

COMPLIANT I
121/1
MATHEMATICS
PAPER 1
JULY /AUGUST 2019

SECTION 1 (50 MARKS)

Answer all the questions in this section in the spaces provided.

1. Using logarithms tables: Evaluate. (4 marks)

$$\sqrt{\frac{4.283 \times (0.009487)^2}{\log 18.94}}$$

2. Solve the inequality below. Hence represent the solution on a number line. (3 marks)

$$x < 2x + 7 \leq -\frac{1}{3}x + 14$$

3. The cost of mass production of cars is partly constant and partly varies as the number of cars produced. The total cost of making 400 cars is sh 3,740,000 and that of making 1000 cars is sh 7,100,000. Find the cost of making 2500 cars. (4 marks)

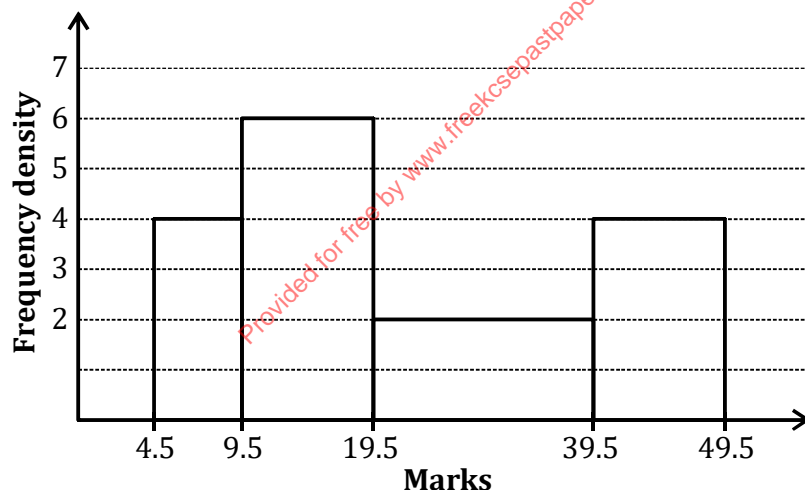
4. If $\cos \alpha = \frac{15}{17}$, find without using tables or calculator $\tan (180 - \alpha)$ (2 marks)

5. The difference between two positive integers is 5 and the sum of their squares is 73. Find the integers. (4 marks)

6. Find the value of x given that $\begin{pmatrix} 2x-1 & 1 \\ x^2 & 1 \end{pmatrix}$ is a singular matrix (3 marks)

7. Find the value of k in the equation $125^{k+1} + 5^{3k} = 630$ (3 marks)

8. The diagram below shows a histogram from marks obtained in a certain test.



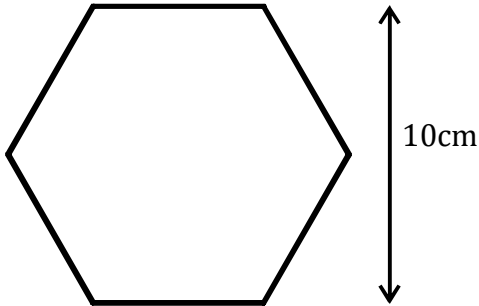
Develop a frequency distribution table for the data if the first class 5 - 9 has a frequency of 8. (3 marks)

9. Evaluate without using tables or a calculator. (3 marks)

$$\sqrt{\frac{(0.000125)^{\frac{1}{3}} \times 0.0049 \times 3.9 \times 10^3}{0.325 \times \sqrt{0.0036}}}$$

10. A cold water tap can fill a bath in 10 minutes, while a hot water tap can fill it in 8 minutes. The drainage pipe can empty it in 5 minutes. The cold water and hot water taps are opened for 4 minutes. There after, all the three taps are opened. Find how long it takes to fill the bath. (3 marks)

11. Two similar blocks have masses of 729g and 216g respectively. If the surface area of the smaller block is 300cm², calculate the surface area of the larger block. (3 marks)
12. An arc subtends an angle of 0.9 radians. If the radius of the circle is 13cm. Find the length of the arc.(2 marks)
13. The cross-section of a head of a bolt is the form of a regular hexagon as shown below.



