ALLIANCE GIRLS HIGH SCHOOL MOCK 2017
MATHEMATICS PAPER 1

Section 1 (50 marks)

*Answer **all** the questions from this section*

1. Without using tables or calculator, evaluate: (3 marks)

$$\frac{-8 \times 4 + 96 \div 4 \text{ of } (-42 + 30)}{(-5) - (-8) \times 2 + 6}$$

2. The following data shows the marks scored by 30 students in an exam

Marks	54	58	64	66	73	76
No of students	5	6	9	5	3	2

(a) State the mode (1 mark)

(b) Calculate the mean giving your answer correct to two decimal places (2 marks)

3. Use logarithms correct to 4 decimal places to evaluate

$$\sqrt[3]{\frac{0.3215 \times 1.439}{0.00485}}$$

(3 marks)

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4. Simplify (3 marks)

$$\frac{8a^2 - 2b^2}{2a^2 - 7ab + 3b^2}$$

5. Using a ruler, a pair of compasses and a set square, construct on the upper side of a line **BC**, 8cm long, a line **BD** such that $\angle \mathbf{DBC} = 37.5°$. Use the line **BD** to divide **BC** into 5 equal portions. (3 marks)

6. The marked price of a pair of shoes is Ksh. 2400. Nicky bought the shoes after being allowed a discount of 15%. By this, the store owner made a 20% profit. Determine how much the store owner paid for the shoes. (3 marks)

7. Mamba's clock gains 15 seconds every hour. He adjusted the time on his clock to read 1800hours on Friday. What will be the time on his clock when the correct time will be 0600hours on Wednesday the following week? (3 marks)

8. Solve for x in the equation
$$4\cos(2x - 30) = -2 \quad \text{for } 0^0 \le x \le 180^0$$
(3 marks)

9. The figure below is an incomplete sketch of a solid with a uniform cross-section. Complete the sketch showing the hidden edges with broken lines. (3 marks)
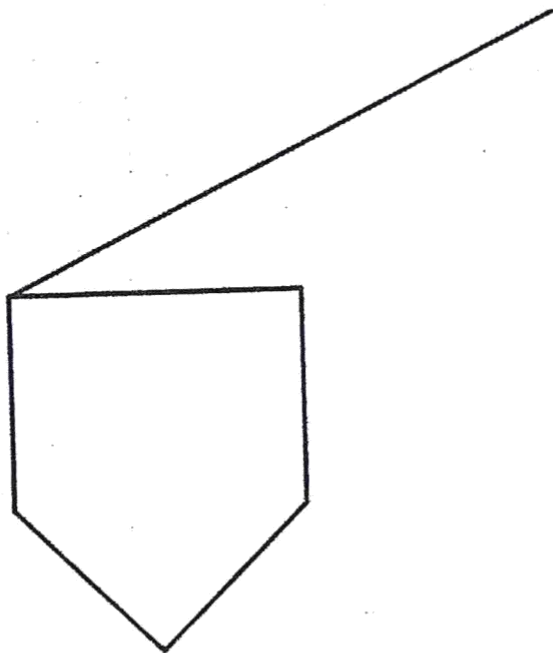
10. Express 1323 in the prime factor form

Hence solve for x and y in the equation
$$3^{y-1} \times 7^{x+1} = 1323$$
(3 marks)

11. The sum of the interior angles of a regular polygon is1440^0. Find the size of the exterior angle of the polygon.
(3 marks)

12. The gradient of a straight line L_1 passing through the points $P(3,4)$ and $Q(a,b)$ is $-\frac{3}{2}$. Another line L_2 is perpendicular to L_1 and passes through the points Q and $R(2,-1)$. Determine the values of a and b.
(3 marks)

