YOU EITHER DO IT OR YOU DO IT 2023

1. Factorize $x^4 + x^2y^2 + y^4$ completely. *(04 marks)*

2. Solve $x + 1 < 9x + 9$ and show the solution on a number line. *(04 marks)*

3. Given matrix $A = \begin{pmatrix} 6 & -2 \\ -4 & 1 \end{pmatrix}$ and $\boldsymbol{I}$ is the 2×2 identity matrix, show that $A^{-1} = ½(A - 7I)$. *(04 marks)*

4. A pharmacy sells face masks in a variety of sizes. Their sales over a week are recorded in the table below.

	Kids		Adults			
Size	**Small**	**Large**	**S**	**M**	**L**	**XL**
Frequency, *f*	29	4	8	24	15	4

(a) Write down the mode for this data. *(01 mark)*

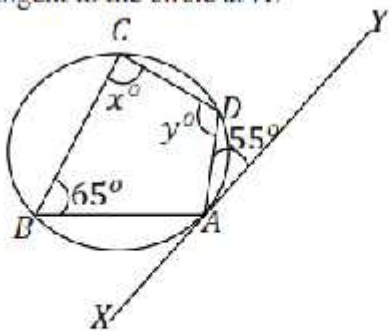
(b) Given that the shop is open everyday of the week, calculate the mean number of masks sold per day. *(03 marks)*

5. Express x in terms of p, q and y in the expression

$$2y = \frac{p}{q + \frac{1}{x}}$$ *(04 marks)*

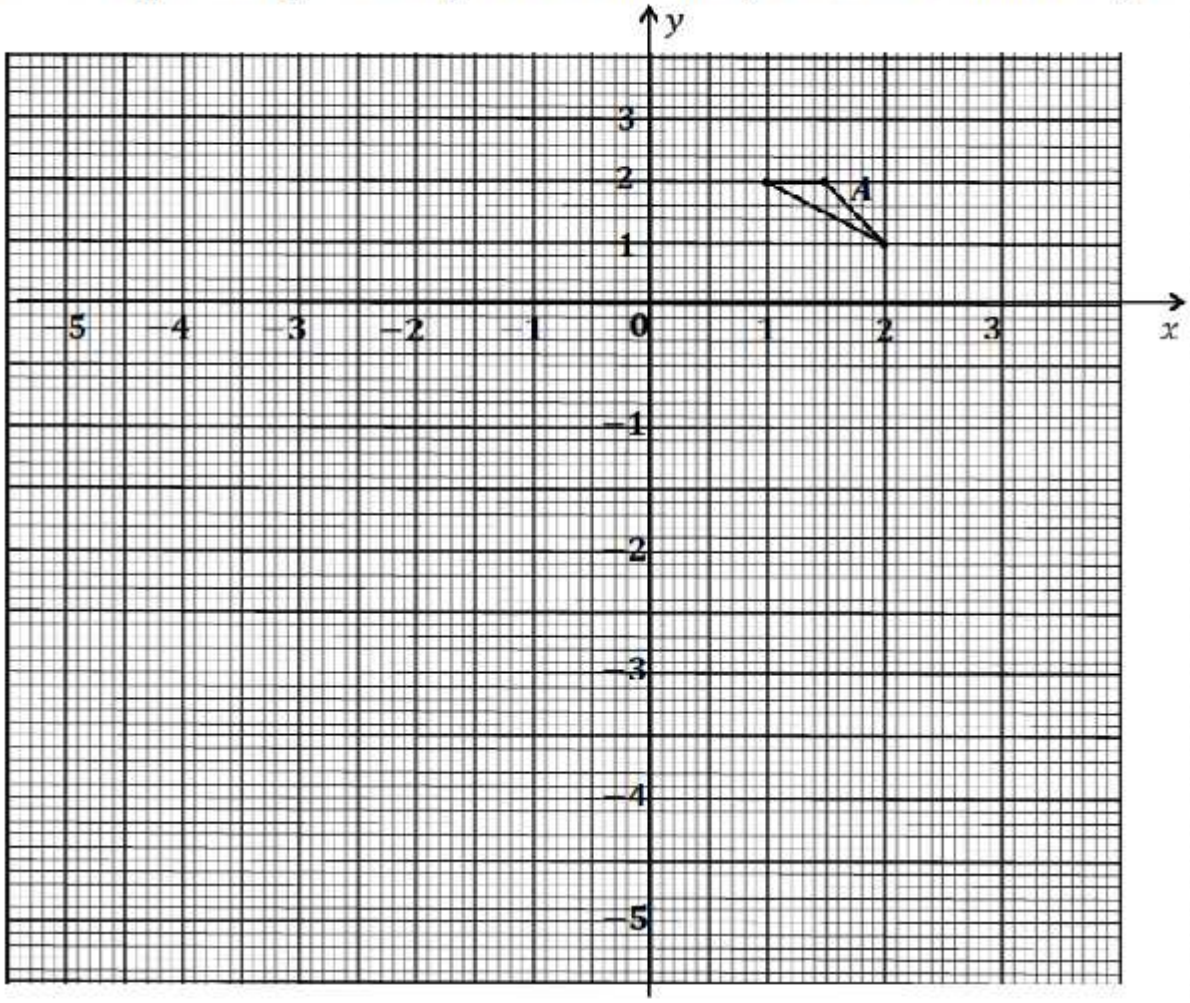
6. Given that $x * y = 1 - xy + x^2 - y$. Find the value of $(3 * 2) * -1$. *(04 marks)*

7. In the diagram below, A, B, C and D are points on the circumference of the circle. The line XY is a tangent to the circle at A.



