

NAME _____ CLASS _____ ADMNO _____

ALLIANCE HIGH SCHOOL
END OF TERM 1 FORM 4 MATHEMATICS 2016

2HR 30MINS

SECTION 1 : ANSWER ALL QUESTIONS IN THIS SECTION

1. Evaluate: $\frac{1}{2} \left\{ \frac{3}{5} + \frac{1}{4} \left(\frac{7}{3} - \frac{3}{7} \right) \right\}$ of $1\frac{1}{2} \div 5$. (3 Marks)

2. Find the limits within which the area of a parallelogram whose base is 8cm and height is 5cm lies. Hence find the relative error in the area. (4mks)

3. A cylinder of radius 14cm contains water. A metal solid cone of base radius 7 cm and height 18 cm is submerged into the water. Find the change in height of the water level in the cylinder. (3 mks)

4. Find the equation of the perpendicular line that passes through the midpoint of a line whose ends are C (-7, 3) and D (3, -8). (3 marks)

5. Five pupils A, B, C, D and E obtained the marks 53, 41, 60, 80 and 56 respectively. The table below shows part of the work to find the standard deviation.

Pupil	Mark X	$X - \bar{X}$	$(X - \bar{X})^2$
A	53	-5	
B	41	-17	
C	60	2	
D	80	22	
E	56	-2	

- (a) Complete the table. (1mks)
- (b) Find the standard deviation (3 mks)
6. Town X is east of town Y where town Y is (15°N , 3°W). The local time at X is 1.00am when the local time at Y is 6.00pm. Find the position of town X. (3mks)
7. Solve for θ for $0^\circ \leq \theta \leq 360^\circ$ in the equation $3\cos^2 \theta - 2 = 2\sin \theta$. (3mks)

8. $\mathbf{OA} = 3\mathbf{i} + 4\mathbf{j} - 6\mathbf{k}$ and $\mathbf{OB} = 2\mathbf{i} + 3\mathbf{j} + \mathbf{k}$. P divides a line AB in the ratio 3:-2. Write down the coordinates of P. (3mks)
9. Solve for x in the equation.
 $\log_5 5 + \log_{16} x = 3$ (2mks)
10. A train 20m long is moving at an average speed of 52km/hr. Another train 30m long is moving in the opposite direction at an average speed of 48km/hr. How long do the trains take to completely pass each other? Leave your answer in seconds. (3mks)
11. Find the value of m in the equation below. $\left[\frac{1}{27}\right]^m \times (81)^{-1} = 243$ (3mks)
12. Find the centre of enlargement in which point P(8,7) is mapped onto point P'(5,5) (3 Marks)

13. (a) complete the table below for the curve $y = 3x(4-x)$ for $x = -3$ to $x = 5$. (1mks)

x	-3	-2	0	2	4	5
y	-63	-36				-15

- (b) Hence use mid-ordinate rule with 4 strips estimate the area bounded by the curve, the x-axis and the lines $x = -3$ and $x = 5$. (2mks)

- 14 Simplify the expression $\frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ giving your answer in the form of $a+b\sqrt{c}$. (3mks)

- 15 The interior angle of a regular polygon is 150° . Determine the number of sides of the polygon. (2 mks)

16. Expand $(x - \frac{1}{2x})^6$ upto the fourth term and state its constant term, hence use the first four terms to solve $(9.95)^6$ to (4 s.f) (4mks)

SECTION II: ANSWER FIVE QUESTIONS FROM THIS SECTION

17. (a) three years ago, Otieno was four times older than his sister Akinyi. In two years time, the product of their ages will be 38.5 years. Calculate their present ages. (4marks)

(b) A school ordered books worth Ksh. 28,000 priced at Ksh. X each. Because of the number involved the supplier reduced the price of each book by Ksh. 10 and the school finally decided to spend Kshs. 27,300 on the books.

