

MATHEMATICS ALT A

18th July, 2019

TIME: 2 ½ HRS



**ALLIANCE GIRLS' HIGH SCHOOL
FORM 3 2019 MID YEAR EXAMINATIONS**

Instructions to candidates

- (a) Write your name, and admission number in the spaces provided above.
- (b) The paper contains TWO Sections: Section I and Section II.
- (c) Answer ALL the questions in Section I and only five questions from Section II.
- (d) All answers and working must be written on the question paper in the spaces provided below each question.
- (e) Show all the steps in your calculations, giving your answers at each stage in the spaces below each question.
- (f) Marks may be given for correct working even if the answer is wrong.
- (g) Non-programmable silent electronic calculators and KNEC Mathematical tables may be used except where stated otherwise.
- (h) This paper consists of 15 printed pages.
- (i) Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
- (j) Answer all the questions in English.

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

Grand

Total

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SECTION 1: (50 MARKS)

Answer all questions in this section in spaces provided

1. Evaluate $\frac{-15 \div (-3) \times 4 - (-25)}{(4 - 9) + 10 \div 5 \times (-5)}$ (3 marks)

2. The size of an interior angle of a regular polygon is 108° . Find the number of sides of the polygon and hence the sum of its interior angles (3 marks)

3. Express 1728 as a product of its prime factors (1 mark)

Hence, find the value of x and y in $2^{x+1} \times 3^{y-1} = 1728$ (2 marks)

4. Find all the integral values of x which satisfy the inequality

$$3x - 6 \leq 9x + 3 < 3x + 33$$

(3 marks)

5. Evaluate without using mathematical tables or calculators

$$\frac{\sqrt{784}}{\sqrt[3]{343 \times 8}}$$

(3 marks)

6. Make r the subject of the formula

$$A = \sqrt[3]{\frac{mx^2r}{n-r}}$$

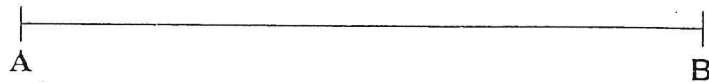
(3 marks)

7. Given that $\cos \theta = \frac{1}{\sqrt{3}}$, find without using tables or calculators the value of $\frac{\tan \theta + \sin \theta}{\cos \theta}$ in its simplest form, leaving your answer in surd form. (4 marks)

8. A British tourist left UK for Kenya with UK £ 6500. She converted the whole amount into Kenya shillings. While in Kenya, she spent Sh. 264,225. After one week, she left Kenya for Spain and converted the money she had to Euros. Using the conversion table below, calculate the amount she got in Euros. (3 marks)

	Buying (Kshs)	Selling(Kshs)
UK (£)	133.60	135.75
Euros(e)	106.95	109.85

9. Using a ruler and a pair of compasses only, construct a line AC such that $\angle BAC = 30^\circ$ Using line AC, locate a point P on the line AB such that AP: PB = 3: 2. (3 marks)



10. Simplify the expression

$$\frac{3x^2 - 2xy - 8y^2}{9x^2 - 16y^2}$$

(3 marks)

11. (a) Expand $(1+x)^6$ up to the term in x^4

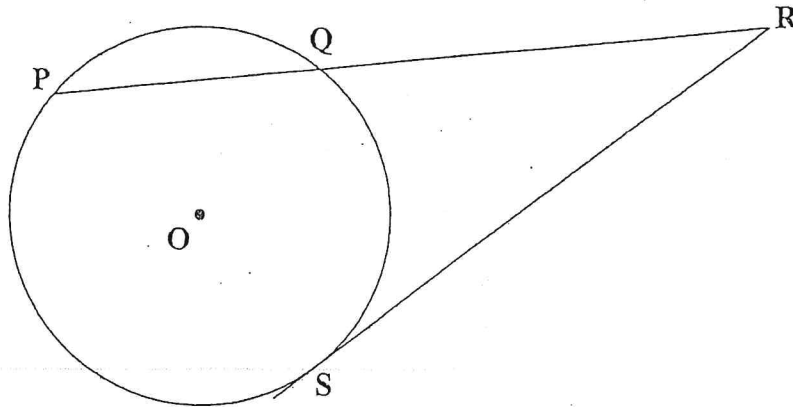
(2 marks)

(b) Use the expansion in (a) above to approximate the value of $(1.03)^6$, correct to 4 significant figures