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

8. Triangle A undergoes an enlargement transformation by scale factor -2 about the origin.



Plot triangle B, the image of A after the enlargement and state the coordinates of the image triangle. *(04 marks)*

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(Name and Personal Number)

Cut

NB: *Cut along this line and attach to your answer booklet.*
Remember to write your Name and Personal Number on this sheet.

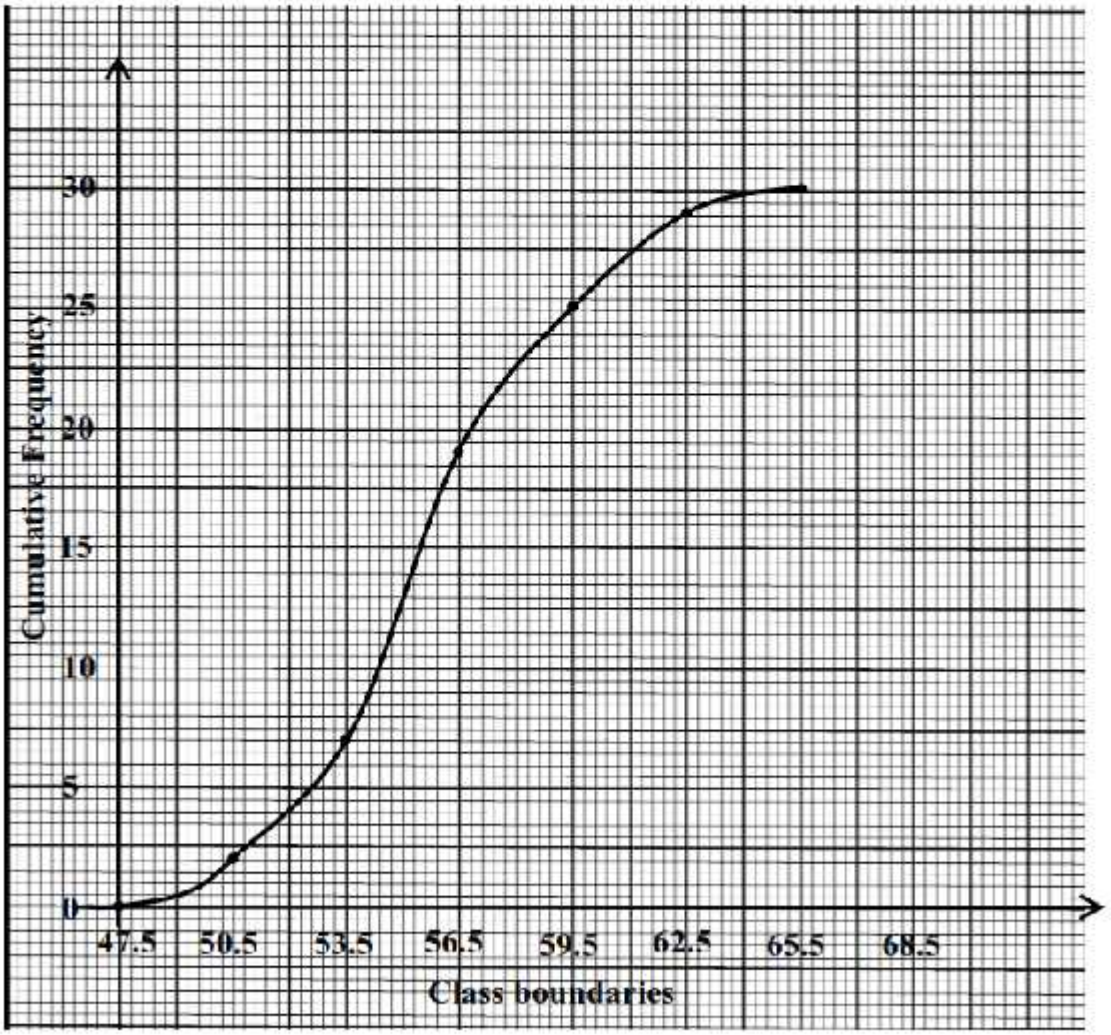
9. 16 cards numbered {1, 2, 3, ... 16} are put in a box and mixed thoroughly. One person draws a card from the box. Find the probability that the number on the card is divisible by 3 and 2. *(04 marks)*

10. If $tan\theta = \frac{-3}{4}$ and θ is reflex, find the value of $sin\theta$ *(04 marks)*

SECTION B: (60 MARKS)

Answer any **five** *questions from this section.* **All** *questions carry equal marks.*

11. The cumulative frequency diagram below shows mock results in mathematics examination of Kadama Islamic Secondary School.



