

FORM 3 END OF TERM 1 EXAM

MATHS PAPER 2-2020

1. This paper consists of two sections. Answer all the questions in section 1 and any **5** questions in section 2.
2. KNEC mathematical tables and non-programmable calculators may be used when necessary
3. Answer all the questions in the spaces provided.

Section 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	total

Section 2	17	18	19	20	21	22	23	24	total

Grand total

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SECTION 1

Answer all the questions in this section

1. Evaluate
$$\frac{36 - 8 \times -4 - 15 \div -3}{-3 \times -3 - 8(-6 + -2)}$$
 (3mk)

2. Simplify
$$\frac{a+b}{2} - \frac{2a-b}{3}$$
 (3mk)

3. Find the greatest number which divides 181 and 236 and leaves a remainder of 5 in each case (2mk)

4. A rectangle measures 20cm by 15cm. If each dimension is increased by 2.5cm, by what percentage is

a) the perimeter of the rectangle increased (2mk)

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b) the area of the rectangle is increased (2mk)

5. The angle of elevation of the top of a tree from a point P on horizontal ground is 30° . From another point Q 8 metres from the base of the tree, the angle of elevation of the top of the tree is 48° .

a) Calculate to one decimal place the height of the tree. (1mk)

b) Calculate the distance between P and Q (2mk)

6. Given that $\cos \theta = -0.8070$, find θ for $0 \leq \theta \leq 720$ (3mk)

7. A piece of wire 40cm is bent to form a right-angled triangle whose hypotenuse is 17cm long. Find the lengths of the other two sides of the triangle (4mk)

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8. Solve for x in $\log 5 - 2 + \log(2x+10) = \log(x-4)$ (3mk)

9. Solve the quadratic equation by completing of squares giving your answer to 3sf

$$11x^2 - 13x + 3 = 0 \quad (4mk)$$

10. Rationalize the denominator and simplify

$$\frac{4\sqrt{5} + 3\sqrt{2}}{2\sqrt{2} - \sqrt{5}} \quad (4mk)$$

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11. Use a calculator to work out

a) $\sqrt[4]{\frac{186 \times 120}{490 \times 211}}$ (1mk)

b) $\sqrt[3]{\frac{62^2 - 270}{91 \times 4693}}$ (1mk)

12. A tourist from Kenya left for Ethiopia. He exchanged sh 9898 into Ethiopian Birr at the rate of 1 Eth. Birr = ksh 7.95. He spent $\frac{3}{4}$ of the money he got and converted the balance back to Kenyan money at the rate of 1 Eth. Birr = ksh 7.98. Calculate what he finally got to 2dp (3mk)

13. Simplify the expression

$$\frac{9t^2 - 25a^2}{6t^2 + 19at + 15a^2} \quad (3mk)$$

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14. Three types of tea costing sh203,sh146 and sh197 per kg are blended in the ratio of 2:5:k. Find the value of k,if the blend when sold at sh221 per kg gives 30% profit (3mk)

15. A two digit number is such that 4 times the units digit exceeds the tens digit by 1. If the digits are reversed, the number formed is decreased by 45. Find the number. (3mk)

16. A triangular field has dimensions 21m by 52m by 47m.

a) calculate the area of the field to the nearest m^2 . (2mk)

b)calculate the length of a straight ditch dug from the largest angle meeting the opposite side at right angles. (1mk)

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SECTION 2

Answer any 5 questions in this section

17. A bookseller bought a number of cartons of books at a cost of ksh 57600 from Kagumo bookstore. Had he bought the same books from Kerugoya bookstore, it would have cost him ksh 480 less per carton. This would have enabled him to buy 4 extra cartons of books for the same amount of money. By taking x to be the number of cartons of books he actually bought;

a) write an expression in x

i) for the cost of each carton he bought at Kagumo bookstore (1mk)

ii) for the cost of each carton had he bought from Kerugoya bookstore (1mk)

b) find the value of x (6mk)

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c)the bookseller later sold all the books he had bought each carton at ksh 720 more than he had paid for it. Determine the percentage profit he made (2mk)

