NYAMBARIA HIGH SCHOOL

END OF YEAR EXAMS

Paving Way For Kenya Certificate of Secondary Education Success

Name …….. Admission no…….

Candidate's Signature…… Date…….

FORM 3

MATHEMATICS

PAPER 1

TIME: 2Hours

INSTRUCTIONS:

1. Write your name, Index number in the space provided at the top of the page.
2. Write the date of examination and sign in the spaces provided above.
3. This paper consists of **two** sections: I and II.
4. Answer all the questions in section I and any **five** questions from section II
5. All answers and working must be written on the question paper in the spaces provided below each question.
6. Show all the steps in your calculation, giving your answers at each stage in the space provided.
7. Marks may be given for correct working even if the answer is wrong.
8. Non programmable silent electronic calculator and KNEC Mathematical table may be used, except when stated otherwise.

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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

SECTION I (50 Marks)

Answer ***all*** the questions in this section

1. Anthony spent one-quarter of his net January salary on school fees. He spent 25% of the remainder on bills and one-ninth of what was left on transport. If he finally had Kshs. 15,800, calculate Anthony's net January salary.

(3 marks)

2. Find the values of x and y in $2^{\frac{3}{2}x} \times 3^{2y} = 5184$ **(3 marks)**

3. A straight line is such that P(4, −3) and Q (2, 5), find the equation of the perpendicular bisector of PQ in the form $ax + by = c$, where a, b and c are integral values. **(3 marks)**

4. Without using a calculator or mathematical tables, simplify **(3 marks)**

$$\frac{\frac{1}{2}\log 625 + \frac{1}{2}\log 100}{\log 100 - \frac{1}{2}\log 16}$$

5. Simplify the algebraic expression **(3 marks)**

$$\frac{9p^2 - q^2}{3p^2 - 4pq + q^2}$$

6. Determine all the integral values of x that satisfy the inequalities **(3 marks)**

$$3x - 5 < 7 - x \leq x + 13$$

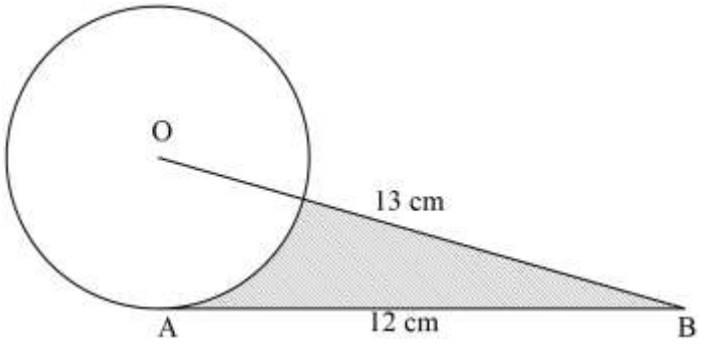
7. Simplify the expression below without using a mathematical table or a calculator, giving the answer as $p + q\sqrt{r}$, where p, q and r are constants. **(3 marks)**

$$\frac{\sqrt{7} + 3}{\sqrt{7} - 2}$$

8. Solve for x in the equation below for $0^0 \leq x \leq 90^0$ **(3 marks)**

$$\sin(2x - 30^0) = \frac{\sqrt{3}}{2}$$

9. In the figure below, O is the centre of the circle, OA=13 cm, AB=12 cm and AB is a tangent to the circle at A. Use π=3.142 to calculate the shaded area correct to 2 decimal places



10. A Kenyan company received US dollars that it converted into Kenya Shillings in Bureau de Change that buys and sells foreign currencies at the rates shown below.

	Buying (Kshs)	Selling (Kshs)
1 Sterling Pound	125.78	126.64
1 US Dollar	75.66	75.86

(a) If the company received Kshs. 15,132,000, calculate the amount it received in US dollars. **(1 mark)**

(b) The company exchanged the amount in (a) into Sterling pounds and bought a car. Calculate the cost of the car to the nearest sterling pound. **(2 marks)**

11. 5men can erect 2 cottages in 21 days, how many more men, working at the same rate, will be needed to construct 6 cottages in the same period. **(2 marks)**

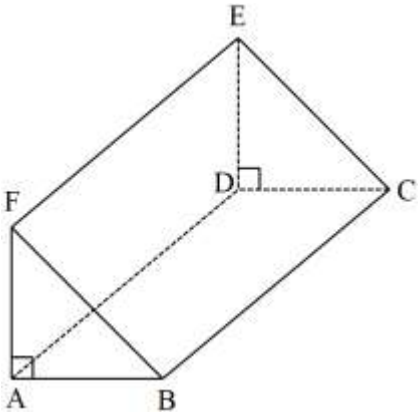
12. Two trains M and N are travelling in opposite directions along parallel railway lines. Train M is moving at a speed of 72 km/h and is 20 m long. Train N travels at a speed of 54 km/h. Find the length of train N if it took the two trains 9 seconds to completely pass each other **(3 marks)**

