Name: ..... Class: ..... Adm.No.....

School: ..... Date: .....

121/2

MATHEMATICS

PAPER 2

TIME: 2 ½ HOURS

M O K A S A J O I N T E X A M I N A T I O N - 2020

Kenya Certificate to Secondary Education

MATHEMATICS (PAPER 2)

TIME: 2 ½ HOURS

Instructions

- *Write your name, class, admission number, school, date and signature in spaces provided above.*
- *The paper contains **two** sections **A** and **B.***
- *Answer **all** questions in section **A** and **any five** questions from section **B** in the spaces provided below each question.*
- *Show all the steps in your calculations giving your answers at each stage in the spaces below each question.*
- *Non-programmable silent electronic calculator and mathematical tables may be used except where 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

17	18	19	20	21	22	23	24	Total

SECTION 1

1. Use logarithms to 4 decimal places to evaluate: (4 marks)

$$\left(\frac{2.345 \times \sqrt{0.1356}}{84.92}\right)^{\frac{1}{3}}$$

2. The sides of a rectangle are given as 4.5 cm and 2.5 cm. Calculate the percentage error in its area. (3 marks)

3. Rationalize the denominator in the following $\frac{3\sqrt{3}}{2\sqrt{3-3\sqrt{2}}}$ (3mks)

4. Solve for x *and* y in the simultaneous equations using matrices method. (4mks)

$$2x + 3y = 7$$

$$y - x = 2$$

5. Solve the equation below by completing the square. $5 - 9x - 2x^2 = 0$ (2 mks)

6. The distance from a point X to the centre of a circle is 12 cm. If the diameter of the circle is 12cm, Calculate the length of the tangent from X to the point of contact with circle hence calculate the area that lies outside the circle to four significant figures. (3mks)

7. Make r the subject of the formula (3marks)

$$p = \sqrt[3]{\frac{r+q}{r}}$$

8. Expand $\left(1+\frac{1}{2}x\right)^8$ up to the term x^3. Use your expansion to find the approximate value of $(1.05)^8$ correct to 2 decimal places. (3 mks)

9. The sum of the first ten terms of an arithmetic Progression is 400.If the sum of the first 6 terms of the same series is 120, find the 15^{th} term . (3mks)

10. Solve for x (3marks)

$5^{2x} - 5^{x} - 12=0$

11. The position vectors of points X and Y are $X = 2\boldsymbol{i} + \boldsymbol{j} - \boldsymbol{k}$ and $Y = 3\boldsymbol{i} + 2\boldsymbol{j} - 2\boldsymbol{k}$ respectively. Find $/\boldsymbol{XY}/$. (3 marks)

12. The equation of a circle is $x^2 - 8x + y^2 + 12y + 16 = 0$. Determine the coordinates of the centre of the circle and its radius. (3mks)

13. A vendor mixed grade 1 rice and grade 2 rice in the ratio 1:3 to form a mixture which she sold at sh.105 making a profit of 40%.Given that the cost price of grade 2 rice is sh.80 per kg. Find the cost price of 1kg grade 1 rice. (3marks)

14. If ½ $Sin(2x + 30) = 0.4216$, find x for $-180^0 \leq x \leq 180^0$. **(3 marks)**

15. The volume V of a cylinder of base radius r and height h varies jointly as h and r^2. If $V=352cm^3$, when h=7cm and r=4cm, find r to 1 decimal place, when $V=905.1428cm^3$ and h=8cm. (3mks)

16. Calculate the variance of the following distribution (4marks)

x	5	7	9	11	13
f	2	4	8	6	4

SECTION II

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

17. The table below shows monthly income tax rates.

Monthly taxable pay (K£)	Rate of tax ksh. Per £
1 – 342	2
343 – 684	3
685 – 1026	4
1027 – 1368	5
1369 – 1710	6
1710 and above	7

Mr. Onyando who is a civil servant earns a monthly basic salary of ksh. 20,000 and is provided with a house at a nominal rent of kshs. 700 per month.

a) Taxable pay is the employee's salary plus 15% of basic salary less nominal rent. Calculate Mr Onyando's taxable pay in K£. (3 marks)

b) Calculate the total tax Mr. Onyando pays. (4 marks)

c) If Mr. Onyando is entitled to a personal tax relief of ksh. 600 per month, what is the payable tax? (1 mark)

