

NAME:.....ADM NO:..... CLASS:.....
MATHEMATICS - PAPER 2 2020
FORM 4
TIME – 2 ½ HOURS

Instructions.

1. Write your name, adm no. and class in spaces provided above.
2. This paper consists of two sections: Section I and Section II.
3. Answer all questions in section I and any five questions from section II.
4. Show all the steps in your calculations, giving your answer at each stage in spaces provided below each question.
5. Marks may be given for correct working even if the answer is wrong
6. Non programmable silent electronic calculators and KNEC mathematical tables may be used, except where stated otherwise.

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

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*This paper consists of 16 printed pages .Candidates should check the question paper to
 Ensure that all the pages are printed as indicated and no question(s) are missing*

SECTION I (50MKS)

ANSWER ALL QUESTIONS IN THIS SECTION IN THE SPACES PROVIDED.

1. Without using a calculator, evaluate: $\frac{\frac{3}{4} + 1\frac{2}{7} \div \frac{3}{7} \text{ of } 2\frac{1}{3}}{\frac{2}{3} (1\frac{2}{7} - \frac{3}{8})}$ (3mks)

2. Use completing square method to solve the following quadratic equation (3mks)
 $(x + 1)(x + 3) = 13$

3. Evaluate: (4mks)
$$\frac{4 \times 6 + \frac{1}{25} \div 0.05 + \frac{1}{5}}{(-3) \div (-6) + (23) - 6 \text{ of } 3}$$

4. Find the equation of the tangent and the normal to the curve $y = 2x^3 - 3x^2 + 6$ at the point, (2,10) (4mks)

5. Tap A can fill a tank in 10 minutes, tap B can fill the same tank in 20 minutes. Tap C can empty the tank in 30mins. The three taps are left open for 5 minutes, after which tap A is closed. How long does it take to fill the remaining part of the tank? (4mks)

6. Solve the following trigonometric equation:
 $2\sin(x+30)^\circ = -0.7986$, for $0^\circ \leq x \leq 360^\circ$. (3mks)

7. Differentiate $y=(x+2)(x-1)$ with respect to x . (2mks)

8. Find all the integral values of χ which satisfy the inequalities.

$$\chi + 8 > 4\chi - 6 \geq 3(4 - \chi)$$

(3mks)

9. Solve for x in the equation.

$$\text{Log}_{10}5 + \log_{10}(2x+10) = 2 + \log_{10}(x-4)$$

(3mks)

10. Given that $A = \begin{pmatrix} 4 & 3 \end{pmatrix}$ and $C = \begin{pmatrix} 14 & 7 \end{pmatrix}$ find B if

(3mks)

-1 2

-4 2

$$A^2 + B = C$$

11. A triangle ABC is such that $a = 14.30$ cm, $b = 16.50$ cm and $B = 56^\circ$. Find the radius of a circle that circumscribes the triangle. (3mks)

12. The fifth term of an arithmetic progression is 11 and the twenty-fifth term is 51. Calculate the first term and the common difference of the progression. (3mks)

13. A quantity P is partly constant and partly varies as the square of Q. When $Q=2$, $P=40$ and when $Q=3$, $P=65$. Determine the value of P when $Q=4$. (4mks)

14. A shopkeeper mixes sugar costing sh. 40 per kg with another type which costs sh. 60 per kg. find the ratio in which the two types should be mixed so that if a kilogram of the mixture is sold at sh. 55, a profit of 10% is realized. (3mks)

15. Truncate 561.7 to: (2mks)
- a. 3 significant figures

b. 2 significant figures.

16. Simplify leaving your answer in surd form.

$$\frac{1+3\sqrt{2}}{1-\sqrt{3}}$$

(3mks)

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SECTION II (50MKS)

Answer any five questions from this section in the spaces provided.