(2 marks)

12. In the figure below, $QR = 4\text{ cm}$ and $RS = 6\text{ cm}$. Find PQ .

(2 marks)



13. The cash price of a fridge is Sh. 18000. Mary buys it on hire purchase by making a down payment of Sh. 7000 followed by 10 equal monthly instalments of Sh. 1800 each. Calculate the rate of compound interest charged. (3 marks)

14. Solve for x in the equation: $2\log x - \log(x+3) = 2\log 2$

(3 marks)

15. A straight line l_1 passes through points $(2,3)$ and $(4,k)$ and is perpendicular to another straight line l_2 whose equation is $2y - x - 2 = 0$. Determine:

(i) The value of k

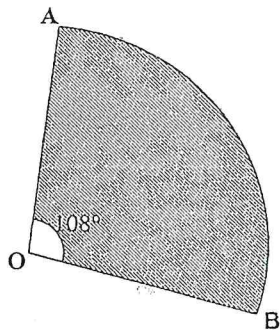
(2 marks)

(ii) The equation of line l_1

(2 marks)

16. The figure below shows a sector of a circle which subtends an angle of 108° at the centre. If the area of the sector is 46.2 cm^2 , calculate the arc length AB. (Take $\pi = \frac{22}{7}$)

(3 marks)



SECTION 11 (50 marks)

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

17. The table below shows the tax rates in Kenya in the year 2019.

Monthly income (Ksh)	Tax rate per shilling
0 - 9580	10%
9581-19160	15%
19161-28740	20%
28741-38320	25%
Above 383290	30%

An employee earns a basic salary of Sh 49000 per month. In addition she is given a house allowance of Sh 12000 and commuter allowance of Sh 6000. She is entitled to a personal relief of Sh 1162 per month. Calculate:

- (i) Her taxable income (2 marks)

- (ii) The total tax paid per month (6 marks)

- (iii) Other deductions on her monthly salary include; Sacco loan repayment of Sh 5000, Nhif: Sh 1300, W.C.P.S: Sh 600, sacco contributions : Sh 800.

Calculate her net salary per month. (2 marks)

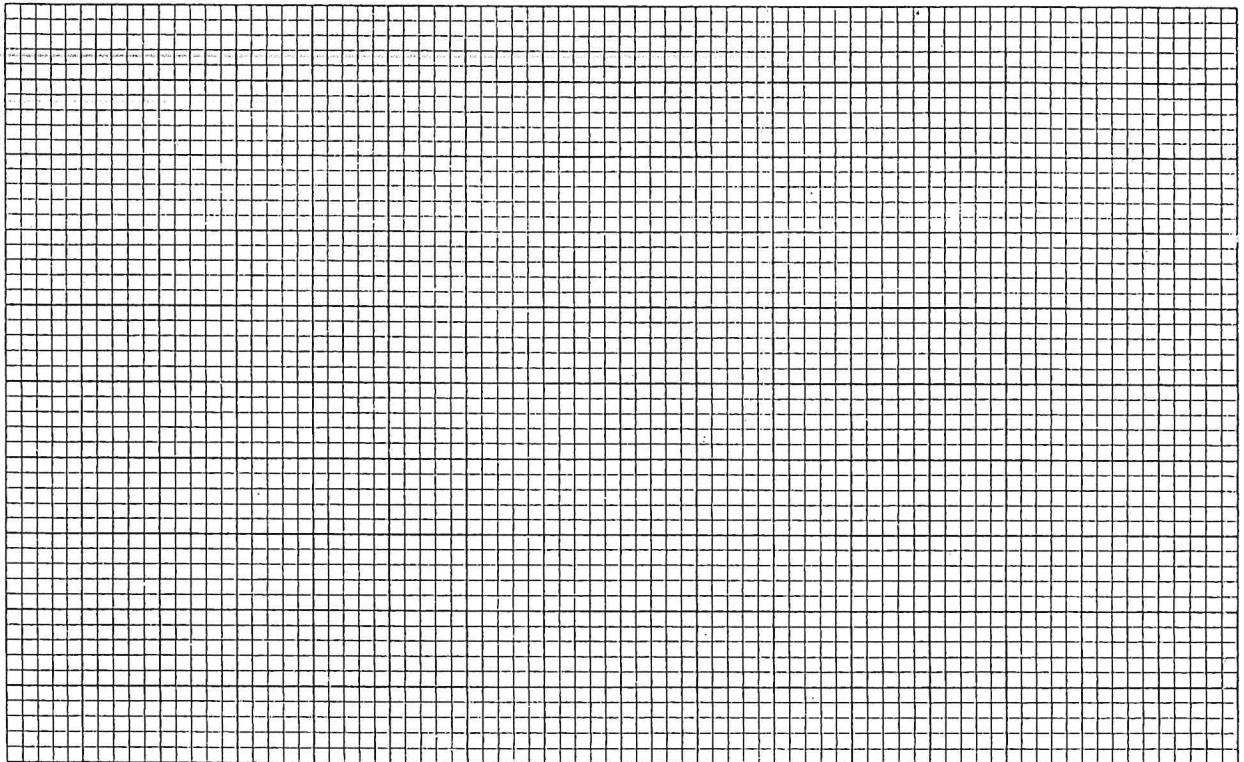
8. The frequency table below shows the heights of tree seedlings in a nursery.