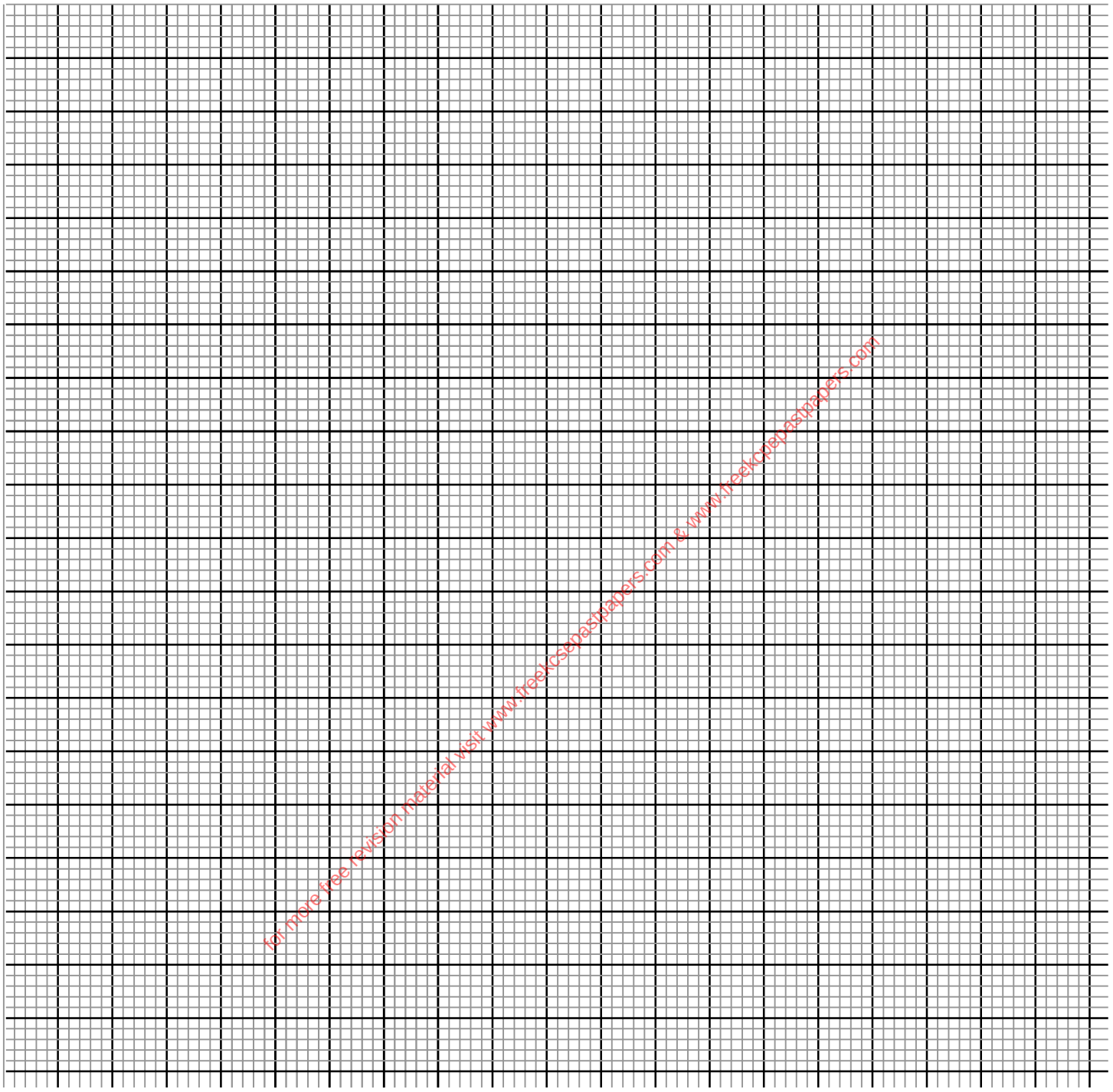
d) Mr. Onyando has the following deductions on his pay; loan repayment of ksh. 2100 per month, salary processing ksh. 200 and service charge at 2% of his basic salary. Calculate Onyando's net pay. (2 marks)

18. A trader wishes to buy some goats. A she-goat cost sh.900, while a he-goat cost sh.1500. He has to buy atleast 9 she-goats. He also has a space to hold atmost 20 goats and sh.21,000 to spend. Taking the number of he-goats bought to be x and the number of she-goats bought to be y.