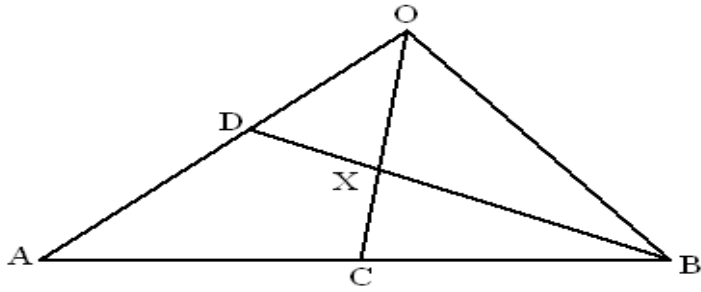
17. The parents of a certain mixed secondary school decided to buy a school van worth Ksh. 900,000. Each student was to contribute the same amount of money. 50 students were transferred from the school; as a result, each of the remaining students had to pay Ksh. 600 more.

a. Find the original number of students in the school (5mks)

b. Find the percentage change in contributions per student. (3mks)

c. If the ratio of boys to girls in the school was 11:7, Find the amount of money contributed by boys alone. (3mks)

18. In the figure below C is a point on AB such that $\vec{CA} = 3\vec{CB}$ and D is the mid-point of OA. OC and BD intersect at X. Given that $\vec{OA} = a$ and $\vec{OB} = b$



a. Write down in terms of a and b the vectors.

i. \vec{AB}

(1mk)

ii. \vec{OC}

(2mks)

iii. \vec{BD}

(1mk)

b. If $\vec{BX} = h\vec{BD}$, express \vec{OX} in terms of b and h

(1mk)

c. If $\vec{OX} = k\vec{OC}$, find h and k .

(4mks)

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d. Hence express OX in terms of a and b only. (1mk)

19. The displacement of a particle after t seconds is given by $S=40t^3 - t^2 - 3t + 3$

Find the:

a. Velocity of the particle when $t=2$ (3mks)

b. Acceleration of the particle when $t=3$ (3mks)

c. The instant at which the particle is at rest. (2mks)

d. The instant at which the acceleration of the particle is zero. (2mks)

20. The table below shows the distribution of the wages in a week for 40 employees in a certain factory:

Wage (ksh)	800-899	900-999	1000-1099	1100-1199	1200-1299
No. of workers	3	40	25	9	3

- a. Using Kshs. 1049.5 per week as the assumed mean wage, calculate:
- The mean for the grouped wages. (3mks)

- The standard deviation of the wages. (4mks)

- b. Estimate the median wage. (3 mks)