Height (cm)	$0 \leq x < 5$	$5 \leq x < 15$	$15 \leq x < 25$	$25 \leq x < 45$	$45 \leq x < 75$
No of seedlings	5	34	45	30	6

On the grid provided,

- (a) Draw a histogram to represent the above information

(5 marks)



- (b)(i) State the class in which the median height lies

(1 mark)

- (ii) Draw a vertical line in the histogram, showing where the median height lies

(3 marks)

- (c) Using the histogram, determine the number of seedlings whose height is below 50 cm

(1 mark)

19. An amount of Ksh 24000 was to be divided equally among a group of girls as a reward for good performance. During the ceremony, it was realised that 4 girls had been left out on the list of awardees and they had to be included. This meant that each girl received Sh. 300 less than what they could have received originally.

(a) Write an expression in terms of x for the amount received by;

(i) Each girl originally

(2 marks)

(ii) Each girl after the 4 girls were added

(2 marks)

(b) Form an equation in x and hence determine the number of girls who received the money.

(6 marks)

20. A bag contains 3 blue balls, 5 green balls and 4 red balls. A ball is picked at random;

(a) Find the probability of picking:

(i) A blue ball (1mark)

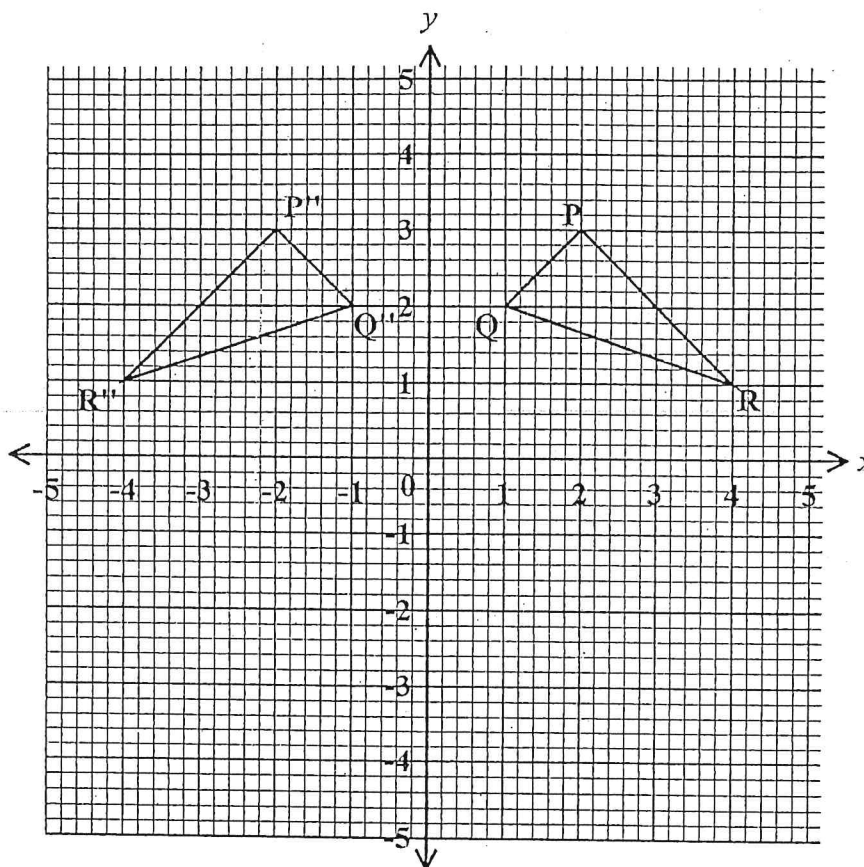
(ii) A green or a red ball (2marks)

