**NAME:……………………………………………. INDEX No………………..…**

**ADM. NO…………..…. CLASS…………**

**SIGNATURE………………**

121/2

MATHEMATICS

PAPER 2

MARCH 2018

2½ HOURS

MOI HIGH SCHHOL

**END OF THE TERM EXAMINATIONS**

**(Kenya Certificate of Secondary Education)**

**INSTRUCTIONS TO CANDIDATES**

* *Write your* ***name*** *and* ***index*** *number in the spaces provided at the top of this page.*
* *This paper consists of two sections:* ***Section I*** *and* ***Section II****.*
* *Answer* ***all*** *questions in section* ***I*** *and* ***only*** *five questions from Section* ***II****.*
* *Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.*
* *Marks may be given for correct working even if the answer is wrong.*
* *Non- programmable silent electronic calculators and KNEC Mathematical tables may be used.*

**For Examiner’s Use Only**

SECTION I

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

SECTION II

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

Grand

Total

***This paper consists of 14 pages. Candidates should check the question paper to ensure that all the pages are printed as indicated and no questions are missing.***

Section I(50 marks):Answer all questions in this section.

1. Rationalize and simplify. (3mks)



1. Solve for x in 2Sin x = - 0.4284 for the range of , 00 ≤ X ≤ 3600 (3mks)
2. Make h the subject of the formula: (3mks)



1. Given that 2 ≤ A ≤ 4 and 0.1 ≤ B ≤ 0.2 find the maximum value of (3mks)
2. A matrix  maps an object to an image of area 30cm2. Calculate the area of the image.

(3mks)

1. Line PQ is the diameter of a circle. Find the equation of a the circle, given the coordinates of P (0, 2) and Q (6, 2) (3mks)
2. Calculate the rate per annum in which a certain amount of money triples after being invested for a period of 6 years compounded annually. (3mks)
3. solve for y in log2y + log250 – 2 = log2100 (3mks)
4. Determine the amplitude, the period and the phase angle for the graph:  (3mks)
5. Given the vectors A= and B=, given that pont C is a midpoint of vector ,find vector C in form of and the magnitude of CB,written to 4 s.f. (3mks)
6. Expand ( 1 + 2x)6 upto the term X3, hence use it to solve (1.12)6 giving your answer to three

decimal places. (4mks)

