

ITEM ONE

Paul wanted to sale his land at \$80,000 he failed to get a buyer. After a while, land brokers brought him a deal of buying it at 30% discount as their commission for connecting him to a buyer. Further still, he has to pay sales tax of \$6,000/-

Jonah wanted to purchase a car worth \$50,000. He has two options;

Option 1: pay cash upfront

Option 2: hire purchase with a 20% down payment (\$10,000) and monthly installments of \$ 1,200 for 4 years.

Meanwhile, Jonah has \$20,000 in a savings account earning 5% per annum simple interest.

Task

- How much did Paul get from the sale of his land?
- Which option is better for Jonah and how much will he pay in total for the car? Also, how much interest will he earn on his savings account per annum simple interest for the period above.

ITEM TWO

Kedi is a farmer in Ngora district who practices both farming and rearing of animals on a large scale. Due to demand of products that come out of animals, Kedi puts much emphasis on rearing of birds and cows on his farm. All together there are 200 heads of birds and cows and that there are at most 240 legs of birds and cows on the farm. The number of birds on the farm is two times more than cows on the farm. Kedi wishes to maximize profits by selling each bird at UGX 50,000 and each cow at UGX 1.5million but does not know the number of birds and cows to sell.

Task

- Write mathematical statements that show the relation between the cows and birds.
- Show the feasible region of the relation on the Cartesian plane.

c) Help Kedi to determine the maximum amount of money he will possibly make from the sale of cows and birds.

ITEM THREE

Mr. Tusabe, the Entrepreneurship teacher has organized a study trip for his class of 90 students. He intends to use a taxi and the school coaster to transport the students. The maximum capacity of the taxi is 15 passengers and that of the coaster is 30 passengers. The number of trips made by the taxi will be less than five. The fuel consumption per trip for the taxi and coaster is UGX 60,000 and UGX 100,000 respectively. The school bursar has given Mr. Tusabe UGX 600,000 only for transport expenses.

Task

By writing the number of trips made by the taxi and those made by the coaster as x and y respectively.

- Write five mathematical statements that show the relation between the number of trips made by the taxi and coaster.
- Show the feasible region of the relation on the Cartesian plane.
- Help Mr. Tusabe to determine the number of trips that have to be made by each vehicle so that all the students are transported at a minimum cost.

ITEM FOUR

The schools in Busoga region have organized a science quiz; at least five but not more than ten students are to be chosen. The ratio of the number of boys to the girls must be less than 2:1, and there must be less girls than boys. The organizers intend to spend shs. 100,000 and shs.120,000 for each male and female participant respectively.

Task.

- Write down mathematical statements that show the relationship between the boys and girls in the competition.
- By using a suitable scale, show the feasible region of the relation on a Cartesian plane.

Help the organizers to determine the maximum and minimum amount of money they will spend for organizing such a quiz on students.

ITEM FIVE

Your teacher wants to show a documentary in your class. He assigned you as the class captain to measure the height of some of your fellow students and use those measurements to select a fair height at which the screen can be put and you put it. Below were the measurements you took in cm

158	152	163	165	152	166	153	164	165
158	162	153	154	160	154	153	162	163
151	157	153	159	156	160	161	153	158
153	152	153	151	160	153	161	166	162
158	166	166	167	158	154	151	153	153

Task

- (a) Summarize your measurements
- (b) Represent your measurements in such a way that even a person who is not good with numbers can easily recognize the tallest and shortest amongst those measured.
- (c) Which height is fair and why says it's fair?
- (d) What are the chances that members who are below that height will not be able to see?
- (e) What do you recommend the teacher can do for them?

ITEM SIX

A telecommunication company plans to introduce a new minutes bundle on the menu and employs callers to investigate people's opinion on the minutes of the package that will cost 1200Shs. The callers made a survey on random calls of the customers to gather their opinion and use the average minutes. The data was collected as shown below.

52	36	76	51	62	67	70	50
45	49	54	58	53	74	64	56
50	80	70	57	64	64	43	78
84	71	85	72	78	43	42	75
84	72	69	49	66	42	65	88

Task:

- (a) Giving a reason based on computations using the collected data, suggest the suitable number of minutes to be added on the menu.
- (b) The supervisor wishes to know the number of people who prefer minutes greater than 60. Help him/her to estimate this number of people.