13. Find the values of c and d if $0.4\dot{9}\dot{7}$ is equivalent to $\frac{c}{d}$, where c and d are integers. **(3 marks)**

14. A mother is 42 years old and her daughter is 25 years younger than her. After how many years will the daughter's age be half the mother's? **(2 marks)**

15. The exterior angle of a regular polygon equals one-third of its interior angle. Calculate the number of sides of the polygon. **(3 marks)**

16. The figure below shows a solid triangular prism ABCDEF. Sketch the net of the solid. **(2 marks)**



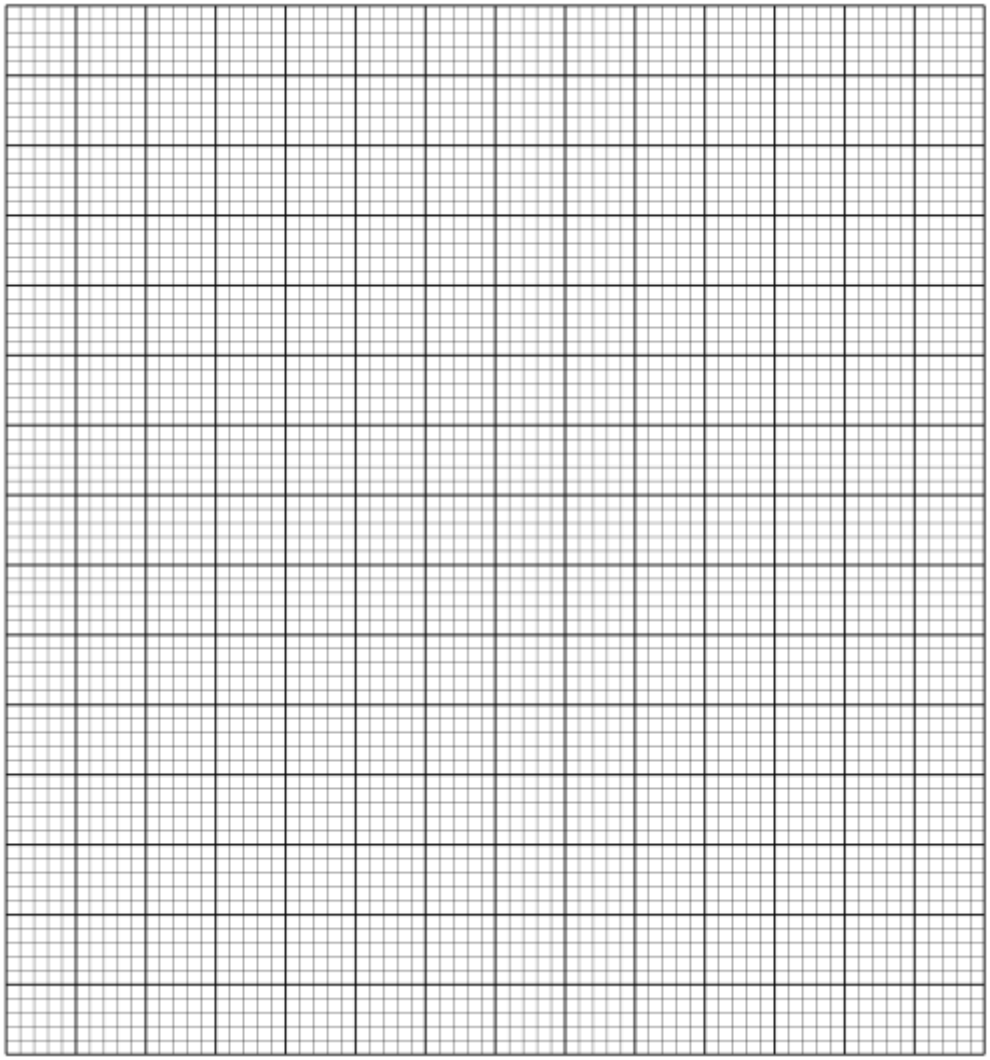
SECTION II (50 Marks)

Answer ***any*** five questions in this section

17. (a) Complete the table below for the function $y = 2x^2 - 3x - 5$ for $-2 \leq x \leq 3$ **(2 marks)**

x	-2	-1.5	-1	-0.5	0	0.5	1	1.5	2	2.5	3
y					-5						

(b) On the grid provided, draw the graph of $y = 2x^2 - 3x - 5$ for $-2 \leq x \leq 3$ **(3 marks)**