13. A cylindrical solid of radius is 7cm and length 30cm floats lengthwise in water to a depth of 10.5cm as shown in the figure below.
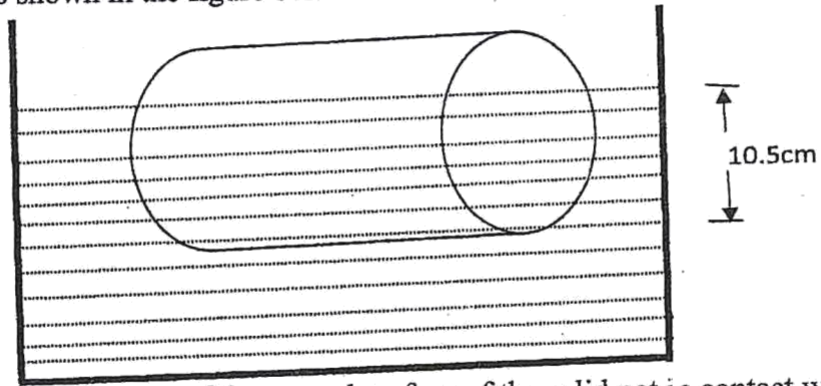

Calculate the area of the curved surface of the solid not in contact with water.

(Use $\pi = \frac{22}{7}$)   (4 marks)

14. Solve the inequalities $2x - 5 > -11$ and $3 + 2x \leq 13$ and represent the solution on the number line.   (3 marks)

15. An open rectangular container has internal dimensions; 35cm length, 30cm breadth and 25 cm high. The thickness of the material making the container is 10mm. Find the volume of the material used to make the container in cubic centimetres. (3 marks)

16. In the figure below(not drawn to scale), PS=PQ=19cm, $\angle PSQ = 47^0$, $\angle QRS = 58^0$ and $\angle SQR = 61^0$. Calculate the length of SR correct to 4 significant figures. (4 marks)
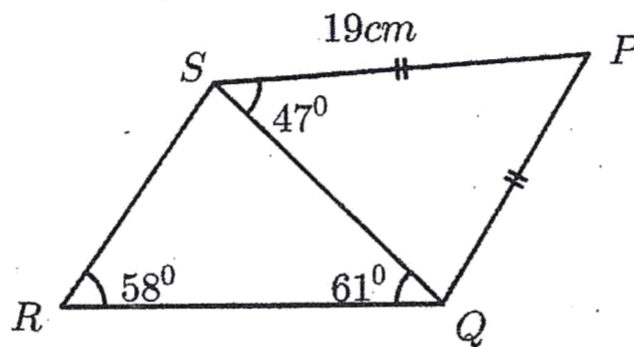
17. Mwajuma and Mwangi entered a partnership. They contributed Ksh. 120000 and Ksh. 150000 respectively. After 18 months of business, Njambi joined the partnership and contributed Ksh. 90000.

(a) Determine the ratio of their contribution after three years of business. (3 marks)

(b) After the three years, they realized a profit of Ksh. 510000. They agreed to set aside 30% of the profit to cater for the cost of running the business and share the rest as per their contributions. Determine the difference in Mwangi's and Njambi's share of the profit. (4 marks)

(c) Njambi then invested back her share into the business. Determine their new ratio of contributions at the end of the fourth year. (3 marks)

18. A women group decided to raise kshs 1 920 000 to start a bakery business. One commercial oven was costing kshs 320 000. Before the actual payment was made, four of the members pulled out and each of those remaining had to pay an additional ksh 80 000.

(a) If the original number of the group members was x, write down;

    (i)   An expression of how much each was to contribute originally.   (1 mark)

    (ii)   An expression of how much the remaining members were to contribute after the four pulled out.   (1 mark)

    (iii)   Determine the numbers who actually contributed towards the project.

                   (5 marks)

(b) After sometime, the members agreed to dissolve the business and sold all the commercial ovens to another group at a discount of 10% per oven. Calculate how much each member got after the sale.   (3 marks)

19. (a) given that $T^{-1} = \frac{1}{8}\begin{pmatrix} 12 & -4 \\ -7 & 3 \end{pmatrix}$ find the matrix T   (4 marks)

(b)Two ladies bought trouser suits and skirt suits from a boutique at Ksh x and sh y respectively: Jane paid Ksh 12,000 for 3 trouser suits and 4 skirt suits. Lucy paid Ksh 32,000 for 7 trouser suits and 12 skirt suits.

