**Name: …………………….……………………... Index No: ….………………………/.….…**

**121/2 Candidates Signature ……………………**

**MATHEMATICS ALT A Date: ……………………………....……….**

**PAPER 2**

**Time: 2 ½ Hours**

***Kenya Certificate of Secondary Education (K.C.S.E)***

## Instructions to Candidates

1. *Write your* ***name, Index number, Admission Number, Sign and write the date of examination*** *in the spaces provided above.*
2. *The paper consists of two sections:* ***Section A*** *and* ***Section B.***
3. *Answer* ***ALL*** *the questions in* ***Section A*** *and only any* ***FIVE*** *questions in* ***Section B****.*
4. *Show all the* ***STEPS*** *in your working, giving your answer at each stage in the spaces below each question.*
5. *Marks may be given for correct working even if the answer is wrong*
6. ***Non-programmable*** *silent electronic calculators and KNEC Mathematical tables may be used, except stated otherwise.*
7. *This paper* ***consists of 14 printed pages****.*
8. *Candidates should check the question paper to ensure that all pages are printed as indicated and no questions are missing.*

**For Examiners Use Only**

**Section A**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **Total** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**Section B**

**Grand Total**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **Total** |
|  |  |  |  |  |  |  |  |  |

*This paper consists of 15 printed pages. Candidates should check carefully*

*to ascertain that all the pages are printed as indicated and no questions are missing.*

**SECTION A (50 Marks)**

***Answer all the questions from this section in the spaces provided***

1. Make t the subject of the formula **(3marks)**

1. a) Show that the circle with equation 2 + 2 passes through the origin. **(1mark)**

b) Find the coordinates of another point (not the origin) where the circle cuts the -axis. **(3marks)**

1. A survey carried out in a rural town on the number of young people who went for HIV test was shown in the table below

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Percentage infected |  |  |  |  |  |  |
| No of people | 6 | 5 | 3 | 3 | 2 | 1 |

Calculate the quartile deviation of the data. **(4marks)**

1. A shear parallel to the *x*-axis (the invariant line) maps (1,2) onto point (5,2)

a) Determine the shear factor. **(2marks)**

b) Hence state the shear matrix. **(1mark)**

1. A colony of bees was found to have 250 bees at the beginning. Thereafter the number of bees doubled every two days. Find how many bees there were after 16 days **(3marks)**
2. Solve for **(3marks)**
3. The circumference of the circle of latitude *x*0 south is 3751nm. Find *x* to the nearest whole number. **(3marks)**
4. a) Determine the turning point of the curve *y=x3 – 3x2 + 3x – 6* **(2marks)**

b) State the nature of the point identified in a above, **(1mark)**

1. Nine men working 8 hours a day can weed a field in 15 days. How many hours a day must 27 men work in order to weed the same field in 5 days? **(2marks)**
2. Solve the equation below using the completing square method

*3x2 – 7x + 2= 0* **(3marks)**

1. Given that show that **(3marks)**

1. (a) Expand and simplify the binomial expression 6 **(1 mark)**

(b) Use the expansion up to the term in x3 to estimate to 3 decimal places. **(2marks)**

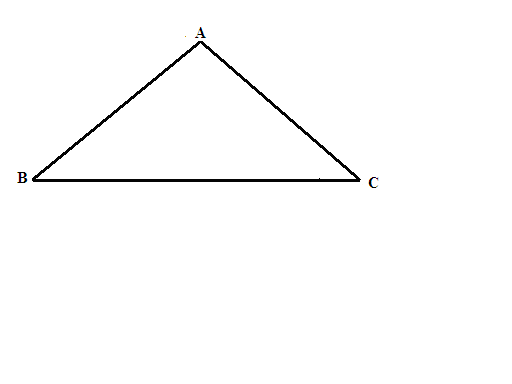
1. Without using calculators or mathematical tables simplify **(3marks)**

1. A line L1 has the equation *x+2y = 4*. The line L2 is perpendicular to L1 and passes through the origin

(a) Determine the equation of L2. **(1mark)**

(b) Find using matrix method the co-ordinates of the intersection point of the two lines. **(2marks)**

1. By correcting each number to one significant figure, approximate the value of Hence calculate the percentage error arising from this approximation. **(3marks)**
2. The diagram below represents a garden ABC.