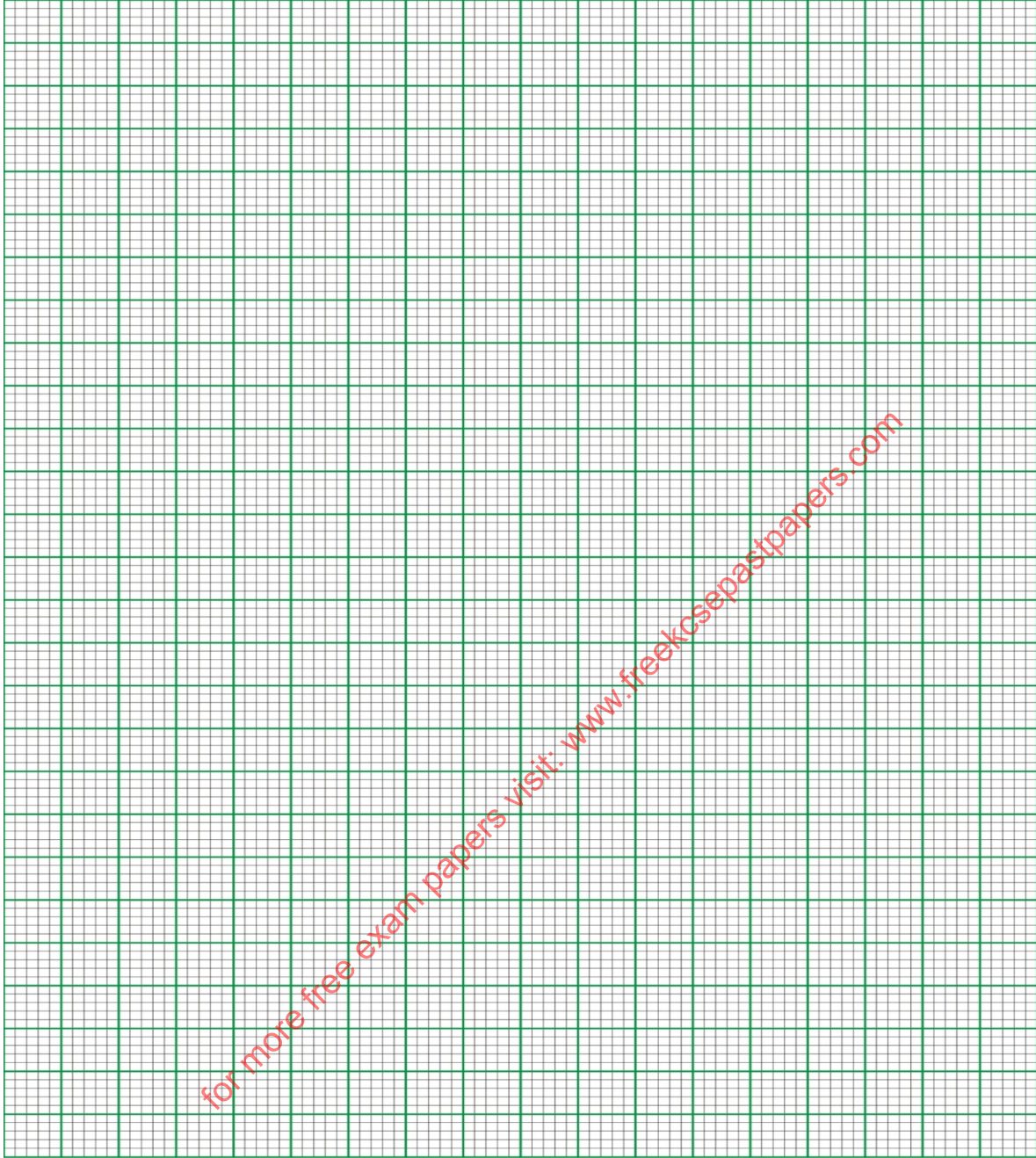
21. The vertices of triangle PQR are P(1,1) Q(4,1) and R (5,4). A transformation represented by a matrix $T = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$ maps triangle PQR onto triangle P'Q'R'. A second transformation represented by $U = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ maps triangle P'Q'R' onto triangle P''Q''R''.

a. On the grid provided, draw the three triangle PQR (1mrk)

b. Draw triangle P'Q'R' (3mks)

c. Draw triangle P''Q''R'' (3mks)

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- d. Describe a single transformation which maps triangle PQR onto triangle $P''Q''R''$ and find its matrix. (4mks)

22. A ship sails from port X(20°N , 60°E) northwards to port Y (45°N , 60°E). It then sails due west to port R(45°N , 15°W). It further covered a distance of 2500nm due west from R to S along the same parallel of latitude.