(c) Use your graph to find the roots of the equation $2x^2 - 3x - 5 = 0$ **(1 mark)**

(d) (i) On the same axes, draw the graph of $y = -2x - 2$ **(1 mark)**

(ii) From your graphs, find the values of x that satisfy the simultaneous equations $y = 2x^2 - 3x - 5$ and $y = -2x - 2$ **(1 mark)**

(iii) Hence write the quadratic equation in the form $ax^2 + bx + c = 0$ satisfied by the values of x where the two graphs intersect, where a, b and c are integers. **(2 marks)**

18. Leakey, a salesman, earns a basic salary of Kshs. 20,000 per month and a commission of 8% on sales up to Kshs. 100,000 and a further commission of $2\frac{1}{2}\%$ on sales above Kshs. 100,000. In January 2021, he earned a total of Kshs. 48,000 in salaries and commissions.

(a) Determine the amount of sales he made in January. **(4 marks)**

(b) In the month of February, the total sales increased by 18%. Calculate his commission in the month of February. **(3 marks)**

(c) In March, the total sales decreased by 25%, calculate his total earnings in March. **(3 marks)**

19. Using a ruler a pair of compasses only,

(a) Construct triangle ABC in which AB=5.3 cm, BC=7.4 cm and AC=8.5 cm **(3 marks)**

(b) Construct an escribed circle opposite angle ACB **(3 marks)**

(i) Measure the radius of the circle **(1 mark)**

(ii) Measure the acute angle subtended at the centre of the circle by chord AB **(1 mark)**

(c) Calculate the area of triangle OBA with O as the centre of the circle **(2 marks)**

20. Kisumu Concrete Products owns three lorries A, B and C. Lorry A has a capacity of 7 tonnes and uses one litre of fuel for every 10 km. Lorry B has a capacity of 5 tonnes and uses one litre of fuel for every 12 km, and lorry C has a capacity of 2 tonnes consuming a litre of fuel for every 15 km. the company plans to transport materials with the lorries making 3, 7 and 9 trips respectively.

(a) Calculate the quantity of materials transported by each lorry. **(1 mark)**

(b) The materials are to be transported to a site 30 km from their yard. Calculate the amount of fuel consumed by each lorry. **(4 marks)**

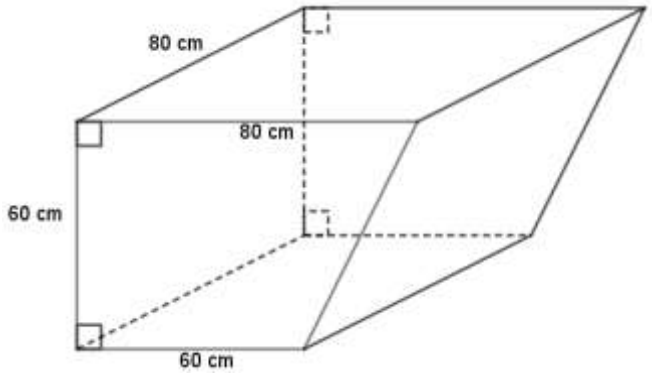
(c) The company's expenses are as follows; fuel at Kshs 112 per litre, wages Kshs. 20,100 and tear and ware at Kshs. 105,000

(i) Calculate the total fuel cost **(1 mark)**

(ii) If the lorries are hired at Kshs. 25,000, Kshs. 15,000 and Kshs. 10,000 per trip respectively, calculate the company's profit. **(3 marks)**

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21. The figure below shows the internal dimensions of a laundry sink whose cross-section is a trapezium



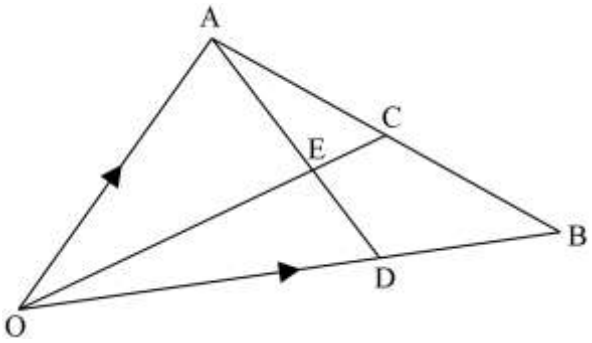
(a) Calculate the capacity of water that the sink can hold when full. **(4 marks)**

(b) The sink is filled with water using a cylindrical pipe of radius 10.5 cm at a rate of 10 cm per minute.