- (i) Write down two expressions for the number of books originally ordered and the number of books finally obtained. (2marks)

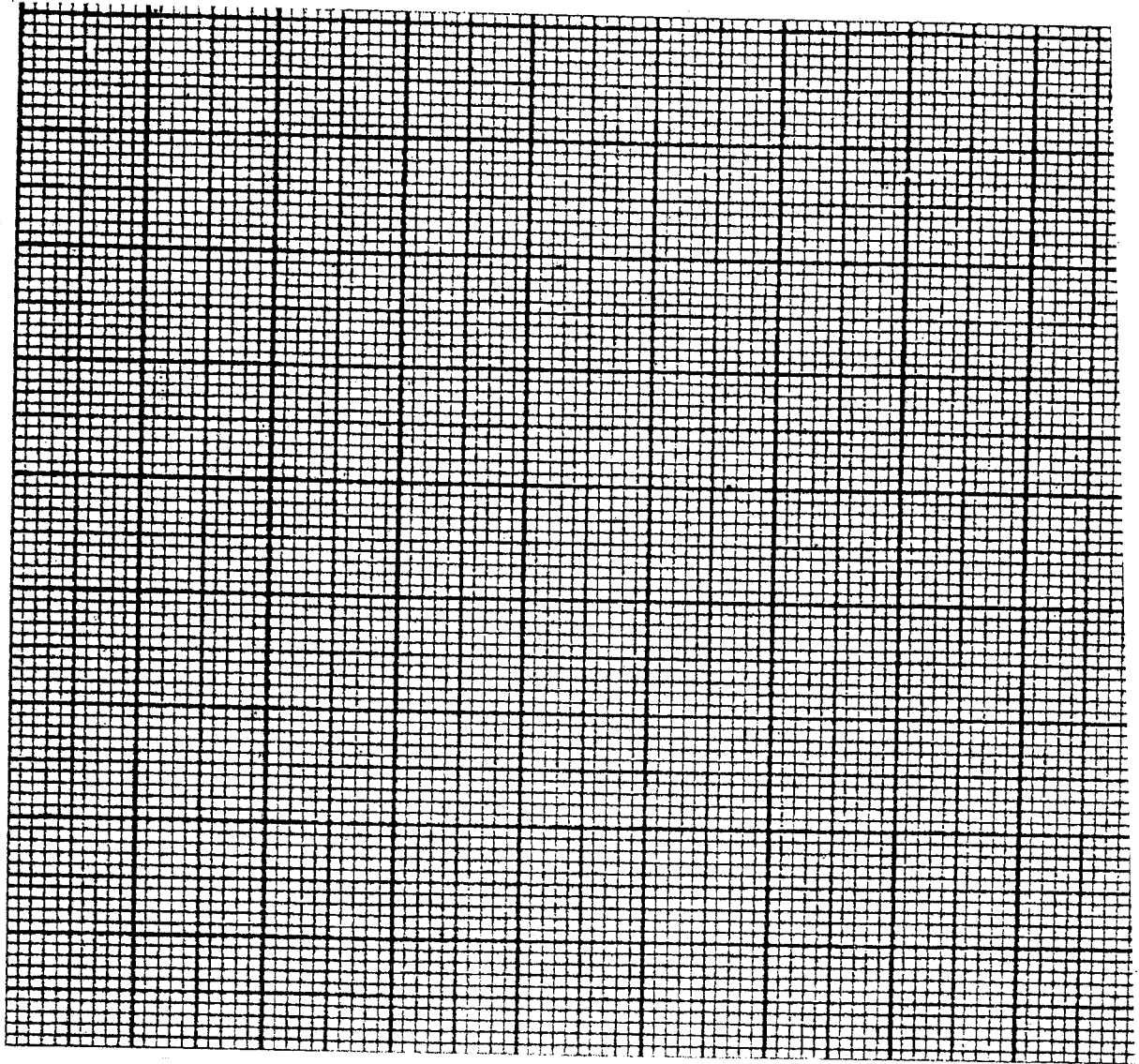
- (ii) If the number of books finally obtained was 10 more than the first, write down the equation which X must satisfy. Hence find the price at which the school bought the books. (4 marks)

18. Boeing 707 plane flies from Nairobi to South Africa It has 600m^2 of cabin space and can 5000kg of luggage. An economy class passenger gets 3m^2 of space is allowed 20kg of luggage. A first class passenger gets 4m^2 of space and is allowed 50kg of luggage. There must be at least 50 economy class passengers.

Let x be the number of economy seats and y be the number of first class seats

(i) List down four inequalities that satisfy these conditions.

(4mks)



(ii) Use the grid provided below to represent the region where x and y must lie. (4mks)

(iii) The profit per flight from an economy seat is sh.4000 and from a first class seat is sh.10000 Use your graph to determine the allocation of seats which will give maximum profit.