18. A cylindrical metal bar of diameter 14cm and length 2m is melted and moulded into spherical balls. In the process, 5% by volume of metal is lost and what remains makes balls of radius 3.5cm.

a)calculate the volume of metal used to make the balls. (3mk)

b)find to the nearest whole number the number of balls made (3mk)

c)find the total surface area of the metal bar (2mk)

d)find the total surface area of the balls made (2mk)

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19.a) Draw the graph of $y=(2x-3)(x-1)$ for the interval $-2 \leq x \leq 4$ (6mk)

b)use your graph to solve

i) $2x^2-5x+3=0$ (1mk)

ii) $2x^2=3x+2$ (3mk)

20. a)Plot triangle ABC with coordinates A(1, 1), B(3, 1) and C(1,3) (1mk)

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b) Plot $A'B'C'$ the image of ABC under an enlargement scale factor 2 centre A and write down its coordinates (2mk)

c) Plot $A''B''C''$ the image of $A'B'C'$ under a reflection in the line $x+y=0$ and write down its coordinates (3mk)

d) $A''B''C''$ is then reflected in the line $y=0$ to give $A'''B'''C'''$. Give the coordinates of $A'''B'''C'''$ (2mk)

e) Describe fully a rotation that maps $A'''B'''C'''$ onto $A'B'C'$ (2mk)

21 Three business ladies Wanjiku, Muthoni and Njoki decided to buy a lorry. The marked price of the lorry was 2.8 million shillings. The dealer agreed that the ladies could pay a deposit of 60% of the marked price and the rest to be paid within a year. The ladies raised the deposit in the ratio of 3:2:5 respectively. At the end of the year the lorry had realized 2.08 million shillings which the three shared in the ratio of their contribution. However, they were required to contribute for the balance of the lorry from these earnings again in the ratio of their original contributions.

a) calculate amount to be paid as deposit (1mk)

b) how much did each contribute to pay for the deposit? (3mk)

c) how much did Njoki receive at the end of the year? (1mk)

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d) calculate the total amount Muthoni and Njoki contributed to pay for the balance. (3mk)

e) how much money did Wanjiku remain with after paying her share of the balance? (2mk)

22.a) Make a table and draw the graph of $y = \sin x - \cos x$ for x in the range $0^\circ \leq x \leq 360^\circ$, with y values to 2dp and x intervals of 30° (6mk)

b) use the graph to find the value of y when

i) $x = 75^\circ$ (1mk)

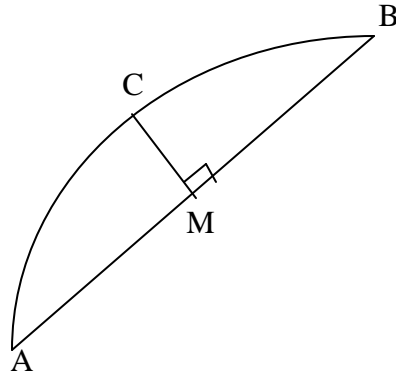
ii) $x = 255^\circ$ (1mk)

c) find the values of x for which $y = -0.9$ (2mk)

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23. The figure below is a segment of a circle centre O radius r units. CM is the perpendicular bisector of AB.



Given that $CM=1\text{cm}$ and $AB=2\sqrt{3}\text{cm}$,

a) calculate the radius of the circle centre O from which the segment was cut (3mk)

b) calculate the angle that chord AB subtends at the centre of the circle (2mk)

c) hence calculate

i) the length of arc ACB (2mk)

ii) the area of the segment AMBC (3mk)

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24. A rectangular sheet of metal which measures 120cm by 0.8m is 1.5mm thick and is made of material whose density is 2.2 g/cm^3 . From each of the four corners of the rectangle, a square of side 10cm is cut off and the remaining part folded to form an open cuboid.

a) calculate

i) the capacity of the cuboid in cm^3 to the nearest whole number (3mk)

ii) the mass of the empty cuboid in kg to the nearest whole number (3mk)

b) the cuboid is filled with a liquid whose density is 0.75 g/cm^3 . Calculate the mass in kg of the cuboid when full of the liquid (2mk)

c) calculate the mass of metal lost in kg (2mk)