1. The data below represents heights in centimeters of ten students.

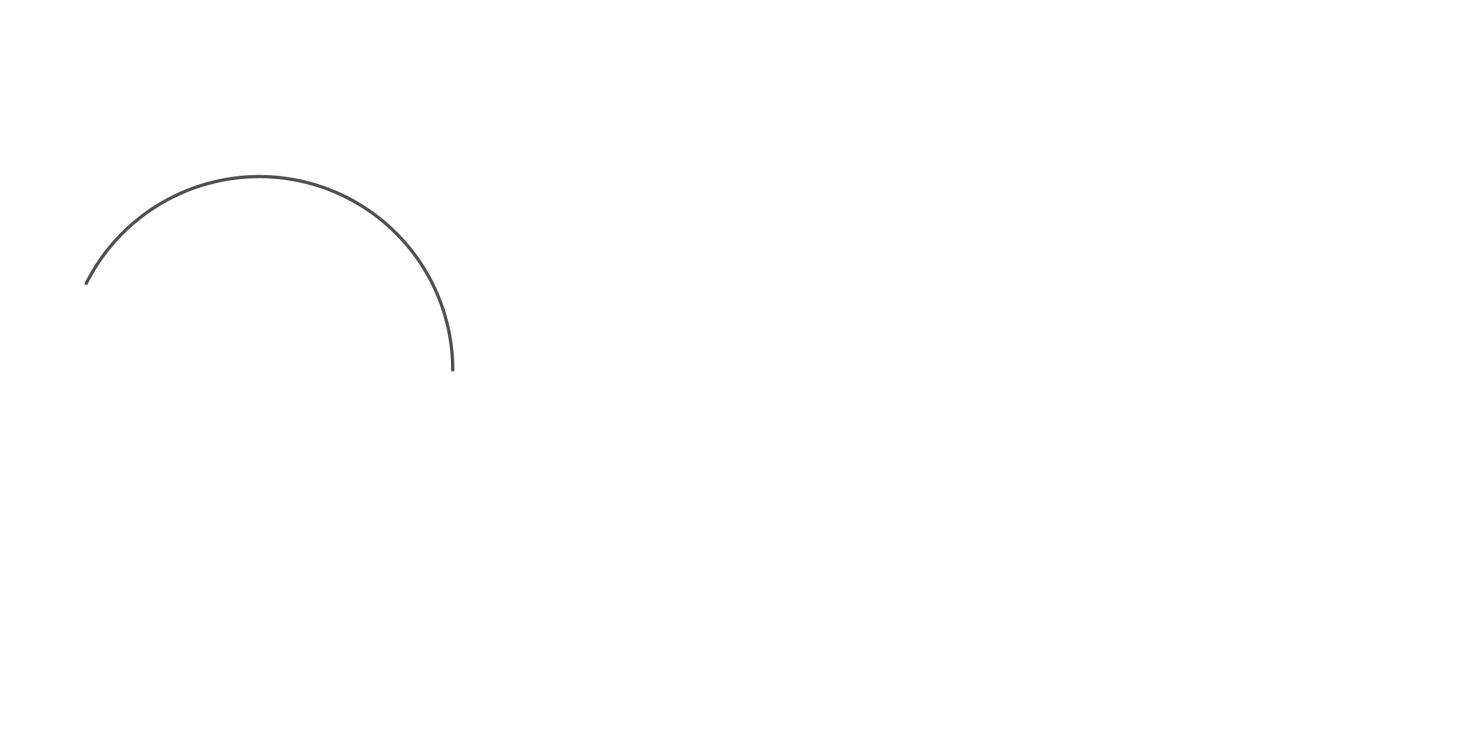
100, 121, 103, 122, 125, 118, 115, 123, 105, 108

Calculate the mean absolute deviation of their heights. (4mks)

1. Two variables A and B are such that A varies partly as B and partly as the square root of B.

Given that A = 30, when B = 9 and A = 16 when B = 4, find A when B = 36. (4mks)

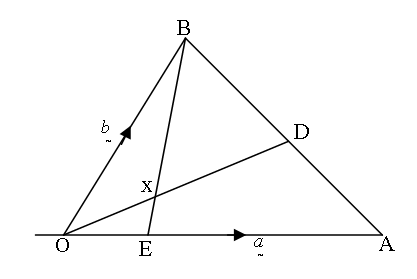
1. The first, the third and the seventh terms of an increasing arithmetic progression are three consecutive terms of a geometric progression. If the first term of the arithmetic progression is 10, find the common difference of the arithmetic progression. (3mks)
2. The figure below shows an arc of a circle. Determine the radius of the circle. (3mks)



1. Lynn mixes rice worth Kshs.47 and Kshs.55 per kg, how many kilograms of each should she use to obtain 24kg of the mixture worth Kshs.52 per kg. (3mks)

Section II(50 marks):Answer ***only five*** questions in this section

1. The figure below shows triangle **OAB** in which **OA** is vector  and **OB** is vector . Points **D** and **E** are such that **AD** =  **AB** and **OE** =  **OA**.

****

(a) Express in terms of  and 

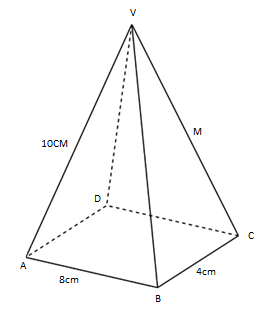
(i)  (1mk)

(ii)  (1mk)

(b) If = **k** and = **h** , where **k** and **h** are constants, express OX in terms in two ways hence, find the values of **h** and **k**. (6mks)

(c) Find the ratio in which D divides OX. (2mk)

1. The figure below shows a right pyramid with the vertex V and edges VA, VB, VC, CD each 10cm long. The base ABCD is a rectangle of length 8cm and width 4cm and M is the mid-point of CV.