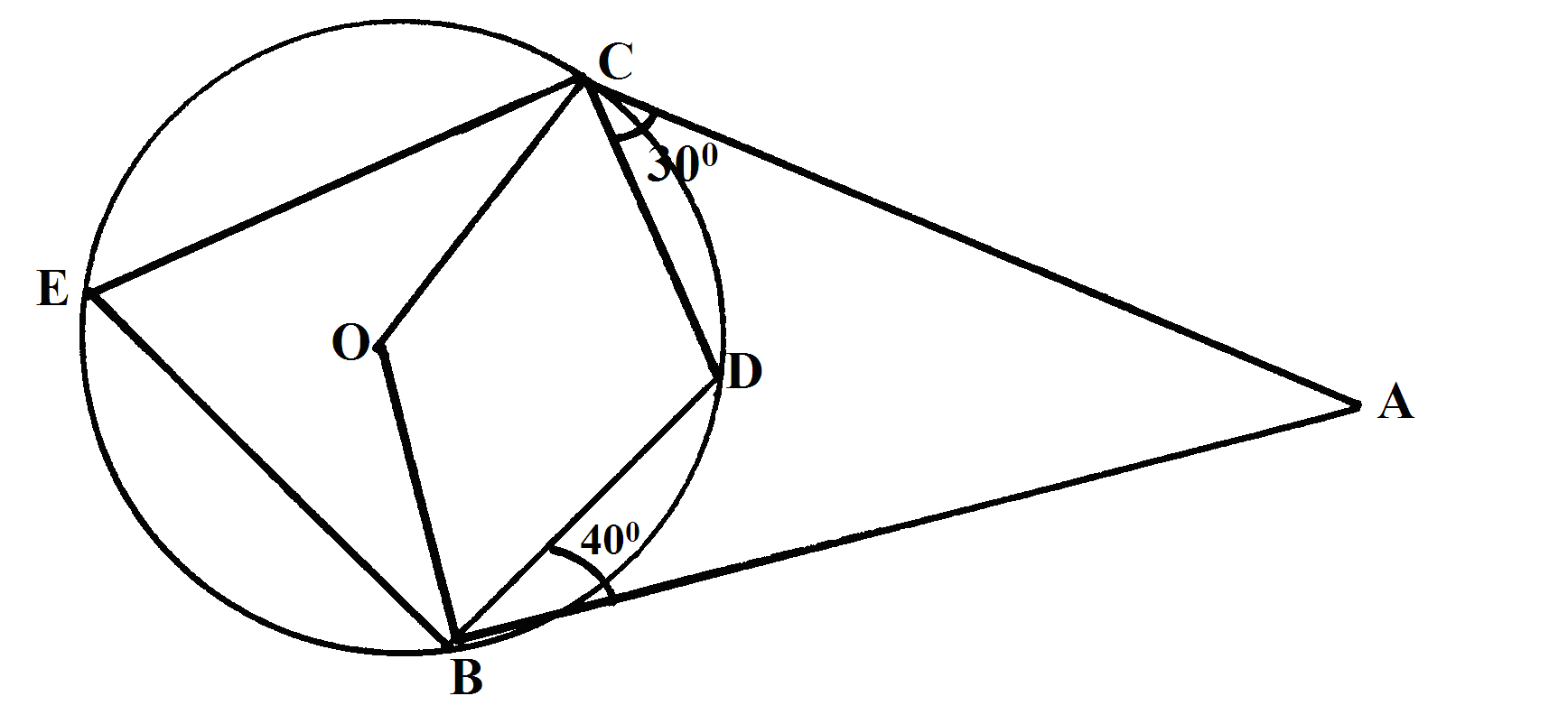


1. Draw the locus of points equidistant from sides AB and AC.
2. Draw the locus of points equidistant from points A and C
3. A bead is lost within a region which is nearer to point A than to point C and closer to side AC than to side AB. Show by shading the region where the bead can be located. **(3marks)**

**SECTION II (50 MARKS)**

***Attempt any five questions in this section***

1. A bag contains 3 black balls and 6 white balls. If two balls are drawn from the bag one a time, find the:-
2. Probability of drawing two white balls
3. with replacement  **(2marks)**
4. without replacement **(2marks)**
5. Probability of drawing a black ball and white ball.
6. with replacement **(3marks)**
7. without replacement **(3marks)**
8. In the figure below, O is the centre of the circle AB and AC are tangents. Angle ABD = 400 and ACD = 300. find:



1. Angle CEB **(6marks)**
2. Angle OCB **(2marks)**
3. Angle CAB **(2marks)**
4. Income rates for income earned were charged as follows.

