**Name ……………………………………………………………………………. Class …..**

**121/1**

**MATHEMATICS**

**FORM 3**

**Paper 2**

**2½ Hours**

**Instructions to candidates**

1. Write your name, admission number and class in the spaces provided above.
2. The paper contains two sections: **Section I** and **Section II**.
3. Answer **ALL** the questions in **Section I** and **ANY FIVE** questions from **Section II**.
4. All working and answers must be written on the question paper in the spaces provided below each question.
5. Marks may be awarded for correct working even if the answer is wrong.
6. Negligent and slovenly work will be penalized.
7. Non-programmable silent electronic calculators and mathematical tables are allowed for use.

**For Examiner’s use only**

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

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

***This booklet contains 15 printed pages. Please confirm that all the pages exist and are properly printed before starting the exam.***

**Section I (50 marks)**

**Answer all the questions in this section**

1. Evaluate: without using calculator or mathematical tables leaving your answer as a simplified fraction. **(2 marks)**

**2.** Find the equation of a line perpendicular to 2x +4y = 8, which cross the line at its y – Intercept.  **(3 marks)**

**3.** Simplify completely:  **(3 marks)**

**4.** Find the integral values of x for which:

 -6 < 3x + 3

 14 – 3x >2  **(3 marks)**

**5.** Use tables of square, cubes roots and reciprocals to find the value of x if  **(3 marks)**

**6.** One interior angle of a certain polygon is 840. If each of the other angles is 1470, how many sides does this polygon have? **(3 marks)**

**7.** Simplify  **(3 marks)**

**8.** In the figure below **OA** = 3**i** + 4**j** and **OB** = 8**i.** C is a point on AB such that AC: CB = 3: 2, and D is a point such that OB// CD and 2**OB** = **CD**.



C

 Determine the vector **DA** in terms of **i** and **j**. **(3 marks)**

**9.** An airbus left town N at 1945hrs and arrived in town L at 0320hrs. It stayed for  hours for rest and refreshment of passengers and crew. It then headed for town W and took  hours.

**(a)** How long did the journey from town N to town L take in hours and minutes? **(2 marks)**

**(b)** At what time did it arrive in town W? **(2 marks)**

**10.** Mzee is three times as old as his son now. If ten years ago the sun of their ages was 44, how old was Mzee when his son was born? **(3 marks)**

**11**. Given that find the ratio. **(3 marks)**

**12.** A cylinder of radius 14cm contains water. A metal solid hemisphere of radius 6.8cm is submerged into the water in the cylinder. Find the change in height of the water in the cylinder. **(4 marks)**

**13.** An Italian tourist, on arrival in Kenya, converted 6000 Euros into Kenya shillings. During her three day’s stay the country, she spent Kshs 260,000. She converted the remaining amount into US dollars. Using the exchange rates table below calculate how many US dollars she got?

 Buying Selling

 1 US dollar $ 96.20 96.90

 1 Euro C 112.32 112.83 **(3 marks)**

**14.** Find the area in hectors of a field book measurement is recorded in metres as follows.

 D

 170

 To E 50 140

 110 60 to C

 To F 80 100

 30 50 to B

 A **(3 marks)**

**15.** The perimeter of a triangular field is 120 m. Two of the sides are 21m and 40m. Calculate the largest angle of the field hence find the area of the field.**(4 marks)**

**16.** Given that log4 = 0.6021 and log 6 =0.7782, without using mathematical tables or a calculation, evaluate log 0.096. **(3 marks)**

**SECTION II- 50 MARKS**

**Answer any five questions in this section**

**17.** A Kazi Kwa Vijana youth group decided to raise sh.126,000 towards a quail farming project. Each youth was to contribute an equal amount of money. Before the contributions, 7 of them pulled out the group resulting in the remaining members to pay more.

**(a)** If x stands for the original number of members, show that the increase in contribution was  **(3marks)**

**(b)** If the increase in contribution per youth was sh.200, find the number of youths that were originally involved in the project. **(4marks)**

**(c)** Calculate percentage increase in the contribution per youth caused by the withdrawal of some women to one decimal place. **(3marks)**

**18.** The diagram below represents a model of a pillar. The radii of the top and the base are 7cm and 3.5cm respectively. The height of the cylindrical part is 10cm while the height of the whole pillar is 15cm.