Calculate:

* 1. the vertical height of the pyramid (2mks)
  2. the angle between the planes VBC and the base ABCD. (2mks)
  3. the angle between the planes VBC and VAD. (3mks)
  4. the length of the projection of CM on the base ABCD. (3mks)

1. Each member of a class take one and only one of the three foreign languages: French, Germany and Spanish. 15 pupils take French, 9 take Germany and 6 take Spanish.If two students are chosen at random.
2. Draw a tree diagram to represent the above information. (2mks)

Hence, find:

1. The probability that both students take French. (2mks)
2. The probability that both students take same subject. (3mks)
3. The probability that both pupils take different subject. (3mks)
4. (a) Complete the table for the function y = *x*3 – 3x2 + 4 for . (2mks)

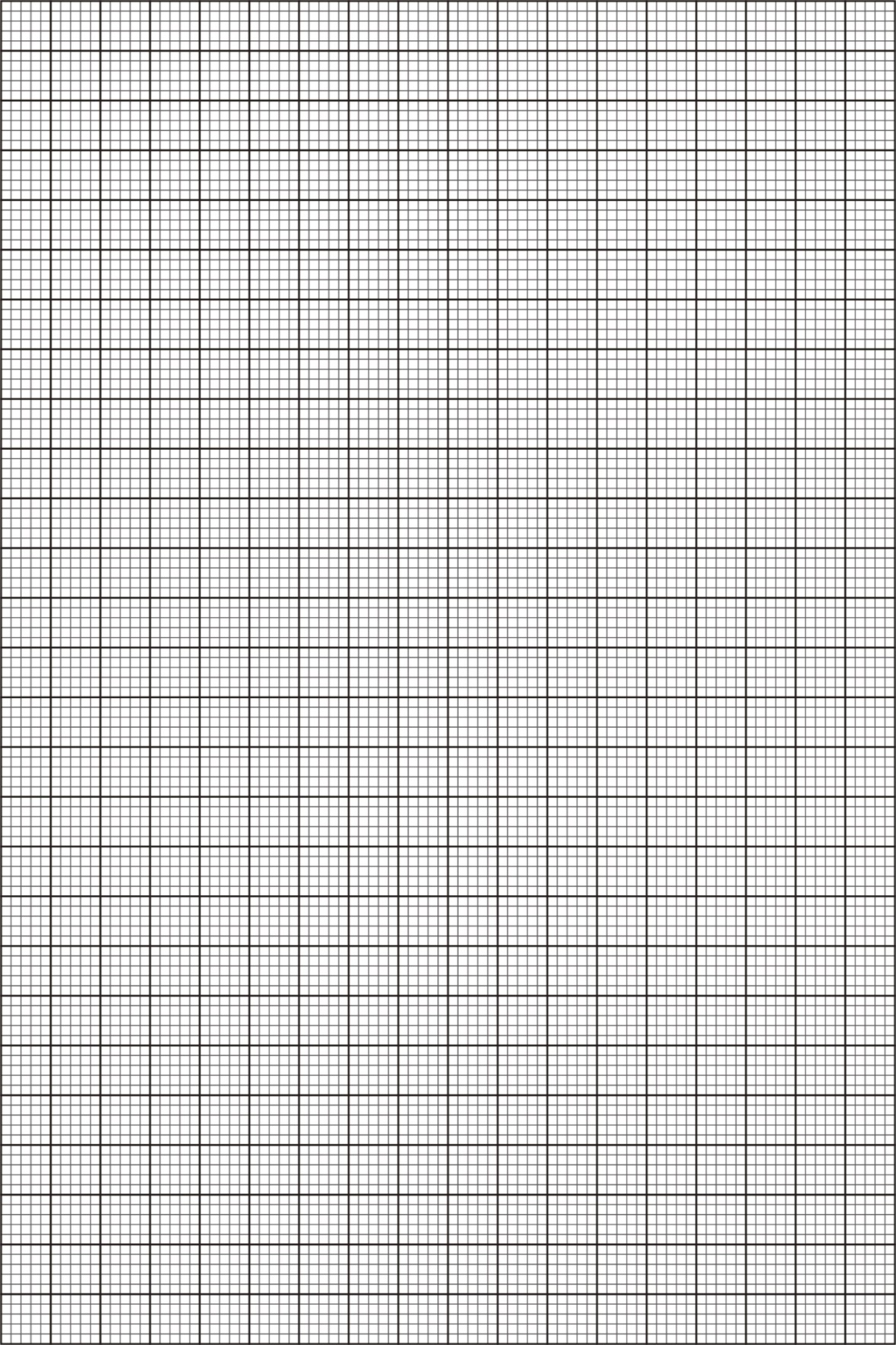
|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **X** | **-2** | **-1** | **0** | **1** | **2** | **3** |
| **Y** | **-16** |  |  |  |  | **4** |