Determine the area of the cross-section to 2dp

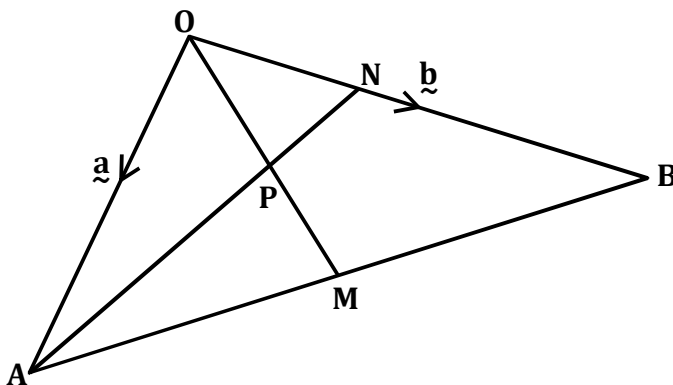
(4 marks)

14. The current price of a vehicle in sh 1,500,000, if the vehicle depreciate at a rate of 18% p.a. Find the number of years it will take for it's value to fall to sh 800,000 to the nearest years. (3 marks)
15. A truck left Kisumu to Mombasa a distance of 1000 km at 11.30 am on Monday at a speed of 60km/hr. On the way it stopped for $2\frac{1}{3}$ hours. At what time did it reach Mombasa. (3 marks)
16. A certain volume of methlylated spirit has a mass of 2.2kg. Given that the density of methlylated spirit is 0.8g/cm³ calculate the volume of the methlylated spirit in litres. (3 marks)

SECTION II (50 marks)

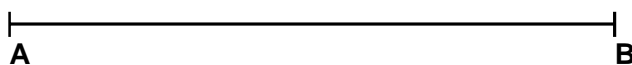
Answer any FIVE questions from this section in the space.

17. a) Solve the equation $\frac{y+3}{24} = \frac{1}{y-z}$ (4 marks)
- b) A square carpet is laid on the floor of a room so that one of its sides is against a side of a room. It leaves strips of uncovered floor 1.5m wide along the two opposite sides and 2m wide along the remaining side. If the area of the room is 72m². find
- i) the dimension of the carpet (5 marks)
- ii) the area of the uncovered floor. (1 mark)
18. In a triangle AOB, $\vec{OA} = \mathbf{a}$, $\vec{OB} = \mathbf{b}$. M is the mid-point of AB and N is c point on OB such that ON:NB = 1 : 2. AN and OM intersect at P.

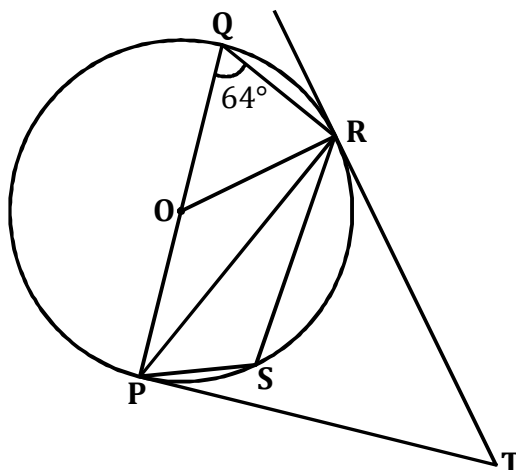


- a) Express in terms of \mathbf{a} and \mathbf{b} the vectors.

- i) AB (1 mark)
 - ii) OM (1 mark)
 - iii) AN (1 mark)
 - b) If $OP = sOM$ and $AP = tAN$, Express OP in two different ways and find the values of s and t . (6 marks)
 - c) Find the ratio $AP : PN$ (1 mark)
19. A truck left town X at 8.45am and travelled toward Y at an average speed of 50km/hr. A car left town X at 11.15am on the same day and travelled along the same road at an average speed of 90km/h. The distance between the two town is 420km.
- a) Calculate the time of the day when the car overtook the truck. (5 marks)
 - b) The distance from Y when the car overtook the truck. (2 marks)
 - c) After overtaking the bus, both vehicles continued towards Y at their original speeds. Find how long the car had to wait at town Y before the truck arrived. (3 marks)
20. On the line PQ below and on the same side of the line, use a ruler and compasses only to construct the following.
- a) Triangle PQR whose area is 20cm^2 and $\angle PRQ = 90^\circ$ (5 marks)
 - b) i) The locus of point Z such that $\angle PZQ = 45^\circ$. (2 marks)
 - ii) Locate the position of Z such that triangle PZQ has maximum area and calculate this area. (3 marks)