10cm

7cm

r = 3.5cm

**(a)** Calculate the volume of the model in cm³. **(6 marks)**

**(b)** Calculate the mass of the material used to construct the pillar given that the actual height of the whole pillar is 60m and the density of the material used is 0.832g/cm³. (Give your answer in tonnes). **(4 marks)**

**19.** A bus left N at 7.00a.m and travelled towards town E at an average speed of 80 km/h. At 7.45a.m a car left town E towards town N at an average speed of 120 km/h. The distance between towns N and E is 300km. Calculate:

**(a)** The time the bus arrived at town E. **(2 marks)**

**(b)** The time of the day the two met. **(4 marks)**

**c)** The distance from Nairobi where the two met. **(2 marks)**

**d)** The distance of the bus from town E when the car arrived at town N. **(2 marks)**

**20.** In a physics test student scored the following marks.

 72 50 43 58 62 49 69 60 84 62 55 89 67 92 81 75 63 77 95 65 54

35 45 73 41 56 50 36 49 58 61 85 38 64 76 78 51 43 72 37 62 55

**(a)** Using a class width of 10 and 35-44 as the first class, make a frequency table of the grouped data. **(5marks)**

**(b)** Estimate

**(i)** The mean **(2marks)**

**(ii)** The median  **(3marks)**

**21. (a)** Find the equation of a straight line passing through the points (3, 2) and (-3, 6) giving your answer in the form  , where a and b are constants**. (4marks)**

**(b)** State the coordinates of point A and B, at which the line in (a) above crosses the x-axis and y-axis respectively. **(2marks)**

**(c)** Using the information in (a) and (b) above, find the area of triangle AOB, where O is the origin **(2marks)**

**(d)** Find the acute angle the line in (a) above makes with the axis. **(2marks)**

**22.** A flag post 12m long is fixed on top of a tower. From a point on horizontal ground, the angles of elevation of the top and bottom of the flag post are 460 and 330 respectively.

Calculate

**(a)** The horizontal distance from the point on the ground to the base of the tower.

 **(4marks)**

**(b)** The total height of the tower and the flag. **(2marks)**

**c)** The shortest distances from the point on the ground to

**i)** The top of the flag post. **(2marks)**

**ii)** The top of the tower. **(2marks)**

**23.** The vertices of triangle PQR are P (0, 0), Q (6, 0) and R (2, 4).

**a)** Plot these points on the grid provided below. **(1 mark)**

**b)** Triangle P1Q 1R1 is the image of a triangle PQR under an enlargement scale factor ½ and centre (2, 2). Write down the coordinates of triangle P1Q 1R1 and plot on the same grid.  **(2 marks)**

**c)** Draw triangle P11Q11R111 the image of triangle P11Q1R1 under a positive quarter turn about the point (1, 1).  **(2 marks)**

**d)** Draw a triangle P111Q111R111 the image of triangle P1Q11R11 under reflection in the line y = l. **(3 marks)**

**e)** Describe fully a single transformation which maps triangle P 11 Q 11 R 11 onto triangle P1 Q1 R1. **(2 marks)**

**24.** The figure below shows a circle centre O. PQRS is a cyclic quadrilateral and QOS is a straight line.



 Giving reasons for your answers, find the value of:

**a)** <PRS. **(2 marks)**

**b)** <POQ. **(2 marks)**

**c)** <RPS. **(2 marks)**

**d)** <PSR. **(2 marks)**

**e)** Reflex <POS. **(2 marks)**

**Marking scheme paper2**

|  |  |  |  |
| --- | --- | --- | --- |
| 1. |  | M1 A1 | √removal of all bracketsSimplified fraction. |
|  |  |  |  |
| 2. | 4y = -2x + 8Y = - ½ x + 2 M2 = 2y = 2x | M1M1A1 | grad |
|  |  | 3mks |  |
| 3. |  | M1M1A1 | ✓ L.C.M✓ 1 Simplification✓ Answer |
|  |  | 3mks |  |
| 4. |  -9  -3 |  |  |
|  |  | 3mks |  |
| 5**.** |  | M1M1A1 |  |
|  |  | 3mks |  |
| 6 | Exterior angle = 180 -96Rem. Ext. angles =360 – 96 = 264✓One ext. angle with 1470 = 180 -147 = 33= 8 +1✓ = 9 ✓ | MlMlAl |  |
|  |  | 3mks |  |
| 7. |  | M1M1A1 | 🗸 application of indices or otherwise🗸 square root |
|  |  | 3mks |  |
| 8 | **DA** = **DC** + **CA****DA** = -2(8**i** – **j**) + **BA** = -16**i** + 2**j** + {(3**i** + 4**j**) – (8**i** – **j**)} = -16**i** + 2**j** + (-5**i**+5**j**) = -19**i** + 5**j** | B1M1A1 |  |
|  |  | 3mks |  |
| 9. | (a) Time from 1945hrs to 0320hrs. = (2400 – 1945) + (0320 – 0000) = 0415 + 0320 = 4hrs 15mins + 3hrs 20mins = 7hrs 35mins 1. Time of departure = 0320 + 1hr 30mins = 0450hrs