Draw the curve of function y = x3 – 3x2 + 4 in the range on a grid provided below. (3mks)

Use your graph to solve

1. x3 – 3x2 + 4 = 0 (1mks)
2. x3 – 3x2 + 2 = 0 (2mks)
3. 3x3 – 9x2 + 15=0 (2mks)
4. Mokaya has 20 acres of land on which to grow maize and beans. For maize he has to employ one worker per acre and for beans he employs two workers per acre. The number of workers must not exceed 30. The total cost of growing beans is ksh 600 per acre and ksh 1000 per acre for maize. He cannot spend more than ksh 15000 altogether. He approximates the profit of maize to be ksh 4000 per acre and ksh 6000 per acre of beans.

(a) Form all the inequalities to represent the information above. Take x to represent acres for maize ` and y beans. (4mks)

(b) On the grid provided, draw the inequalities to show the wanted region R. (4mks)

(c) Use your graph in (b) above to determine the number of acre of maize and beans he has to plant in order to maximize the profit and find the profit. (2mks)

1. A pilot starts flying from city M to city P. Given that M (30°N, 70°E) and P (30°N, 20°W) taking and radius of the earth , Calculate:

(a) the distance between city M and city P along the parallel of latitude.

(i) in km (2mks)

(ii) in nm (1mk)

(b) The local time at city M if the local time at city P is 2030 hours. (2mks)

(c) The position of city A if A is 5,700nm south of P(Give your answer to the nearest whole ` ` number). (2mks)

(d) The distance between A and K in nm given the position of K (65°S, 20°E). (3mks)

1. Using a ruler and a pair of compass only, construct triangle PQR such that PQ=8cm, QR=7cm and <PQR=1200. (2mks)
2. measure PQ. (1mk)
3. Locate a locus p1 equidistant from point P and Q. (2mks)
4. Locate locus p2 equidistant from point Q and R. (2mks)
5. Draw a circle touching the vertices P, Q and R. (1mk)
6. Locate by shading locus p3 which is within the triangle PQR, such that p3 is closer to P than R. (2mks)
7. In a certain year income tax for all the income earned was charged at the rate shown below

|  |  |
| --- | --- |
| Monthly taxable pay in Ksh | Rate of tax % in each Ksh |
| 1 - 9680 | 10 |
| 9681 - 18800 | 15 |
| 18801 – 27920 | 20 |
| 17921 – 37040 | 25 |
| Excess over Ksh 37040 | 30 |

Mr Juma earned a basic salary of Ksh 32000 and a house allowance of Ksh 10000 per month. He claimed a tax relief of Ksh 1400 per month.

1. Calculate:
   * 1. his taxable income. (2mks)
     2. tax payable without relief. (3mks)
     3. the tax paid after relief. (2mks)
2. Other than tax, the following deductions are made: a service charge of sh 100, sacco loan of sh 3200, health insurance fund of sh 500 and burial benevolent fund of sh 300. Calculate:
3. the total monthly deductions made from his income. (1mk)
4. his net income from his employement. (2mks)