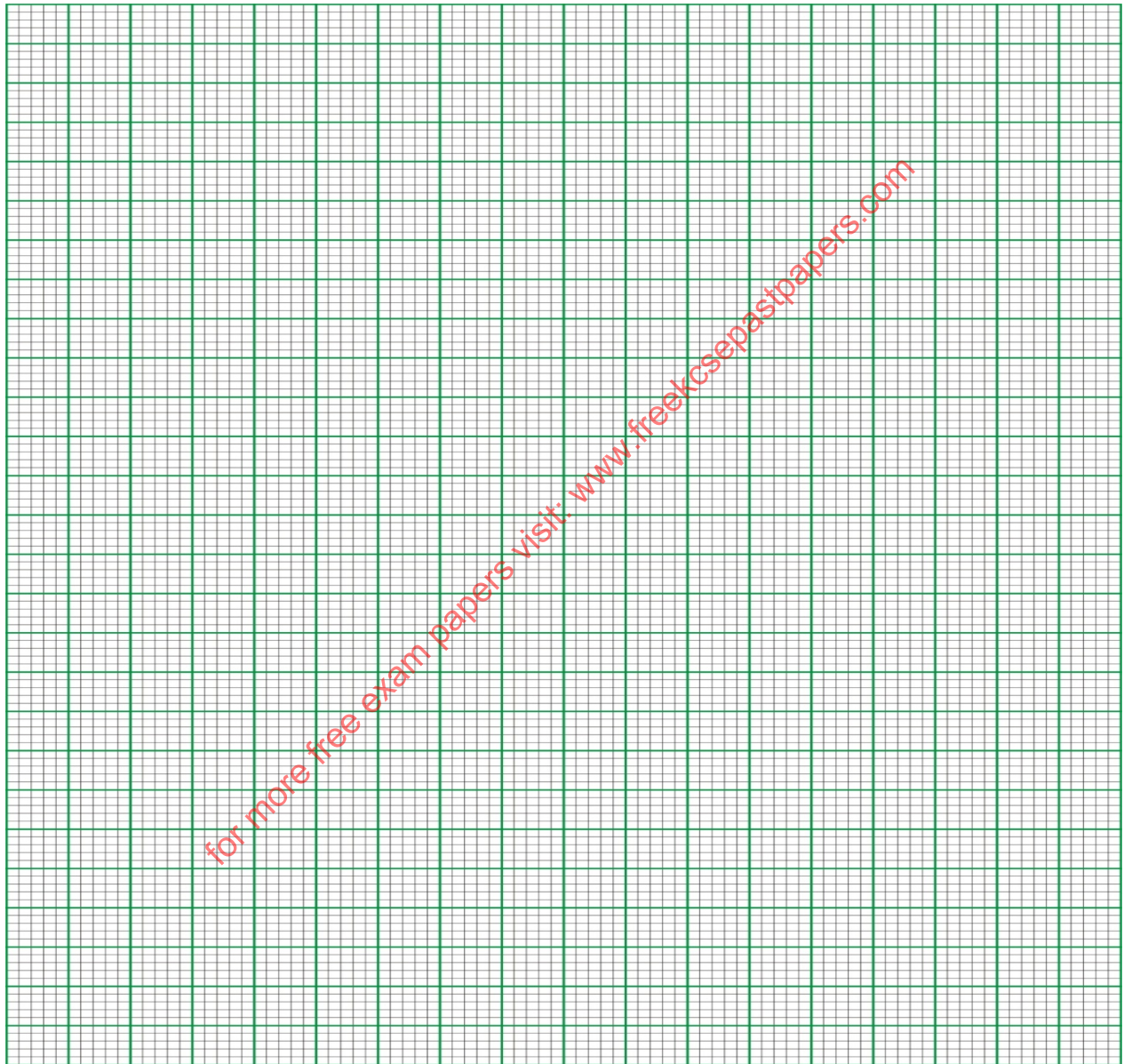
Calculate:

- a. The average speed in knots if the whole journey took 45 hours. (Give the answer correct to 4 s.f) (6mks)

- b. Determine the position of S. (4mks)

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23. Draw the graph of $y = \sin(2x + 30)^\circ$ for $0^\circ \leq x \leq 360^\circ$. using an interval of 30° . (6mks)



c. By including a suitable straight line, use graph to solve:

i. $\sin(2x + 30)^\circ = 0.8$ (2mks)

ii. $\sin(2x + 30)^\circ - \frac{1}{2} = 0$ (2mks)

24. A line, L1, passes through the points (3,3) and (5,7). Find the equation of L1 in the form $y=mx+c$ where m and c are constants. (3mks)

e. Another line L2 is perpendicular to L1 and passes through (-2,3) find:

i. The equation of L2. (3mks)

ii. The x-intercept of L2 (1mk)

f. Determine the point of intersection of L1 and L2. (3mks)

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