      (i) Form a matrix equation to represent this information   (2 marks)

      (ii) Use matrix method to find the cost of one trouser suit and one skirt suit
              (4 marks)

20. A bus leaves town **X** for town **Y** 240km away at an average speed of 60km/h at 8.00 am. Thirty minutes later a car leaves town **Y** and travels towards town **X** at an average speed of 80km/h.

(a) (i) Calculate the time when the bus met the car. (4 marks)

(ii) How far from X does the car meet the bus? (2 marks)

(b) At the point of meeting, the car develops a puncture and the driver stops for 45 minutes to replace the wheel. At what speed must the car travel so as to get to **X** at the same time the bus reaches **Y** (4 marks)

21. The diagram given below show triangle OAB. **OA** = **a**, **OB** = **b**. C divides **OA** in the ratio 2:3 and D divides **OB** in the ratio 3:4 while **AD** and **BC** meet at E.
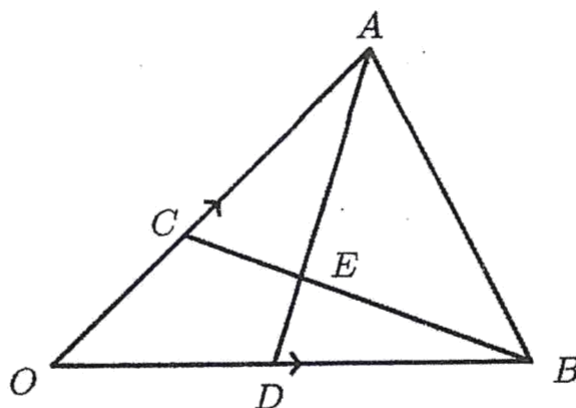
Find in term of a and b

    (a) (i) **AD**   (1 mark)

       (ii) **BC**   (1 mark)

    (b)   Given that **BE** = h**BC** and **AE** = k**AD** where h and k are scalars.
         (i) Write down two distinct expressions for **OE**   (2 marks)

         (ii) Hence find the values of h and k (5 marks)

   (iii) Find **OE** in terms of **a** and **b** only   (1 mark)

