SECTION A: (40 marks)

Answer **all** *questions in this section.*

1. If the operation $(a * b)$ denotes the arithmetic mean of the two given numbers, find the value of $15 * (7 * 3)$. *(04 marks)*

2. Solve the equation $\frac{x}{6} - \frac{2x-3}{5} = \frac{x-5}{3}$. *(04 marks)*

3. Make N the subject of the formula $= 3\sqrt{\left(\frac{N-1}{N+1}\right)}$ 3 *(04 marks)*

4. The mean weight of a class 30 boys is xkg. When two boys whose total weight is $150kg$ are absent, the mean weight of those present is $2kg$ less than the mean weight of the whole class. Find the value of x. (04 marks)

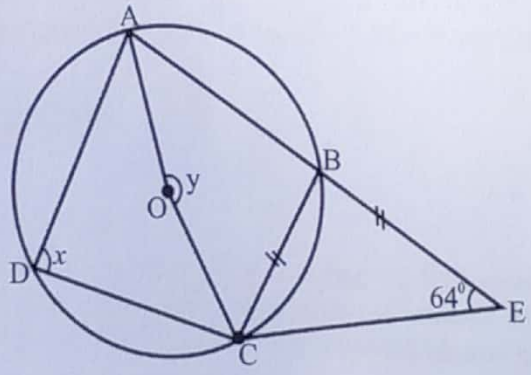
5. Given the matrices, $P = \begin{pmatrix} -2 & 1 \\ 0 & 3 \end{pmatrix}$ and $Q = \begin{pmatrix} 5 & 0 \\ -6 & 2 \end{pmatrix}$. Find the matrix $(P - Q)^2$. *(04 marks)*

6. A point $P(-2, 3)$ is reflected in the line $x - y = 0$ to form its image P'. State the matrix of reflection and hence obtain the coordinates of P'. *(04 marks)*

7. A family of Angella, Bogere and Carol share 25500 at a ratio 0f 5:7:3. Draw a pie chart to show the percentage share each family member gets. *(04 marks)*

8. Given that $tan\theta = 1$ and that θ is a reflex angle, find the value of $Sin\theta$, without the use of a calculator or tables (Express your answer with a rational denominator). *(04 marks)*

9. In the figure below, $\boldsymbol{O}$ is the centre of the circle. Points $\boldsymbol{A}$, $\boldsymbol{B}$ and $\boldsymbol{E}$ lie on a straight line; $\overline{BC} = \overline{BE}$, points $\boldsymbol{A}$, $\boldsymbol{B}$, $\boldsymbol{C}$ and $\boldsymbol{D}$ all lie on the circumference of the circle; $\boldsymbol{BEC} = 64^o$, $\boldsymbol{ADC} = x$ and $\boldsymbol{AOC} = y$.



Find the values of the angles marked x and y. *(04 marks)*

10. A bag contains 6 yellow and 8 blue balls of the same size. Two balls are picked at random from the bag, one at a time, without replacement. Using a probability tree diagram, find the probability of picking a blue ball on the second picking. *(04 marks)*

SECTION B: (60 marks)

Answer any **five** *questions from this section*

All questions carry **equal** *marks*

11. On a given day, a certain shop attendant set the price of frying oil to be shs.$\boldsymbol{x}$ per litre and on that day, he sold $\boldsymbol{n}$ litres of oil, making a total collection of shs. 8,000 from the sales of oil. On the next day, he reduced the price per litre by shs. 50 and the amount of oil sold increased by 4 litres, leading to a total collection of shs. 23,700 from the sales of the oil.

(a) Write down the two equations relating $\boldsymbol{x}$and $\boldsymbol{n}$. *(03 marks)*

(b) Use your equations in (a) above to calculate the;

(i) amount of oil sold before the price was reduced. *(07 marks)*

(ii) initial price per litre of the oil. *(02 marks)*

12. The table below shows the number of vehicles that pass by Kisi point at Napak Main road at given hours

Time	7:00-8:00	9:00-10:00	11:00-12:00	1:00-2:00	3:00-4:00	5:00-6:00	7:00-8:00
Number of passing cars	2	2	10	8	2	5	1

(a) Find the modal number of passing cars.

(b) Plot an O – give for the masses and use it to estimate the median. *(12 marks)*

13. (a) Draw a graph of $y = x^2 - 4x + 2$ for the values of x from $^-1$ to $^+5$. *(06 marks)*

(b) Use your graph to solve the equations:

(i) $x^2 - 8x - 4 = 0$ *(03 marks)*

(ii) $2x^2 + x - 3 = 0$ *(03 marks)*

14. The angle of depression of a buoy, B from a point, C on a cliff, is 15^o and distance $\overline{BC}$is 250 m. A seagull, S hovers so that it is vertically above B such that $\overline{SB} = 300\ m$.Calculate the;

(a) value of the acute angle SBC, *(04 marks)*

(b) length of CS, *(05 marks)*

(c) angle of elevation of S from C. *(03 marks)*

15. A farmer supplied a restaurant with the following, during the first week of January, 2016: $8kg$ of tomatoes, $30kg$ of irish potatoes and $12kg$ of carrots. He charged shs. 3,000 per kg of tomatoes, shs. 2,500 per kg of irish potatoes and shs. 2,000 per kg of carrots.

(a) Write down the prices of the food items in a column matrix and the quantities supplied, in a row matrix. Hence calculate the amount of money the farmer received from the restaurant in the first week. *(05 marks)*

Turn Over

(b) In the second, third and fourth weeks of the same month, he supplied the restaurant with the same food items at the same prices as follows (weights in kg in the order of;tomatoes, Irish potatoes, carrots): $(30, 60, 20), (10, 50, 24)$ and $(30, 40, 32)$ for the respective weeks.

(07 marks)

16. A rectangle $ABCD$ has the points, $A(1,1), B(3,1), C(3,-2)$ and $D(1,-2)$ as its vertices. $ABCD$undergoes a reflection in the line $y + x = 0$ to form an image rectangle $A'B'C'D'$. Rectangle $A'B'C'D'$ then undergoes a positive quarter turn rotation about the origin to form the image $A''B''C''D''$.

(a) Use graphical methods only to obtain the coordinates of the vertices of the images;

(i) $A'B'C'D'$ (ii) $A''B''C''D''$

(b) Describe a single transformation that would map rectangle $ABCD$ directly to the final image $A''B''C''D''$.

(12 marks)

17. A certain production unit of a manufacturing industry uses two types of machines, ***A***and ***B***. Machine ***A*** requires $2\ m^2$ of floor space for installation, and 4 operators while machine ***B*** requires $3\ m^2$ of floor space and 3 attendants. There are $18\ m^2$ of space and 24 attendants available. For an effective production, there should be more machines of type ***B*** than those of type ***A***. By taking $\boldsymbol{x}$ and $\boldsymbol{y}$ to be the number of machines of types ***A*** and ***B*** respectively installed;

(a) Write down **five** inequalities from the information above. *(04 marks)*

(b) Show graphically, the region satisfying all the inequalities in (a) above, by shading the unwanted region of each inequality. *(05 marks)*

(c) If the profit generated by machine ***A*** is shs. 4,000 and that of machine ***B*** is shs, 6,000, write down an expression for the profit generated by the machines. Hence,

(i) determine the number of machines of each type that has to be used in order to maximize the profits, *(02 marks)*

(ii) state the maximum profit. *(01 mark)*

END