ITEM SEVEN:

Due to poor performance in Mathematics that was observed among learners. The school administration through academic board came up with strategies to improve on the learner's performance. Some of the strategies are that a prize is given to learners scoring above 70% and a remedial exam be given to learners scoring at most 50%. A Mathematics examination was given to S.3 learners and marks were obtained as below;

38	74	28	32	10	31	49	34	50
30	56	50	42	38	64	24	64	09
18	35	12	52	41	27	08	48	22
42	43	52	59	72	70	15	79	29

TASKS:

Using classes with equal class width of 10 marks and starting with a class having the lowest class mark of 1;

- a) Help the administration to find;
 - i. The number of learners to be awarded prize
 - ii. The number of learners to be given remedial examination.
- b) What is the average performance of the class?

ITEM EIGHT.

A security group in Uganda selects people who are physically fit to join the group every year. The commander of the group prefers the height of each person selected to be between 147 and 157cm tall. When they went to Busoga region, the people who came for recruitment were subjected to various interviews which include measurement of their height and medical checkup

Physics. It was however noted that mathematics must be compulsory. The ministry of education planned the composition of teachers as follows 12 for Chemistry, 8 for Biology and 7 for Physics. On further analysis, it was found out that 5 teachers teach Chemistry and Biology, 4 teach Chemistry and Physics and 2 teach Biology and Physics. It is also discovered that the number of teachers who teach only Chemistry is 5 and 3 teachers were not teaching any one of the subjects.

Task;

- Determine the number of teachers who teach all the subjects.
- Calculate the probability that the teacher selected at random teaches only three subjects.
- Advice the ministry of education on which other subject should have been included in the new school so that all teachers teach at least two subjects.

ITEM TWELVE:

Kampala (K) and Arua (A) are about 450km apart. At **7:30 am**, a bus starts from Arua and moves towards Kampala (K) at a steady speed of **100km/hr** while a lorry starts from Kampala (K) an hour later moving at an average speed of **60km/hr** to Arua (A). At **10:00 am**, the bus is stopped at town C by police and ordered to reduce speed. After 30 minutes at C, it resumes its journey at a reduced average speed of **50km/hr** until it reaches Kampala (K).

Task:

- State the difference in time when the two vehicles arrive at their destinations.
- Determine when and at what distance from Arua the two vehicles meet.
- Find the average speed of the bus.

ITEM THIRTEEN

You are an athlete and soon competing with someone. You wanted to test your

chances of winning the race by testing your speed and time in relation to that of your competitor you started to run at **4:50pm**. From your home where you started from, you ran a distance of **5km** North West to place P, then from P, you turned south and ran **4km** until you were at place Q that is west of your home and then ran back and arrived at **5: 12pm**. Your competitor ran the same distance during training at a speed of **10m/s**.

Tasks:

- What is the total distance that you ran?
- What is the total time you took to run that distance?
- How fast were you?
- (i) Do you think you will win the race or not?
(ii) Why do you think that way?

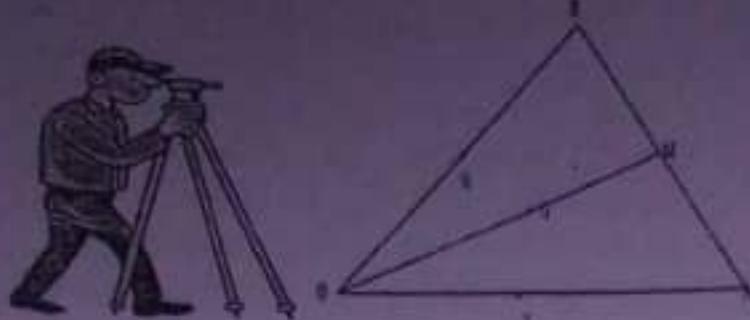
ITEM FOURTEEN:

The caterer of a school located in Iganga municipality is required to buy food stuffs for a school party. The foodstuffs to be bought include: 100 kg of rice, 150kg of meat and 200kg of Irish potatoes. The cost is UGX 3500, UGX15,000, and UGX1500 per kg of rice, meat and Irish potatoes respectively in Iganga Central market. The same items cost UGX. 3000, UGX. 12,000 and UGX. 1,100 per kg of rice, meat and Irish potatoes respectively, in Bugembe farmers' market. To hire a pick - up from Iganga Central market to school costs UGX 60,000 while a pick - up hire from Bugembe farmers' market is UGX95,000.