Use the graph above to:

(a) Estimate the median mark. *(02 marks)*

(b) Calculate the average mark. *(10 marks)*

12. (a) Simplify as far as possible. *(04 marks)*

$$\frac{3x^2y - 27y^3}{3xy - 9y^2}$$

(b) A garden measuring 15 metres by 20 metres is to have a pedestrian path way installed all around it, increasing the area to $336m^2$.

(i) Given that the width of the path way is $x$cm; show that $2x^2 + 35x = 18$.

(ii) Find the possible value of x. *(08 marks)*

13. (a) Given that the matrix $B = \begin{pmatrix} 2 & 1 \\ 1 & 3 \end{pmatrix}$. Evaluate $B^2 - 2B$. *(05 marks)*

(b) In a supermarket *shs.* 8,000 can buy 3 apples and 2 mangoes; *sh.* 13,000 can buy 4 apples and 5 mangoes.

(i) Represent this information in matrix form.

(ii) Find the price of an apple and a mango.

(07 marks)

14. (a) Copy and complete the table below.

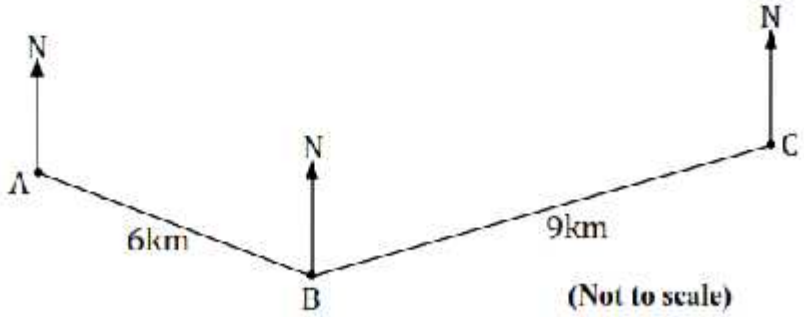
θ	0^o	90^o	180^o	270^o	360^o 450^o	540^o	630^o	720^o
$y = sin\theta$	0			-1	1			
$y = cos\theta$	1			0	0			

(03 marks)

(b) Use your completed table to draw the graphs of $y = sin0$ and $y = cos0$ on the same axes
Use a scale of 4cm to represent 1 unit and 2cm to represent 90°. *(07 marks)*

(c) Use your graph to solve the equation $sin0 - cos0 = 0$ for $0^o \leq 0 \leq 360^o$.
(02 marks)

15. A ship sails 6km from A to B on a bearing of 121°. It then sails 9km to C. The size of angle ABC is 114°.



(a) Copy the diagram into your answer booklet and show all the information on it.
(Accurate construction is **NOT** *required)* *(02 marks)*

(b) What is the bearing of C from B? *(03 marks)*

(c) Find the distance AC to the nearest kilometre. *(03 marks)*

(d) What is the bearing of A from C? *(04 marks)*
Give your answer correct to the nearest degree.

16. (a) On a squared paper, plot the points $A(2,-1)$, $B(0,-3)$, $C(2,-4)$ *and* $D(4,-2)$ and join them to form a quadrilateral $ABCD$. What is the name of this quadrilateral?
(03 marks)

(b) The points $A'(1,2)$, $B'(3,0)$, $C'(4,2)$ *and* $D'(2,4)$ are the images of ABC and D under a certain transformation T_1. On the same axes draw quadrilateral $A'B'C'D'$ and describe transformation T_1 fully. *(03 marks)*

(c) The points $A''(-2,-4)$, $B''(-6,0)$, $C''(-8,-4)$ *and* $D''(-4,-8)$ are the images of $A'B'C'D'$ under a transformation T_2. On the same axes draw quadrilateral $A''B''C''D''$ and describe transformation T_2 fully. *(03 marks)*

(d) On the same axes, draw quadrilateral $A'''B'''C'''D'''$, the image of $A''B''C''D''$ under a reflection in the line $y = 0$. State the coordinates of $A'''B'''C'''D'''$. *(03 marks)*

17. Aunt Kaduuka sells two types of fresh juice in 250ml cups, Red juice and Yellow juice. Red juice and Yellow juice. Red juice is made from one slice of watermelon, 3 apples and one orange. Yellow juice is made from 3 oranges, 2 apples and a slice of ginger.
Aunt Kaduuka has 48 oranges, 42 apples, 10 slices of watermelon and 15 slices of ginger.

(a) If x denotes the number of cups of Red juice she makes and y denotes the number of cups of Yellow juice she makes, write down **six** inequalities representing the above information.
(05 marks)

(b) Represent the inequalities on a graph paper by shading the unwanted regions.
(Use a scale of 2 cm to represent 5 units on both axes) *(04 marks)*

(c) If a cup of Red juice costs sh.1000 and that of Yellow juice costs sh.1200, estimate the maximum profit that can be made by Aunt Kaduuka. *(03 marks)*