22. On the grid provided below draw the quadrilateral P(-3, 2), Q(-3, 6) R(-5, 4) and S(-5, 2)

(1 mark)
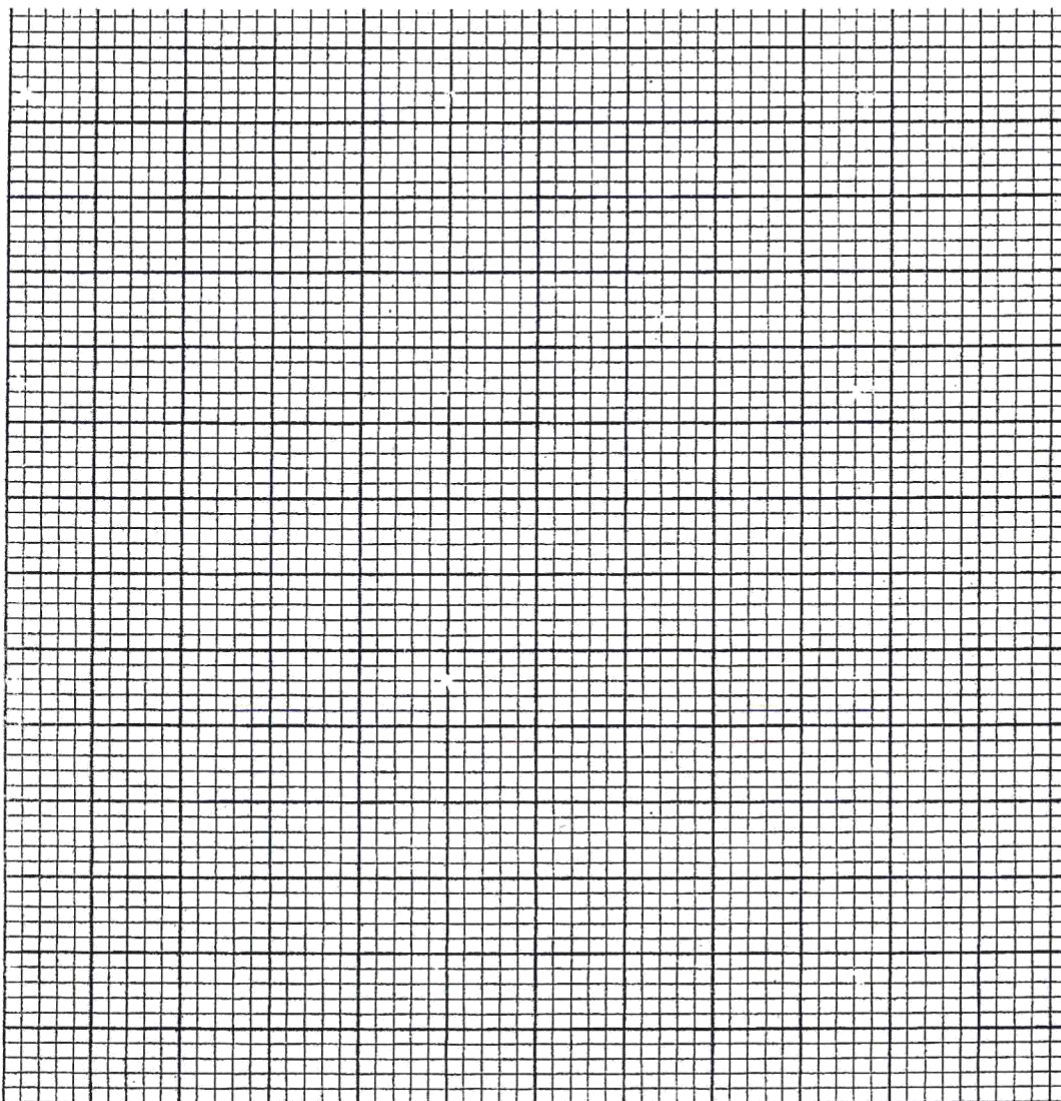
the same axes,

(a) Draw $P'Q'R'S'$ the image of PQRS under an enlargement scale factor -1 about (0, 0)

(2 marks)

(b) Draw $P''Q''R''S''$ the image of $P'Q'R'S'$ under a rotation -90^0 about (0, 0). State the coordinates of $P''Q''R''S''$

(3 marks)

(c) $P'''Q'''R'''S'''$ is the image of $P''Q''R''S''$ when reflected in the line $y + x = 0$. Draw $P'''Q'''R'''S'''$

(2 marks)

(d) State two pairs of the quadrilateral that are oppositely congruent

(2 marks)

23. The figure below is a plumb bob used by masons in building construction. It is a solid metal cylinder mounted on top of a cone. The dimensions are as shown below.
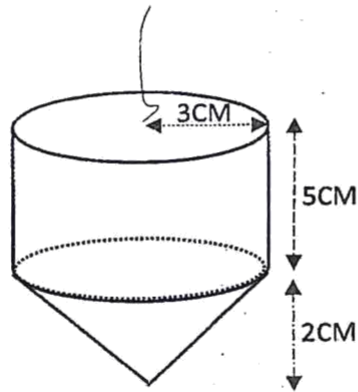
(a) Calculate correct to 2 decimal places;

(i) The volume of the plumb bob in cm^3 (4 marks)

(ii) The curved surface area of the plumb bob.   (3 marks)

(b) The plumb bob is melted down and recast into a solid sphere. Calculate the radius of the sphere correct 2 decimal places.   (3 marks)

24. Four points **P**, **Q**, **R** and **V** lie on the same plane on a ranch. Point **Q** is $850m$ on a bearing of 310^0 from point **P**. Point **R** is $1020m$ on a bearing of 075^0 from **Q**. Given that point **V** is directly South of **R** and East of **P**.

(a) Use a scale of 1cm rep. 100m to represent the relative positions of the four points on the ranch. (4 marks)

(b) From the scale drawing, determine

    (i)   The bearing and distance of point **P** from **R** (2 marks)

    (ii)   The bearing of point **Q** from **V** (1 mark)

(c) A road is to be constructed from point **Q** to the road joining **R** to **V**. Find

    (i)   The shortest distance of this road from **Q** to **RV**. (2 marks)

    (ii)   The distance from point **V** to the junction of the road in (c) above. (1 mark)