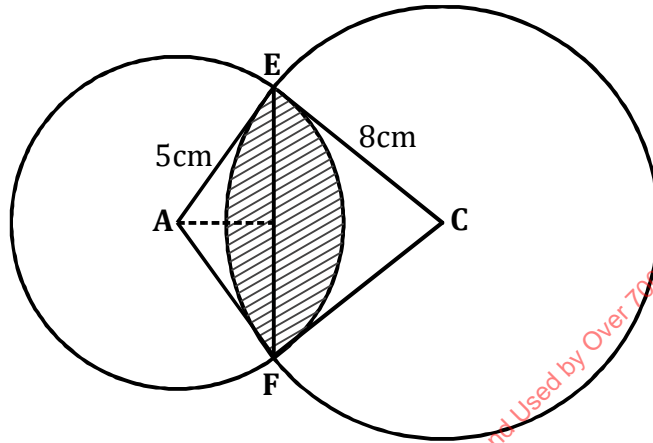
21. A closed cylindrical metal tin has radius r and height h . The capacity of the tin is 250π litres
- a) Express in term of r .
 - i) the height h of the tin. (2 marks)
 - ii) the total surface area of the tin. (2 marks)
 - b) i) Find the value of r for which the surface are of the metal used is to be minimum (4 marks)
 - ii) The minimum area of the metal used to make the cylinder. (2 marks)
22. A pirate boat sails from port A on a bearing of 050° at a speed of 112km/h, for $2\frac{1}{2}$ hours to port B. From port B it changes its course and travelled on a bearing of 170° at a speed of 75km/h for $2\frac{2}{3}$ hours toward part C. From C it travelled to port D. D is on a bearing of 130° and 160km from A.
- a) Using a scale of 1cm to represent 40km, Draw a diagram showing the positions of the ports A, B, C and D. (4 marks)
 - b) Use your drawing to find.
 - i) The distance CD (1 mark)
 - ii) The bearing of C from D (1 mark)
 - c) A marine police patrol leaves port A to intercept the pirate boat at M as it moves from B to C in the shortest time possible.
 - i) How far from A will the two boats meet at M. (2 marks)
 - ii) If the boats meets after 2 hours, what is the speed of the marine police boat. (2 marks)
23. In the figure below, P, Q, R and S are points on the circumference of the circle centre O. TP and TR are tangents to the circle at P and R respectively. POQ is a diameter of the circle and angle PQR = 64°



Giving reasons in each case, find the size of

- a) $\angle ROP$ (2 marks)
- b) $\angle PSR$ (2 marks)
- c) $\angle ORP$ (2 marks)
- d) $\angle TRP$ (2 marks)
- e) $\angle RTP$ (2 marks)

24. The figure below shows two intersecting circles with centres A and C, of radius 5cm and 8cm respectively. The common chord EF = 6cm



Calculate

- a) Angle EAF (2 marks)
- b) Angle ECF (2 marks)
- c) Calculate the common area between the two intersecting circles. (6 marks)

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COMPLIANT I

121/2

MATHEMATICS

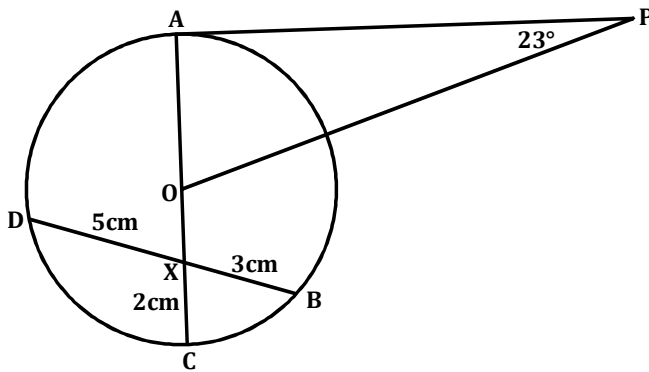
Paper 2

July /August 2019

SECTION 1 (50 MARKS)

Answer all the questions in this section in the spaces provided.