Income in sh. per month Rate in Ksh. per sh.20

1 – 8, 400 2

8401 – 18, 000 3

18001 – 30, 000 4

30, 001 – 36, 000 5

36, 001 – 48, 000 6

48, 001 and above 7

A civil servant earns a monthly salary of ksh.19, 200. His house allowance is ksh.12, 000 per month. Other allowances per month are transport ksh.13, 000 and medical allowance ksh.2, 300. He is entitled to a personal relief of ksh.1, 240 per month. Determine

1. (i) His taxable income per month  **(2 marks)**

(ii) Net tax  **(5 marks)**

1. In addition, the following deductions were made.

NHIF sh.230

Service charge ksh.100

Loan repayment ksh.4, 000

Cooperative shares of ksh.1, 200

Calculate his net salary per month **(3marks)**

1. The figure below represents a model of a tower VPQR. The horizontal base PQR is an equilateral triangle of sides 9cm. The length of the edges are VP = VQ = VR = 20.5cm. Point M is the mid-point of PQ and VM = 20cm. Point N is on the base and vertically below V

P

M

Q

R

V

N

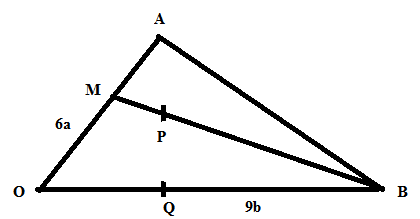
20 cm

9cm

20.5 cm

Calculate

1. The length RM **(2marks)**
2. The length of the model.  **(4marks)**
3. The angle between
4. Plane VPR and the base  **(2marks)**
5. Line VR and the base  **(2marks)**
6. In ΔAOB, **OA** = 6**aOB** = 9**b**. M is the midpoint of OA and P lies on MB such that MB = 5MP



1. Express in terms of and the following vectors; giving your answer in its simplest form.

(i) **MB**

(ii) **AB**

(iii) **AB**

(iv) **AP** **(6 marks)**

1. Given that Q lies on OB such that **OQ** = 3**b** express **AQ** in terms of **a** and **b** **(1 mark)**
2. Hence show that A, P and Q are collinear. **(3 marks)**
3. A tailor makes two types of garments A and B. Garment A requires 3m of material while B requires 2 ½ m of material. The tailor uses not more than 600m of material daily in making both garments. The tailor must make not more than 100 garments of type A and not less than 80 of type B each day.
4. Write down four inequalities from this information. **(4 marks)**
5. Draw a graph for the inequalities shading the unwanted regions. **(4 marks)**



1. If the tailor makes a profit of sh.80 on garment A and a profit of sh. 60 on garment B, how many garments must she make in order to maximize her total profit if all the garments are sold at once. **(2 marks)**
2. (a) Using the trapezium rule, estimate the area enclosed by the curve, the x-axis and the line and taking 7 ordinates. **(3 marks)**

(b) Find the exact area. **(3 marks)**

(c) Find the % error in using trapezium rule. **(2 marks)**

(d) Estimate the area using mid-ordinate rule. **(2 marks)**

1. A publisher employs two agents John and James. John is paid at a rate of sh.240 per week. James is paid at the rate ofsh. 185 per week. John earns no commission on the first 1800 books sold and a commission at a rate of 5% on each extra book sold. James earns a commission of 2.5% on each book sold.In a certain year, each sold a total of 15000 books at the rate of sh. 83.50.
2. Find who earned more money and by how much. *(assume 1 year has 52 weeks)*

**(7 marks)**

b) In another year James earned a total of sh. 51370. Calculate the number of books he sold that year. **(3marks)**