

FORM FOUR TERM ONE EXAM 2017

MATHEMATICS
Paper 2
Time: 2¹/₂ Hours

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4. Make h the subject of the formula (3mks)
 $q = \frac{l+rh}{l-hr}$

5. Three types of sugar P,Q and R are mixed in the ratio of 2:3:5. The cost per Kilogram of each type of sugar P,Q and R were Ksh.120, Ksh.100 and Ksh.80 respectively. Calculate;
(a) The cost of one kg of the mixture (2mks)

(b) The selling price of 2kg of the mixture given that the mixture was sold at 18% profit (1mk)

6. Given that matrix $\begin{pmatrix} 2 & 1 \\ 3 & 4 \end{pmatrix}$, find matrix B such that $A^2-B=A$ (2mks)

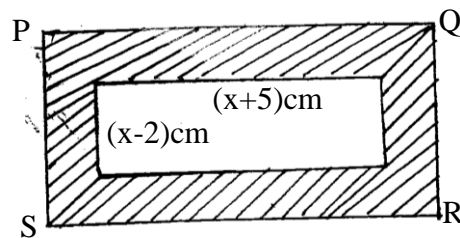
7. Simplify $\frac{2}{2^{\frac{2}{3}}} - \frac{2}{2^{\frac{2}{3-2}}}$ and express your answer in the form of $a\sqrt{b}$. State the values of a and b.
(Express a and b in the simplest form. (3mks)

8. Solve the equation $2 \cos 3t + 60^\circ = -0.5$ for $0^\circ \leq t \leq 180^\circ$ (3mks)

9. The cost C of producing N items varies partly as N and partly as the inverse of N. to produce two items it costs Ksh.135 and to produce three items it costs Ksh.140. find the constant of proportionality and hence write the equation connecting C and N. (4mks)

10. (a) Expand the expression $\left(1 - \frac{x}{3}\right)$ (2mks)

11. PQRS is a rectangle whose area 170cm^2 . The internal rectangle measures $(x+5)\text{cm}$ by $(x-2)\text{cm}$.

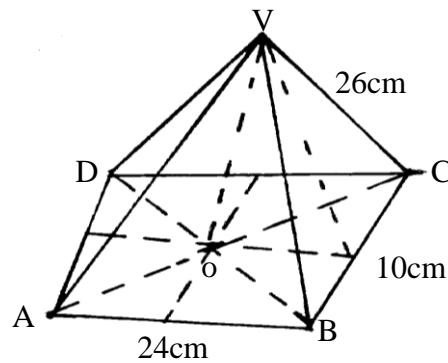


Determine the area of the shaded part if the thickness of this part is $0.1x\text{ cm}$ (4mks)

12. The equation of a circle is given by $x^2 + y^2 - 5y = 0$ Find the radius and the centre of the circle. (3mks)

13. Vector $\vec{OA} = 6\vec{i} - 2\vec{j} + 3\vec{k}$ and $\vec{OB} = -2\vec{i} + 3\vec{j} - \vec{k}$. A point C divides AB in the ratio of 3:1. Find AC in terms of \vec{i} , \vec{j} and \vec{k} (2mks)

14. In the figure below, $VABCD$ is a right pyramid on a rectangular base. Point O is vertically below the vertex, V . $AB=24\text{cm}$, $BC=10\text{cm}$ and $CV=26\text{cm}$.



Determine the angle between plane BCV and the base $ABCD$

(3mks)

15. Determine the equation of a line passing through $(-1,3)$ and parallel to the line whose equation is $3x - 5y = 10$ (3mks)

16. Two taps P and Q can each fill an empty tank in 3 hours and 6 hours respectively. A drainage pipe R can empty the full tank in 5 hours. Taps P and R are opened for 5 hours then closed
- (a) Determine the fraction of the tank that is filled after these five hours (2mks)

- (b) Find how long it would take to fill the remaining fraction of the tank if all the three taps are now opened (2mks)

SECTION II: (50 MARKS)

Answer only five questions from this section in the spaces provided

17. Income rates for income earned were charged as follows

Income in Ksh.p.m	Rate in Ksh.per Ksh.20
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1- 84,000	2
8,401-18,000	3
18,001-30,000	4
30,001-36,000	5
36,001-48,000	6
48,001- and above	7

Mr. Wandera a civil servant earns a basic salary of Ksh.30,000. His house allowances is Ksh.12,000 per month. Other allowances are commuter allowance of Ksh.2,500 and medical allowance of Ksh.3500. he is entitled to a family relief of Ksh.1240 per month. Determine;

(a) (i) His taxable income per month (2mks)

(b) His net tax per month (5mks)

(c) In addition, the following determines deductions are made:

NHIF Ksh.250

Service charge Ksh.150

Loan repayment Ksh.6,000

Co-operative shares Ksh.2,6000

Calculate his net salary per month (3mks)