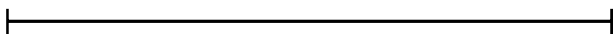
- Given that $\sin\theta = \frac{\sqrt{2}}{\sqrt{3}}$, find the value of $\frac{\tan\theta + \sin\theta}{\cos\theta}$ leaving your answer in form of $\sqrt{a} + \sqrt{b}$ (4 marks)
- The diagram below shows a circle centre O. AP is the tangent to the circle. Angle OPA is 23°. Find the length of the tangent. (4 marks)



- Solve for the value of x in $\frac{x}{3} - \frac{3x-6}{5} = \frac{x+2}{6}$ (3 marks)
- The equation of a circle is $x^2 + 4x + y^2 - 5 = 0$. Find the centre and the radius of the circle (3 marks)
- Given the vectors $a=3j + 2k$ and $b=4i - 7k$ and that $p = 3a - b$. Find the value of $|p|$ to 2 d.p. (3 marks)
- Solve for y in the equation $2\sin^2y - 1 = \cos^2 y + \sin y$. For values of $0^\circ \leq y \leq 360^\circ$. (3 marks)
- Make P the subject of the formula. (3 marks)

$$x = \sqrt{\frac{y(p-y)}{p-y}}$$

- Expand $(1 + \frac{1}{2}x)^5$ upto the term on x^3 , use the expansion to estimate the value of $(1.05)^5$ correct to 4 significant figures. (3 marks)
- Wanyama bought maize flour, sorghum and millet at sh 12, sh 15 and sh 18 per kg respectively. He mixes them in the ratio 1 : 2 : x respectively. After selling the mixture at sh 19.20 he made a profit of 20%. Find the value of x. (3 marks)
- Divide the line AB in 5 equal parts. (2 marks)



- Solve for the value of x if $\log_8(x+5) - \log_8(x-3) = \frac{2}{3}$ (3 marks)
- The equation of the line L, is given by $3y = 2x + 15$. Given that the line L_1 cuts the x axis at point A.
 - Find the coordinates of A. (2 marks)
 - Find the angle the line L_1 makes with the x axis. (2 marks)
- A variable N varies as the square of r and inversely as the square roots of P. What is in the percentage change in N if r is increased by 15% and P is decreased by 36%. (3 marks)

14. The hire purchase price of a machine is sh 36750. If 10% is paid as deposit and the rest of the money is spread over 15 equal monthly instalments, find the amount payable every month. (2 marks)
15. Find the terms of the series $2 + 6 + 10 + 14 + \dots$ that will give a sum of 800. (3 marks)
16. A number 0.7 is truncated to 3.s.f. Calculate the percentage error due to the truncation. (3 marks)

SECTION II (50 marks)

Answer FIVE questions from this section

17. The arithmetic progression has the first term as a and the common difference d .
- a) Write down the third, ninth and twenty fifth term of the AP in terms of a and d . (1 mark)
- b) The AP above is increasing and the third, ninth and twenty-fifth terms form the first three terms of a G.P. The sum of the seventh and twice the sixth term of the A.P is 78 calculate.
- i) The first and common difference of the A.P (5 marks)
- ii) The sum of the first nine terms of the A.P. (2 marks)
- iii) The difference between the fourth and the seventh terms of an increasing AP. (2 marks)
18. Students in a form three class sat for a Chemistry exam which was marked out of 100 marks. The students were 100 in total. The table below shows the distribution of students and marks scored.

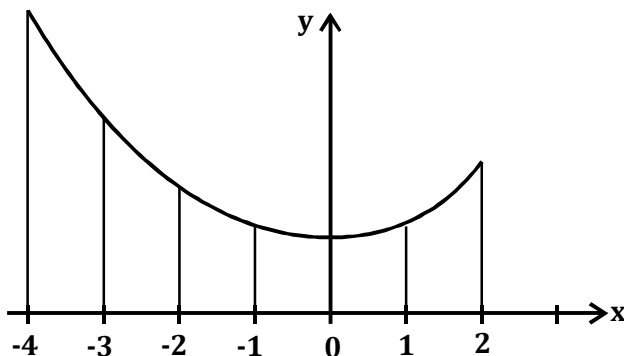
Marks	≤ 20	≤ 30	≤ 40	≤ 50	≤ 60	≤ 70	≤ 80
Frequency	4	16	27	32	15	4	2

- On the grid provided, draw an ogive and use it to determine: (3 marks)
- a) The quartile deviation. (4 marks)
- b) The passmark if 35% of the students failed. (1 mark)
- c) The minimum mark required if only five students got grade A. (2 marks)

