^2 + x - 5 = 0$ .

(3mks)

23. A bus left Kisumu at 9:30 a.m. towards Nairobi at an average speed of 81 km/hr. A matatu left Nairobi at 10.10 a.m. towards Kisumu at an average speed of 72km/hr. The distance between Kisumu and Nairobi is 360km.

(a) Determine

(i) The time taken before the two vehicles met. (3mks)

(ii) The distance between the two vehicles 40 minutes after meeting. (2mks)

(b) A car left Kisumu towards Nairobi at 9:50a.m at an average speed of 90km/hr.

Determine

(i) The time when the car caught up with the bus (3mks)

(ii) The distance of Nairobi from the place where the car caught up with the bus. (2mks)

24. The height of 36 students in a class was recorded to the nearest centimeters as follows.

148	159	163	158	166	155	155	179	158	155	171	172
156	161	160	165	157	165	175	173	172	178	159	168
160	167	147	168	172	157	165	154	170	157	162	173

(a) Make a grouped table with 145 as lower class limit and class width of 5. (4mks)

b) By plotting frequency density against upper class boundary.

(6mks)

(i) Draw a histogram for the above data hence

(ii) Draw a frequency polygon for the data

(Take scale of 2cm to represent 5cm height on x-axis)

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