Name ---------------------------------------------- Class -----------------------Adm no ---------------------

**MATHEMATICS PAPER 2.**

**TIME: 2 ½ HOURS**

**Instructions to candidates**

1. Write your name, class and admission number in the spaces provided above.
2. This paper consists of two section; section A and Section B.
3. Answer all the questions in section A and only FIVE questions from section B.
4. All answer and working must be written on the question paper in the spaces provided below each question.
5. Show all the steps in your calculation, giving your answer at each stage in the spaces provided below each question.
6. Non – programmable silent electronic calculators and KNEC mathematical tables may be used unless stated otherwise.

For examiners use only.

 SECTION I

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

SECTION II

GRAND TOTAL

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

SECTION B (50 MARKS)

Do all questions in this section

1. Evaluate $\frac{\frac{1}{2} of 3\frac{1}{2}+ 1\frac{1}{2}(2\frac{1}{2}-\frac{2}{3})}{\frac{3}{4}of 2\frac{1}{2}÷\frac{1}{2}}$ (3 marks)
2. Make P the subject of the formula $\frac{1}{r}=\frac{1}{p^{2}}+\frac{1}{q}^{}$ (3 marks)
3. Expand ($1-2x)^{2}$ up to the term in $x^{3}$ (1 mark)
4. Use the expansion above o evaluate $(1.02)^{6}$ to decimal places (2 marks)
5. Given the matrix $\left(\begin{matrix}5-x&2\\3x&4\end{matrix}\right)$ has no inverse, find the value of x. (2 marks)
6. Kiprono buys tea costing sh. 112 per kilogram and shs 132 per kilogram and mixes them, then sells the mixture at shs. 150 per kilo gram. If he is making profit of 25% in each kilogram of the mixture, determine the ratio in which he mixes the tea. (3 marks)
7. Given that: $\frac{3}{3√5}+ \frac{3√5}{3-√5}=a+b√5$. Find the values of A and B (3 marks)
8. P varies directly as Q and inversely as the square of R. if P is increased by 20% and R is decreased by 10%. Find percentage changes in Q. (3 marks)
9. Ashanti is a salesman and earns a commission on sales based on the monthly rates shown in the table below:-

|  |  |
| --- | --- |
| Sales (kshs) | Commission rate % of sales  |
| The first 5,000 | 10% |
| The second 3,000 | 15% |
| Sales above 8,000 | 20% |

In addition, she earns a basic monthly pay of kshs. 6,700 during a certain month, she earned a total salary amounting to kshs. 8,368. How much worth of sales did she make? (4 marks)

1. In the figure below, O is the centre of the circle. A, B, C , and D are points on the circumference of the circle. A, o, X and C are points on a straight line. DE is a tangent to the circle at D. Angle BOC = 48°nad angle CAD = 36°.



1. Find the value of the following angles:-
2. Angle ADE (2 marks)
3. Angle BCD (2 marks)
4. Given that p = 3y express the equation (3 marks)

3(2y – 1) + 2 x 3(y – 1) = 1 in terms of P hence or otherwise find y.

1. The diagram below shows a triangle ABC. Construct its image A1B1C1 under a rotation of -120° about centre O. (3 marks)

A

C

B

O

1. Given that cos x -= 0.75; where x is an acute angle, find without using mathematical tables or calculators the following trigonometric ratios:
2. Tan X (1 mark)
3. Sin2 (90-x) (2 marks)
4. A farmer has 200m of fencing with which three sides of a rectangular enclosure, the fourth side being existing wall of the yard. Find in metres the dimension of the largest possible field that can be enclosed. (3 marks)
5. The point with co-ordinates (6,1) and (-4,9) are the ends of a diameter of a circle centre A
6. Find the co-ordinates of the centre. (1 mark)
7. Determine the equation of the circle in the form x2 + y2+ ax +by = C where A, B, and C are constants. (3 marks)
8. Use the trapezium rule to establish the area under the curve Y =x2 + x – 6over the interval 0 $0 \leq x \leq 8 $ using 4 trapezia (3 marks)
9. Wambua invested sh. 6,400 at 15% per annum compound semiannually interest for 3 years. Muinde invested twice that amount at 12 ½ % per annum simple interest for the same period of time. Find whose investment earned more interest and by how much. (4 marks)