19. Triangle PQR have vertices at $P(2, 2)$, $Q(5, 3)$ and $R(4, 1)$ it is mapped n to triangle $P^1Q^1R^1$ by a

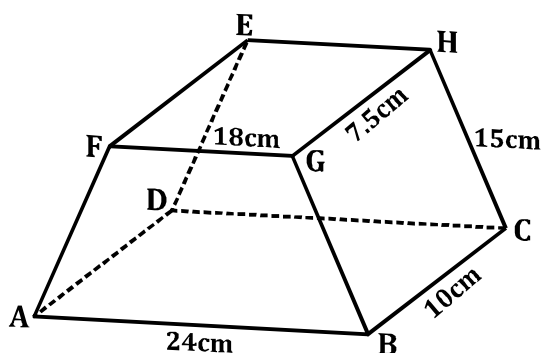
transformation matrix $M = \begin{pmatrix} 1 & -1 \\ -2 & 1 \end{pmatrix}$

- i) Draw on the same grid triangle PQR and $P^1Q^1R^1$ (3 marks)
- ii) Triangle $P^1Q^1R^1$ is mapped onto triangle $P^{11}(-2, 0)$, $Q^{11}(-7, -2)$ and $R^{11}(-7, -3)$. Find the matrix which maps $P^1Q^1R^1$ to $P^{11}Q^{11}R^{11}$. (3 marks)
- iii) If PQR is mapped onto $P^{11}Q^{11}R^{11}$. Find the matrix of transformation. (3 marks)
- Draw triangle $P^{11}Q^{11}R^{11}$
- iv) Describe fully the transformation, Which maps $P^1Q^1R^1$ onto $P^{11}Q^{11}R^{11}$ (1 mark)
20. The figure below shows a sketch of a curve $y = 3x^2 - 5x + 8$ from $x = -4$ to $x = +2$



- a) Use the mid ordinate rule with 6 strips to estimate the area between the curve, the x-axis and line $x = -4$ and $x = +2$ (4 marks)
- b) Use integration to find the exact are in (a) above. (3 marks)
- c) Calculate the 4s.f the percentage error in area estimated by the mid ordinate rule. (3 marks)

21. The figure below shows frustrum ABCDEFH of a right pyramid. $AB = 24\text{cm}$, $BC = 10\text{cm}$, $FG = 18\text{cm}$, $GH = 7.5\text{cm}$ and $AF = BG = CH = DE = 15\text{cm}$.



Determine.

- The altitude of the pyramid. (2 marks)
 - The angle between:
 - AF and the base $ABCD$ (2 marks)
 - FE and GB (3 marks)
 - The distance AG (3 marks)
- 22.a) The probability that Peter will be selected for his school hockey team is $\frac{1}{3}$. If he is selected for the hockey team, then the probability of being selected for basketball is $\frac{4}{7}$.
- Draw a tree diagram to represent the above information. (2 marks)
 - Using the tree diagram or otherwise, calculate the probability that Peter is selected for at least one of the terms. (3 marks)
- b) A coin is biased such that it shows a tail with the probability of $\frac{1}{3}$. The same coin is tossed three times find the probability of obtaining.
- Two tails on the first two tosses. (1 mark)
 - A head, a tail and a tail in that order. (1 mark)
 - Two heads and one tail (3 marks)
23. The position of airport P and Q are $(60^\circ\text{N}, 45^\circ\text{W})$ and $(60^\circ\text{N}, K^\circ\text{E})$ respectively. It takes a plane 5 hours to travel due east from P to Q at an average speed of 600 knots. By taking $R = 6370 \text{ km}$ and $\pi = \frac{22}{7}$.
- Calculate the value of K (4 marks)
 - The local time at P is 10.452am. What is the local time at Q when the plane reaches there? (3 marks)
(Give time in 12 hour clock)
 - Find the distance PQ measured along a circle of latitude to the nearest Km. (3 marks)
24. During installation of electricity bulbs, a dealer is required to supply two types of bulbs A and B. The total number of bulbs should not be more than 400. He must supply more of A than B, and type A bulbs should not be more than 300 and B should not be less than 80.
- Write down in the terms of x and y , all inequalities representing the information above. (3 marks)
 - On the grid provided, draw all the inequalities and shade the unwanted region. (4 marks)
 - If type A costs Ksh 450 per piece of B Ksh 350 per piece and that the higher the cost the higher the profit.
 - Use the graph to determine the number of each type of bulb that he should supply to maximum the profit. (1 mark)
 - Calculate the maximum cost of lighting the streets. (2 marks)