Arrival time = 4hrs 50mins + 10hrs 15mins = 15hrs 05minsTime 1505hrs (3.05pm afternoon)  | M1A1M1A1 | 🗸 + and – |
|  |  | 3mks |  |
| 10. | Let the son’s now age be x(3x – 10) + (x – 10) = 443x + 4 – 10 – 10 = 444x = 64X = 16 years16 x 3 – 16 => 48 – 16 =32 yearsMzee’s age was 32 years | M1M1A1 | FormulatingC.A.O |
|  |  | 3mks |  |
| 11. | 2x+3y=5(3x+4y)2x+15x=20y-3y -13x=17y y:x= -13:17 | M1M1A1 | Accept y:x=13:-17 |
|  |  | 3mks |  |
| 12. | Let change in height be h. | M1M1M1A1 | equating |
|  |  | 4mks |  |
| 13. | 6000 euros = Kshs. 6000 x 112.32 = Kshs.673,920.00🗸Balance = Kshs. ( 673,920 – 260,000) = Kshs. 412,920🗸 = Us dollar 4,271.62🗸 | M1M1A1 |  |
|  |  | 3mks |  |
| 14. | ½ x 30 x 50 + ½ x 80(50 + 60) + ½ x 60 x 60+ ½ x 30 x 50 + ½ x 40(80 +50) + ½ x 100 x 80 = 14,300 = 1.43 ha | B1M1A1 | 🗸 SketchFor addition |
|  |  | 3mks |  |
| 15. | A= ½ x40x21xSin150 =216.33 cm2 | B1M1M1A1 |  |
|  |  | 4mks |  |
| 16 |  | M1M1A1 | ✓ operation✓ operation✓ answer |
|  |  | 3mks |  |
| 17. |  | M1M1A1M1M1A1B1B1M1A1 |  |
|  |  | 10mks |  |
| 18. |  | M1B1M1M1M1A1M1M1M1A1 |  |
|  |  | 10mks |  |
| 18. |  D =   | B1B1M1M1M1A1M1A1M1A1 |  |
|  |  | 10mks |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20.(a) |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| class | x | Tally | f | fx | c.f |
| 35-4445-5455-6465-7475-8485-9495-104 | 39.549.559.569.579.589.599.5 | 1111 111111 111111 1111 111111 1111111111 | 77126541 | 276.5346.5714.0417.0397.5358.099.5 | 7142632374142 |
| B1 | B1 |  | 42 | 2609 |  |

(ii) 21st item =54.5+22nd item=54.5+=61.17Median = | B1B1B1B1B1M1A1M1M1A1 |  |
|  |  | 10mks |  |
| 21. | (b) A(6,0) B(0,4)(c) ½ 🞩6🞩4 =12 units square | M1M1M1A1B1B1M1A1M1A1 |  |
|  |  | 10mks |  |
| 22. |  | B1B1M1A1M1A1M1A1M1A1 |  |
|  |  | 10mks |  |
| 23. | a) for triangle PQR🗸b) P1 ( 1,1) Q1 ( 4,1) R 1 (2,3)🗸c) P11 (1,1) Q 11 ( 1,4) R 11 ( - 1,2)🗸d) L1 for graph of y = 1 D2 for  P111 Q 111 R111🗸 y – 2 = xReflection in X + y = 2🗸 | B1B1B1B1B1B1B1B1M1B1 |  |
|  |  | 10mks |  |
| 24 | a)PRS=200(s in the semi-circle)b) Obtuse POQ=1400( at the centre is twice that on the circumference)Reflex POQ=2200(s at a point add up to 3600)c)RPS=1800-(700+550+200+200)(sum of angles in a triangled) PSR=1800-(700+550+200)=350(opposite s of a cyclic quadrilateral add up to 1800)e) Reflex POS=1800+1400 = 3200 or 3600-400 =3200(s at a point) | B1,B1B1,B1B1B1B1B1B1B1 |  |
|  |  | 10mks |  |