(b) Two balls are picked at random, one at a time, without replacement. Find the probability that:

(i) A red ball and a blue ball are picked (3marks)

(ii) Both balls are of the same colour (4marks)

21. On the Cartesian plane below, triangle PQR has vertices $P(2, 3)$, $Q(1, 2)$ and $R(4, 1)$ while triangle $P''Q''R''$ has vertices $P''(-2, 3)$, $Q''(-1, 2)$ and $R''(-4, 1)$.



- (a) Describe fully a single transformation which maps triangle PQR onto triangle $P''Q''R''$. (2 marks)
- (b) On the same plane, draw triangle $P'Q'R'$, the image of triangle PQR under a reflection in the line $y = -x$ (2 marks)
- (c) Describe fully a single transformation which maps triangle $P'Q'R'$ onto triangle $P''Q''R''$ (2 marks)
- (d) Draw triangle $P'''Q'''R'''$ such that it can be mapped onto triangle PQR by a positive quarter turn about $(0, 0)$ (2 marks)
- (e) State two pairs of triangles that are oppositely congruent (2 marks)

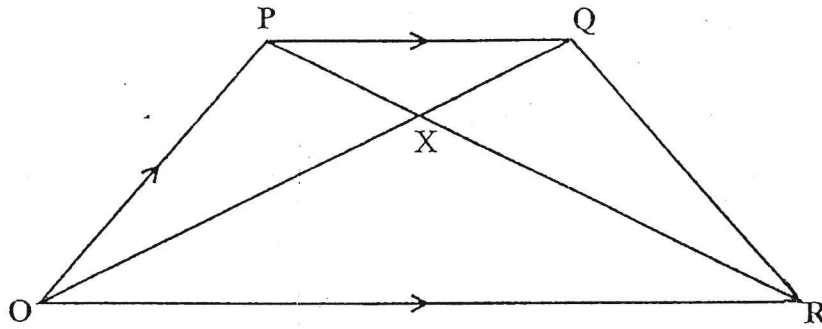
22. (a) An Arithmetic Progression is such that the first term is - 5, the last term is 135 and the sum of the Progression is 975. Calculate:

(i) The number of terms in the series. (4 marks)

(ii) The common difference (2 marks)

(b) The sum of the first three terms of a Geometric Progression is 27 and the first term is 36. Determine the common ratio and the value of the fourth term. (4 marks)

23. In the figure below, OPQR is a trapezium. PQ is parallel to OR and PQ is $\frac{3}{4}$ OR.



- (a) Given that $\vec{OP} = \mathbf{p}$ and, $\vec{OR} = \mathbf{q}$, express in terms of \mathbf{p} and \mathbf{q} :

(i) \vec{OQ}

(1 mark)

(ii) \vec{PR}

(1 mark)

(iii) \vec{QR}

(1 mark)

- (b) Lines OQ and PR intersect at point X such that $\vec{OX} = k \vec{OQ}$ and $\vec{PX} = h \vec{PR}$, where h and k are scalars. Express \vec{OX} in terms of;

(i) k, \mathbf{p} and \mathbf{q}

(1 mark)

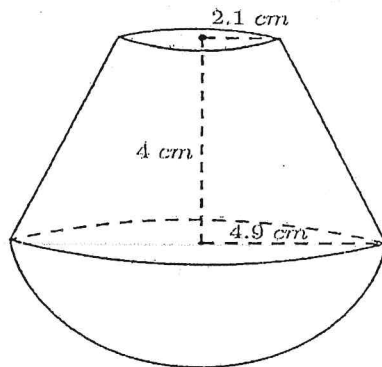
(ii) h, \mathbf{p} and \mathbf{q}

(1 mark)

(iii) Determine the values of h and k

(5 marks)

The diagram below represents a solid consisting of a hemispherical bottom and a conical frustum at the top.



(a) Determine the vertical height of the cone from which the frustum was cut. (2 marks)

(b) Calculate ; $\left(\text{Use } \pi = \frac{22}{7} \right)$

(i) The surface area of the solid (4 marks)

(ii) The volume of the solid (4 marks)