**SECTION B (50 MARKS)**

**Answer only five questions from this section**

1. .
2. Find the quadratic equation whose roots are $\frac{-3}{4}and\frac{2}{3}$ and write it in the form ax2 + bx + c = 0 where a, b and c are integers. (3 marks)
3. The length of a floor of a rectangular hall is 9m more than its width. The area of the floor is 136m2.
4. Calculate the perimeter of the floor (4 marks)
5. A rectangular carpet is placed on the hall leaving am area of 64cm2. If the length of the carpet is twice its width, determine the width of the carpet (2 marks)

1. In the geographical progression, the sum of the second and third terms is 6; and the sum of the third and fourth terms is 1-12. Find:
2. .
3. The first term (3 marks)
4. The common ration (3 marks)
5. The sum of consecutive of an arithmetical progression -19 ½. If the first tern is 16 ½ and the common difference is -3. Find the number of terms. (4 marks)

1. The table below shows the number of students who scored marks in mathematics test.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Marks  | 1-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-60 | 61-70 | 71-80 | 81-90 | 91-100 |
| Frequency  | 3 | 6 | 10 | 10 | 12 | 17 | 15 | 16 | 7 | 4 |

1. Draw a cumulative frequency graph for the data. (3 marks)
2. Use the graph to estimate the median mark (2 marks)
3. If students who score over 40 marks pass the test the tests estimates the percentage of the students who passed (2 marks)
4. Calculate the inter quartile deviation. (3 marks)
5. The probability of a candidate passing her secondary examination is 4/5. If she passes the examination the probability of her joining a university is 2/3. if she fails her examination, the probability of joining a university is ¼. If she joins the university the probability of getting a job is 6/7 and if he does not join the university the probability of getting a job is 2/9
6. Draw a tree diagram. (2 marks)
7. The probability that she fails her examination (2 marks)
8. Find the probability that she got a job after failing her secondary examination (2 marks)
9. The probability that she joins university (2 marks)
10. The probability that she did not get a job (2 marks)
11. At 12.30pm, a ship leaves island A (80° N, 45°E) and sails due west for 120 hours to another island B at an a average speed of 27 knots.
12. Find the position of island B (3 marks)
13. The ship then sails due north to another island C which lies on latitude 75°N. Find the shortest distance between islands B and C in km. (3 marks)
14. The ship had stopped at B for 70 minutes before it sailed to island C. I the ship increase its speed by 20% between B and C find the time arrival at island C to the nearest minute. (4 marks)



In the figure above, OPQ is a triangle in which QS = ¾ OP and RP = 2:1

Line QR and SQ meet at T.

1. Given that O P = p and OQ = Q, Express the following vectors in terms of P and Q.
2. PQ (1 mark)
3. OR (2 marks)
4. SQ (1 mark)
5. You are further given that ST = Msq and OT = Nor. By expressing OT in two ways, determine the values of m and n. (5 marks)
6. Find the ratio in which Q divides ST (1 marks)
7. .
8. Complete the table below for the equation y = x3 – 2x2 – 4x + 7

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X | -3 | -2 | -1 |  | 1 | 2 | 3 | 4 |
| Y | -26 |  | 8 | 7 | 2 |  | 8 |  |

1. Using the scale 1 cm to represent 1 unit on x – axis and 1 cm to represent 5 units on the y – axis, draw the graph of y = x3 – 2x2 – 4x + 7 (3 marks)
2. Use your graph to estimate to roots of the equation x3 – 2x2 – 4x + 7 = 0 (1 mark)
3. By drawing straight lines, use your graph to solve the equation. (2 marks)
4. x3 – 2x2 – 4x + 2 = 0
5. x3 – 2x2 – 3x + 3 = 0 (2 marks)
6. The following figure shows two circles P and Q with centre O1 and O2 respectively and their radii are 9 cm and 6 cm respectively. The common chord MN is 9 cm long. (Not drawn in scale).



1. Find the value of
2. Angle MP1N. (2 marks)
3. Angle MO2N (2 marks)
4. Find the area of:
5. Triangle MO1N (2 marks)
6. Triangle MO2N (1 marks)
7. Find the area of the shaded region. (4 marks)