Task:

- What would be the easiest way to display the information provided above?
- Using the information provided above, how would the caterer decide on where to do the shopping from? Justify your answer.

ITEM FIFTEEN



A surveyor is mapping a triangular plot of land with vertices labeled as O, A and B.

- L, M and N are the midpoints of the sides OA, AB and OB, respectively.
- G is a point on the line segment OM, such that the ratio of OG to OM is 2:3.

The surveyor needs to express the vectors representing the positions of various points on the plot in terms of the given vectors \mathbf{a} and \mathbf{b} , which represent the positions of vertices A and B respectively.

Tasks:

Help the surveyor;

- Express the following vectors in terms of \mathbf{a} and \mathbf{b} .
 - OM
 - OG
 - BG
 - GL
- Determine whether the points B, G and L are on the same line.

ITEM SIXTEEN

Mr. Pepe is a resident of Kigulu, a village with only corporate and working class residents, picked interest in farming last year. As he was planning on opening up his Irish potato farm, he discovered that labor in form of human capital is a very serious problem in Kigulu since almost every resident in the village has an office. He is planning on hiring 3 women from a neighboring village called Bukaye to clear an area of $100m^2$ for the paddock, the second paddock is $300m^2$ and he is planning to hire 5 women. Mr. Pepe has added

another $20,000m^2$ of land on which he wants to plant pineapples.

Mr. Pepe needs to hire women to work on the extra acquired land to plant pineapples but he does not know how many he should hire.

Fortunately, the pineapple project became successful, and the number of women kept on increasing by 20 every month starting from original number of women he started with.

Mr. Pepe is now worried about the welfare of these people since he estimates to have about 500 workers at the end of the year.

Task

- Find extra space it will require him during that time so that he can expand his project at a large scale.

ITEM SEVENTEEN

Your brother received Shs 597,000 as a salary and complains of underpayment exhibited in one of the private secondary schools in which he was employed as a teacher at the start of the year. He further says the biggest percentage of his money goes to the government as tax. On acquiring the job he signed a three-year contract with the following terms and conditions. A teacher's monthly gross income has certain allowances deducted from it before it is subjected to the government income tax band. The allowances are as follows.

- Married teacher Shs 18,000 per month
- Un married teacher Shs 12,000 per month
- Each child below 11 years Shs 5,000 per month
- Each child above 11 years but below 18 years Shs 7,000 per month
- Each lesson taught Shs 3,000
- Each examination invigilated Shs 5000
- Meeting allowance Shs 50,000 per meeting

Housing allowance Shs 240,000 per month	
> Lunch allowance Shs 2,000 per day	
Government Income Tax Band	
Taxable Income (Shs)	Rate (%)
0 - 100,000	10
100,001 - 200,000	25
200,001 - 300,000	30
300,001 - 400,000	45
400,000 and above	50

Your brother earns a monthly gross pay of 1,240,000 he is married with 3 children of ages 10, 15 and 19. Given that he has 64 lessons taught in a month, attended beginning of term staff meeting and invigilated 5 examination sessions.

Hint: A month has 30 days.

Task:

- (a) Help him find how much money and its percentage he pays to the government as tax.
- (b) Establish the take home pay of your brother and advise him if there could be something wrong with his payment transaction.

ITEM EIGHTEEN

Customers of your family cake making company have always complained of too much sugar ingredient in the cakes bought. The company has 25 bakers together who can make 480 cakes in three days. However, your company has been hired to make 960 cakes in the five days remaining for a fourth coming cake festival in your town. The managing director has hired more 8 bakers and you have been selected to do a survey from the nearby related company to solve the problem of too much sugar in cakes. It has been realized that a delicious cake requires Sugar, coconut oil and flour that are mixed in the ratio of 2:3:5 respectively, each cake contains 0.75kg of flour.