a) Form all inequalities from the above information. (4mks)

b) Plot the inequalities above in the graph provided below (3mks)

c) If he makes a profit of sh.200 on each she-goat and sh.280 on each he-goat. How many goats of each type should he buy to maximize his profit. (3mks)



19. The acceleration a m/s^2 of an object moving in a straight line after t sec of motion is given by $a = 48t - 6$.

a)Given that the initial velocity was 5m/s;

i) Find the velocity of the object after 2sec of motion. (3marks)

ii) Find the displacement of the object after 3sec of motion. (3marks

b)A particle moving in a straight line is such that its distance from a fixed point 0 is given by $s = \frac{1}{3}t^3 - \frac{7}{2}t^2 + 6t + 5$ where t is the time in sec after the particle passes 0.Find the time when the particle is at rest. (4marks).

20. There are two examiners A and B marking a mathematics examination. After marking 10 scripts, examiner A marks 6 scripts accurately but deviates in the rest. Examiner B marks 7 scripts accurately out of 10 but deviates in the rest. Determine the probability that;

(a) Both will mark with deviations a given set of scripts. (2 marks)

(b) Only one will mark accurately. (2 marks)

(c) Both of the examiners will mark accurately a given set of scripts. (2 marks)

(d) At least one will mark accurately. (2 marks)

(e) At most one will mark accurately. (2 mark)

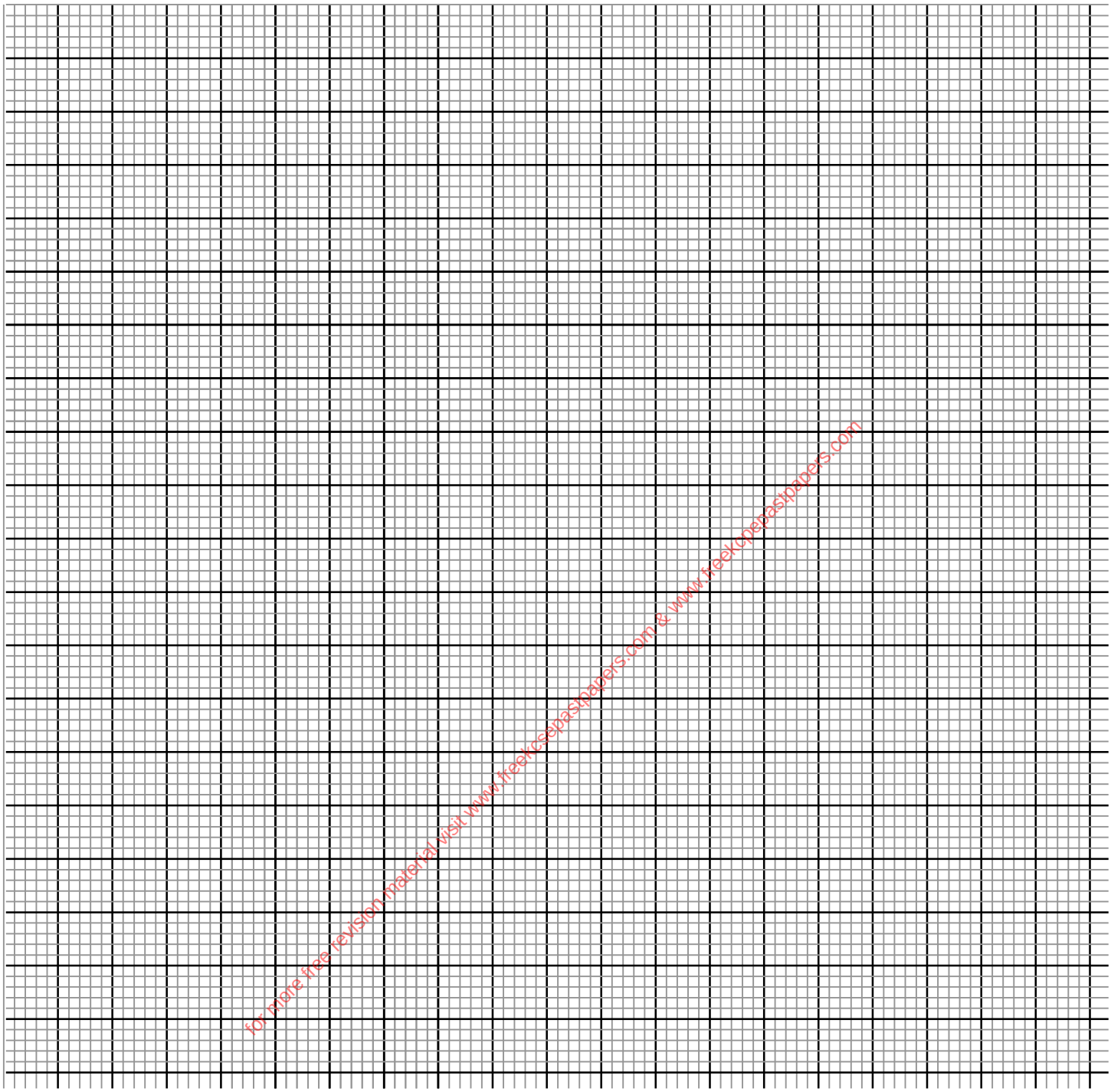
21. a) Complete the table below for the function $y = 2\sin(x + 20^0)$ and $y = \cos(x - 10^0)$ (2mks)