(2mks)

19 Using a ruler and a pair of compasses only:

- (a) Construct a triangle ABC in which $AB = 7.4\text{cm}$, $AC = 8.2\text{cm}$ and angle $BAC = 45^\circ$. (2mks)
- (b) On the same diagram, construct triangle ACD such that D and B are on the opposite sides of line AC, D is equidistant from A and C and $BD = 8.5\text{cm}$. Measure AD. (2mks)
- (c) Draw the locus of Q which passes through C and is parallel to BD. (1mk)
- (d) The normal from C meets BD at N. Mark the points M_1 and M_2 on the locus of Q such that $M_1N = M_2N = 7\text{cm}$. Measure the lengths M_1M_2 and CN. (3mks)
- (e) Find the area of triangle BM_1M_2 . (2mks)

20. Two teams Simba and Nyati are playing a volley ball game. The winner is the first team to either two consecutive games or a total of three games. The probability of Simba winning in game is $\frac{3}{5}$ while that of nyati winning any game is $\frac{2}{5}$.

(a) Draw a tree diagram to show the possible wins (2mks)

(b) Find the probability that

(i) The game ends after only two games (2mks)

(ii) Nyati wins (3mks)

(iii) Simba plays three games to win (1mks)

(iv) Five games are played to determine the winner (2mks)

21. (a) Water flows through a pipe of radius 8cm at a rate of 5 m/s. how long does the pipe take to fill a tank of 2,164,200 liters. Answer to the nearest hour. (3mks)

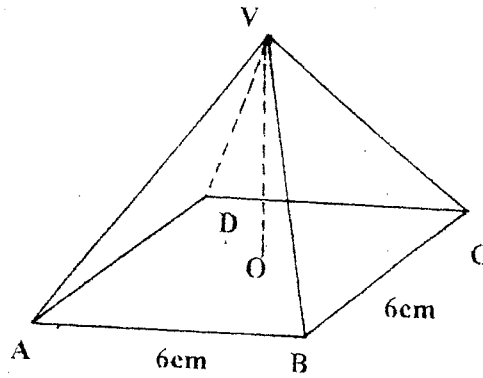
(b) Three hundred and sixty litres of a homogeneous paint is made by mixing three paints A, B; and C. The ratio by volume of paint A to paint B is 3:2 and paint B to paint C is 1:2. Paint A costs sh. 180 per litre, paint B sh.240 per litre and paint C sh. 127.50 per litre. Determine:

(i) The volume of each type of paint in the mixture. (3mks)

(ii) The amount of money spent in making one litre of the mixture. (2mks)

(ii) In what ratio should paint A and B be mixed if the mixer is to be sold at sh. 308 making a profit of 40% (2mks)

22. The figure below is a square based pyramid ABCDV with $AD=DC=6\text{cm}$, and height $VO=10\text{cm}$.



Find:

- (i) The angle between VA and ABCD (3mks)

- (ii) The angle between VC and AB (3mks)

- (iii) The angle between VDC and ABCD. (2mks)

- (iv) The angle between BCV and ADV (2mks)

23. (a) The gradient of the of the curve $y = ax^2 + bx$ at the origin is equal to 8. Find the value of a and b if the curve has a maximum turning point at $x = 4$. (3mks)

(b) A particle P moves in a straight line so that its velocity, V m/s at time t seconds where $t \geq 0$ is given by $V = 28 + t - 2t^2$. Find the time when P is instantaneously at rest. (2mks)

(c) Given that P passes through the point O of the line when $t = 0$. Find;

(i) Find the maximum distance attained. (3mks)

(ii) Find the distance covered by the particle during the 3rd second. (2mks)

24. A triangle T whose vertices are $A(2, 3)$, $B(5, 3)$ and $C(4, 1)$ is mapped onto triangle T_1 whose vertices are $A'(-4, 3)$, $B'(-1, 3)$ and $C'(X, Y)$ by a transformation M . find;

a) The transformation matrix represented by M .

(4 Marks)

b) Co-ordinates of C .

(2 Marks)

c) Triangle T_2 is the image of triangle T_1 under a reflection in the line $y = x$. Use the unit square to find the matrix representing this transformation hence the co-ordinates of T_2 .

(2 Marks)

d) Find a single matrix that maps T onto T_2 .

(2 Marks)