Hint:

1 kilogram of sugar costs Shs 5,000.
500 grams of coconut oil cost Shs 3,500

1 kilogram of flour costs Shs 8,000

Task:

- (a) Help your family to find if the available number of bakers can produce the required number of cakes in the stipulated time and advise them accordingly

- (b) Establish the total cost of sugar, coconut oil and flour required to make 960 delicious cakes.

ITEM NINETEEN:

A family decides to paint the inner walls of its living room for New Year celebrations with a budget of Shs 400,000. The room is 5m long, 4m wide and 3m high. The room has two painted doors in the middle of the walls opposite to each other. Each door is 2m high and 0.75m wide. The room has one painted window in one of the side walls which is 1m square. A painter charges Shs 800 per square meter painted and for every 10m square wall painted fully, consumes a 4 litre tin paint which he sells at Shs 70,000.

Task:

As a mathematics student;

- (a) Establish computations to find out if the budgeted money could be enough for this work.
- (b) If a painter offers a discount of 10% on labour and 5% on every litre of paint. How much money shall the family save?

ITEM TWENTY:

Mr. Mwa intends to buy a computer from Jumia Electronics and Computer Hardware Shop. He asks his employer to deposit his salary to his Bank account in Equity Development Bank. The bank pays a simple interest at a certain rate. After 3 years the total amount of money in his account is shs. 2,750,000/. The interest earned each year was shs. 250,000.

At Jumia Electronics and Computer Hardware Shop, the marked price for a computer is shs. 2,000,000. But the

same computer can also be sold at a hire purchase price of shs. 2,800,000. Mr. Mwa bought the computer on hire purchase terms. He paid a deposit of 25% of the hire purchase price and then the balance by equal monthly installments of shs. 350,000. If Mr. Mwa had bought the computer on cash price he would have been allowed a discount of $12\frac{1}{2}\%$ on the marked price.

Task;

- Help Mr. Mwa to find the amount of money which was deposited in his account and also the annual rate of interest the bank paid him.
- Find the number of installments which he paid in order to buy the computer.
- Find the difference between the cash price and the hire purchase price and express it as a percentage of the cash price.
- As a mathematics student what advice would you give Mr. Mwa when buying a computer?

ITEM TWENTY ONE:

Mr. Itabangi planned to teach about matrix transformation. He has to prepare a show of; A 3 - Dimensional object and coordinates of $A(2, 4)$, $B(2, -5)$, $C(6, -5)$ and $D(6, 4)$ was transformed by a rotation of 45° around the X-axis, followed by a scaling of $1.5x$ in the y - direction and $2x$ in the x - direction and finally a translation of 2 units in the x - direction and 3 units in the y - direction.

- Show how he can determine the coordinate of
 - $A'B'C'$
 - $A''B''C''$
 - $A'''B'''C'''$
- Determine a single matrix of transformation which can be designed in the project so that it can map $A.B.C$ direct onto $A''B''C''$

ITEM TWENTY TWO:

A civil engineering firm is designing a new bridge over a river. The bridge will have a triangular truss structure, and the engineer needs to analyze the transformation of the truss during the design process. The initial design of the truss has vertices $A(0, 0)$, $B(0 - 2)$ and $C(2, 0)$. The engineers then applied a transformation M to the truss, resulting in vertices $A^1(0, 0)$, $B^1(0, -4)$, $C^1(4, 0)$. After analyzing the transformed truss, the engineers then applied another transformation matrix P that would map the transformed truss $A''B''C''$ back to the original truss ABC.

Tasks;

Help the engineer understand the structural integrity of the bridge by determining;

- The transformation matrix M that was applied to the original truss.
- The coordinates of the new truss vertices A'' , B'' and C'' .

ITEM TWENTY THREE:

You are only two children in the family and the chairperson of your village has come to your home to register the details of you and your sibling. Unfortunately both parents are not around and he gives them a call to find your present ages. The mother informs him that the two ages differ by 4. The father informs him that the sum of the squares of their ages is 136.

Your neighbor makes a rectangular flower bed by taking two meters off its length and adding three meters to its breadth. By doing so, he increases the area by 20 square meters.

Moses is 1.5m tall and standing on top of a building 34m tall. In a straight line from where he is standing he can see a car and bicycle at angles of depressions of 50° and 65° respectively.