x^0	0	30	60	90	120	150	180	210	240	270	300	330	360
$y = 2\sin(x + 20^0)$	0.68	1.53						-1.53		-1.88			0.68
$y = \cos(x - 10^0)$	0.98			0.17							0.34		

b) Draw the graphs of $y = 2\sin(x + 20^0)$ and $y = \cos(x - 10^0)$ on the same axes (5mks)

c) i) Find the values of x for which $\cos(x - 10^0) = 2\sin(x + 20^0)$ (1mk)

ii) Find the Amplitude and period of each wave (2mks)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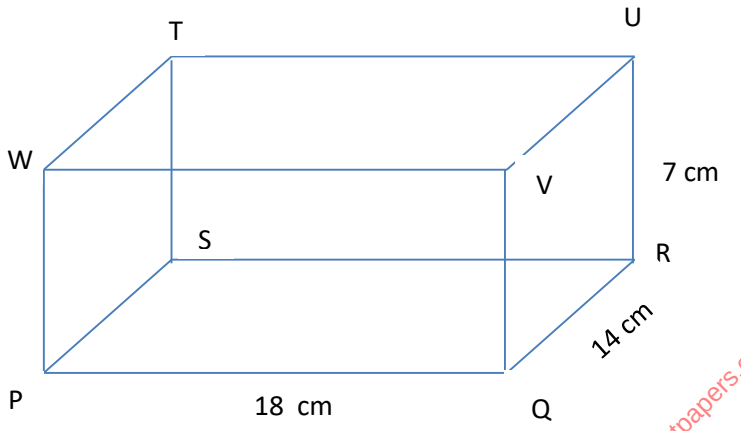
22. The figure below represents a cuboid in which PQ=18cm,QR=14cm and RU=7cm.



a)Name the projection of the line PU on the plane UVWT. (1mark)

b)Calculate correct to 1d.p

i)The size of the angle between PS and QU (2marks)

ii)The angle between the line QT and the plane PQRS (3marks)

iii)The angle between planes QWTR and QRUV (2marks)

d)point A is the midpoint of TU. Calculate the length QA, correct to 2d.p (2marks)

23. Two aircrafts A and B are at T (20^0N, 38^0E). Aircraft A flies 1800nm due South, then 1800mm due West to airport X. Aircraft B flies 1800nm due East then 1800nm due South to airport Y.

a) Determine the position of airport X and Y. (5 marks)

b) Find the distance between X and Y in nautical miles. (3 marks)

c) If the local time at T was 2 pm on Monday when the aircrafts left T. What was the local time at X? (2 marks)

24. (a) Draw a regular pentagon PQRST of sides 7cm. On it draw a line AR such that it is a line of symmetry to the figure. (4mks)

(b) Locate a point M on AR such that M is equidistant from P and Q, hence measure the shortest distance of M from TS. (2mks)

(c) Shade the region within the figure such that a variable X must lie, given that X satisfies the following conditions: (4mks)

(i) X is nearer to PT than to PQ.

(ii) RX is not more than 7.5cm.

(iii) Angle PXT is greater than 90^0.