(i) Calculate the time to the nearest minutes it takes to fill the tank. Use $\pi = \frac{22}{7}$ **(3 marks)**

(ii) Water in the full sink is then drained into cylindrical containers of diameter 28 cm and height 30 cm. How many cylinders are required to completely drain the sink? **(3 marks)**

22. In the figure below, C is the midpoint of **AB** and D is a point on $\boldsymbol{OB}$ such that $\mathbf{OD}:\mathbf{DB} = 3:2$. **OC** and **AD** intersect at E.



Given that $\boldsymbol{OA} = \boldsymbol{a}$ and $\boldsymbol{OB} = \boldsymbol{b}$

(a) Express the following in terms of $\boldsymbol{a}$ and $\boldsymbol{b}$ only:

(i) **AD** **(1 mark)**

(ii) OC **(2 marks)**

(b) Given further that $\boldsymbol{AE} = s\boldsymbol{AD}$ and $\boldsymbol{OE} = t\boldsymbol{OC}$. Express $\boldsymbol{OE}$ in terms of:

(i) $\boldsymbol{a}$, $\boldsymbol{b}$ and s **(2 marks)**

(ii) $\boldsymbol{a}$, $\boldsymbol{b}$ and t **(1 mark)**

(c) hence find the values of s and t **(3 marks)**

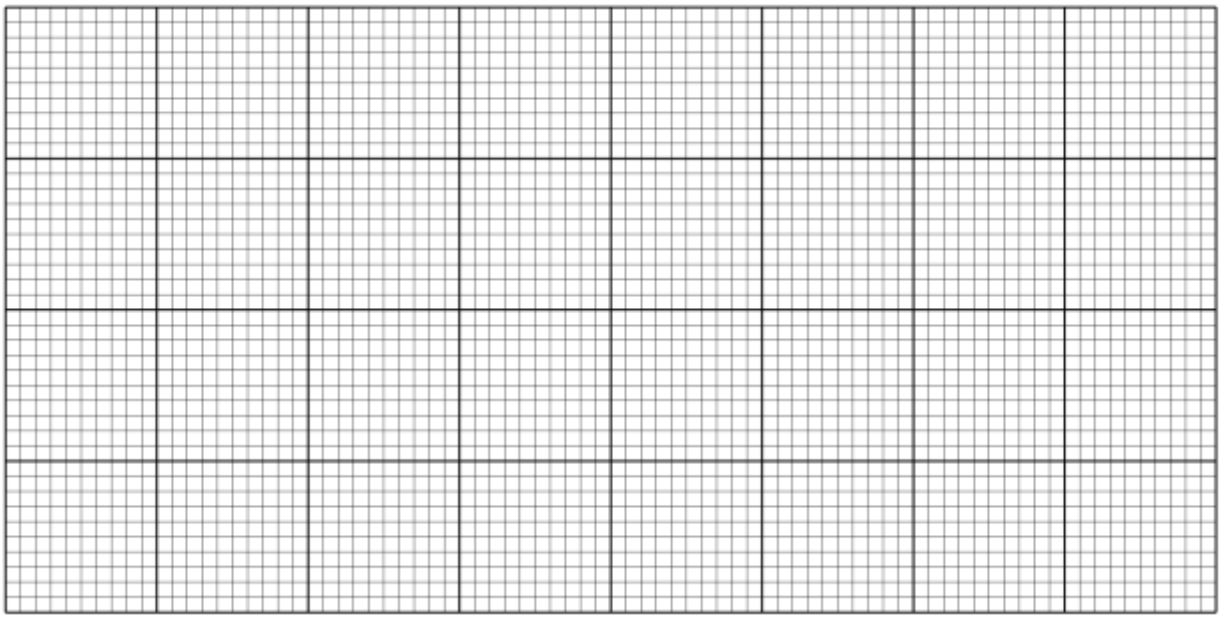
(d) State the ratio in which E divides $\boldsymbol{AD}$ **(1 mark)**

23. The table below shows the age groups and number of people tested of Covid-19 in a health care facility

Age Group	10 – 19	20 – 29	30 – 39	40 – 49	50 – 59	60 – 69	70 - 79
Number of patients	7	12	16	25	15	22	4

(a) Calculate the mean age of the patients tested **(4 marks)**

(b) On the grid provided, draw a histogram to represent the information above **(3 marks)**



(c) On the histogram in (b) above, draw a straight line to show where the median age lies. **(3 marks)**

24. (a) In 2011, the total cost of manufacturing an article was Kshs.3,750 and this was divided between the cost of material, labour and transport in the ratio 14: 8: 3. In 2014 the cost of the material was doubled, labour cost increased by 30% and transport costs increased by 20%.
Calculate the cost of manufacturing the article in 2014. **(6 marks)**

(b) For the same article in (a) above, the cost of manufacturing in 2015 was Kshs. 6,672 as a result of increase in labour costs only. Find the percentage increase in labour cost of 2015. **(4 marks)**

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