18. The probability that it rains on a certain day is 0.8. if it rains the probability that Onguti comes to school late is 0.7 but otherwise it is 0.4. if he comes to school late, the probability that he fails an exercise is 0.8 but if he comes early the probability of failing an exercise is 0.3

(a) Draw a tree diagram to represent this information (2mks)

(b) Use of a tree diagram to find;

(i) the probability that it rains, he comes to schools early and he fails the exercise (2mks)

(ii) the probability that he passes his exercise (2mks)

(iii) the probability that he comes to school late (2mks)

(iv) The probability that he comes to schools late and he passes his exercise (2mks)

19. The table below shows marks scored by 42 students in a test

Marks	25-34	34-44	45-54	55-64	65-74	75-84	85-94
No. of students	2	5	16	9	5	2	1

(a) State the modal class and modal; frequency for the data above (2mks)

(b) Using the assumed mean of 59.5, Calculate;

(i) The mean (3mks)

(ii) The variance (4mks)

(iii) The standard deviation (1mk)

20. The table below shows some values for two function, $y = 3 \cos \frac{x}{2}$ and $y = 5 \sin(\frac{x}{2} + 30)$

X	0	30	60	90	120	150	180	210	240	270	300	330	360
$3 \cos (x/3)$	3.00	2.90		2.12	1.50	1.78		-0.78	-1.50		-2.60		-3.00
$5 \sin (x/2+30)$	2.50	3.54	4.33		5.00	4.83		3.54	2.50	1.29		-1.29	

(a) Complete the table above, giving your answer to 2d.p (2mks)

(b) On the grid provided draw the graphs of : (5mks)

$$y = 3 \cos \frac{x}{2} \text{ and } y = 5 \sin(\frac{x}{2} + 30) \text{ for } 0^\circ \leq x \leq 360^\circ$$

(c) From the graph determine;

(i) the amplitude and period of the wave $y = 3 \cos(\frac{x}{2})$ (2mks)

(ii) The values of x for which $3 \cos \frac{x}{2} - 5 \sin(\frac{x}{2} + 30^\circ) = 0$ (2mks)

21. The product of the first three terms of a geometric progression is 64. If the first term is a and the common ratio is r ;

(a) Express r in terms of a (3mks)

(b) Given that the sum of the three terms is 14,

(i) Find the value of a and hence write down two possible sequences each up to the 4th term (5mks)

(ii) Find the product of the 5th terms of the two sequences (2mks)

22. A triangular PQR has vertices at P(5,5), Q(10,15) and R(15,5)

(a) Find the coordinates of the points P' , Q' and R' the images of P, Q and R respectively under a transformation, M whose matrix is $\begin{pmatrix} -0.6 & 0.8 \\ 0.8 & 0.6 \end{pmatrix}$ (2mks)

(b) Represent ΔPQR and its image $\Delta P'Q'R'$ on the same Cartesian plane (2mks)

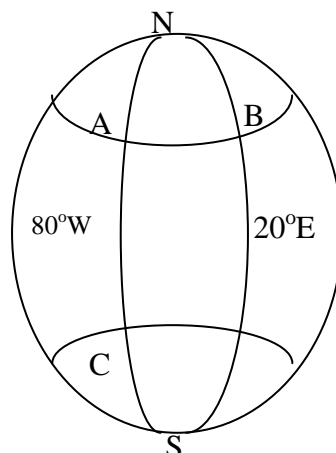
(c) Triangle P'' , Q'' and R'' is the image of P' , Q' and R' under a reflection in the y-axis

(i) Draw $\Delta P''Q''R''$ on the same grid in (b) above and state the co-ordinates of the vertices (2mks)

(ii) Describe fully a single transformation that maps ΔPQR onto $\Delta P''Q''R''$. (2mks)

(iii) Determine a 2×2 matrix representing the transformation in c (ii) above (2mks)

23. Study the globe of the earth below and use it to answer the questions below



D

(a) State the co-ordinates of **A** and **D** (2mks)

(b) Calculate in km the distance between A and C through B. (Take $\pi = \frac{22}{7}$ and the radius of the earth as 6370km) (3mks)

(c) State the local time at D if the time at C is Monday 8.00am (2mks)

24. A textile factory produces two types of materials P and Q. Materials P requires 3kg of cotton wool and materials Q requires 2.5kg of cotton wool. The factory requires not more than 600kg of cotton wool daily to produce both materials. The number of type Q materials is less than twice the number of type P materials plus 80. It must produce not more than 100 materials of type P material and not less than 100 materials of type Q material each day. Using the number of type P materials as x and the number of type Q materials as y

(a) Write down the four inequalities from this information (4mks)

(b) Represent these inequalities on a Cartesian plane

(4mks)

(c) If the factory makes a profit of sh.80 on material P and a profit of sh. 60 on material Q, how many materials of each type must be produced in order to maximize the total profit.

(assume that all the material produced are sold the same day)

(2mks)