SENIOR FIVE

HOLIDAY PACKAGE

FOR

PRINCIPLE MATHEMATHICS

TERM II 2025

TOPIC 1: NUMERICAL CONCEPTS

ITEM 1

Akello is preparing for the new school term and plans to visit a bookshop

to buy: 3 books, 6 pens and 1 mathematical set

She has saved up 10,000 shillings for this shopping trip.

Before going, she consulted three of her friends who had recently bought school materials from the same bookshop. They shared their purchase details as follows:

- Joan bought 1 book, 1 pen, and 1 set and paid 5,500 shillings.
- Mary bought 3 books, 2 pens, and 2 sets and paid 13,000 shillings.
- Tom bought 5 books, 4 pens, and 2 sets and paid 18,000 shillings.

Akello wants to go to the same bookshop but isn't sure if her 10,000 shillings will be enough.

Nakato is a mobile money agent in her village, Mukono. When she started in January 2024, she had 50 regular customers. She observed that her customer base seemed to grow exponentially each month. By the end of March 2024 (after 3 months), she had 135 regular customers. She wants to predict her customer growth to plan for liquidity (cash and e-float) and potentially hire an assistant. Assume the growth follows the model $N = N_0 \times K^t$, where N is the number of customers after t months, N_0 is the initial number of customers, and K is the monthly growth factor.

Tasks:

a) Help Nakato in determining her monthly growth factor,. Express your answer to 3 significant figures.

b) Determine the number of customers Nakato can expect by the end of December 2024 (after 12 months) if this growth rate continues.

c) Nakato estimates she needs UGX 10,000 in float per regular customer per

month. Using the predicted number of customers for December 2024, calculate the total float she would need. Express this amount using index notation in terms of powers of 10.

ITEM 2

Mr. Okello is weaving a traditional Ugandan mat (ekikeeka) with intricate geometric patterns. One key element involves fitting square tiles made of dyed reeds into a rectangular border. The side length of each square tile needs to be exactly $(\sqrt{5} - \sqrt{2})$ for the pattern to align perfectly. The rectangular border has a length of $(10\sqrt{5} + 5\sqrt{2})$ and a width of $(8\sqrt{5} - 4\sqrt{2})$ cm.

Tasks:

a) Calculate the exact area of one square tile. Express your answer in the simplest surd form

$a + b\sqrt{c}$.

b) Determine the exact area of the rectangular border. Express your answer in the simplest surd form.

ITEM 3

A local environmental group in Jinja is studying the population growth of a specific fish species in a protected section of the Nile River. Their initial estimate in 2020 was 1,200 fish. They believe the population fl after t years can be modelled by $(t) = 1200\,x\,(1.15)$. *However,* another model proposed is based on logarithms; $\log_{10} P = \log_{10} 1200 + t \log_{10} 1.15$.

Tasks:

(a) Using the index model $(t) = 1200\,x\,(1.15)$, Calculate

the predicted fish population in the year 2025.

(b) Using the logarithmic model, show that it is equivalent to the index model.

(c) The group wants to know when the fish population is predicted to reach 5,000. Using logarithms and the model $(t) = 1200\,x\,(1.15)$. Determine the approximate number of years **(t) it will** take.

TOPIC 2: EQUATIONS AND INEQUALITIES

ITEM 5

A textile manufacturing company as just bought a new technological system which process curtains. The system was set to produce only same number of colour curtains (repeated) in the first and second run in a single command to ensure uniform production. The system operator commanded the machine to produce Blue and black curtains and the system displayed an operation in form an equation $\frac{(x^2-x+1)}{x-1} = k$ where *x* represented blue curtains in the first and second run, *k* represented black curtains.

The system operator wants to know the number of blue and black curtains that would be produced following the command.

Task;

As a mathematics student, help the system operator know how many blue and black curtains that are most likely to be produced by the command.

Item 6

Daisy sells photographs at art fairs with small, medium, and large sizes. She sells 3 more small photos than twice the difference between the large from the medium photos. It's also noted that when she sells 2 times small photos and 3 times medium photos, their sum is equivalent to 11 minus number of large photos sold. She knows; small photos cost $10, medium $30, and large $40. She wants to determine how many of each size to sell to cover her booth rental cost, which is $150.

Additionally, she monitors her stock by an equation $y = \frac{x+1}{x^2+3}$, then considers the discriminant of

x^2+3

a suitable quadratic equation to determine the range of the possible values of y which would give real stock value of *x*.

Task:

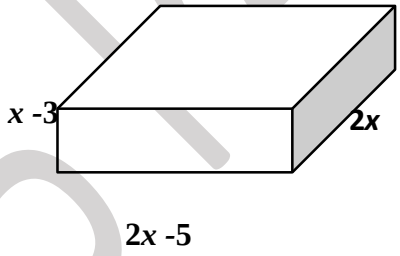
As a mathematics student Help Daisy determine;

(a) how many of each size to sell to cover her booth rental cost
(b) the range of the possible values of y which would give real stock value of *x*.

Item 7

Amoni is given a ground plan of two square rooms of different dimensions wrapped in a gift box. From the plan, a summary defines that the sum of the perimeters of these two square rooms is 40m while the sum of their areas is $58m^2$. He wants to determine the length of the sides of the square rooms so as to plan accordingly.

The gift box has dimensions indicated as shown below with a defined volume of 24 $units^3$



He intend to reuse the top and bottom large surface to design a door mat that would cover an area of 48 $units^2$, but he is not sure whether surfaces would be enough to accomplish his goal.

Task:

As a mathematics student;

(a) Determine the length of the sides of the square rooms.
(b) Prove whether the two surfaces would accomplish Amoni's goal.

Item 8

Abitex organized a show at Theater Laboniter which filled to capacity of 350. The theater charges $4.50 for children, $7.50 for students, and $12.50 of adults. There are half as many adults as there are students. The total ticket sales was $2415, Abitex wants to know how many children, students, and adults attended.

Task:

(a) Explain to Abitex on how he can know the number of children, students and adults attended
(b) Based on your explanation, determine how many children, students and adults attended

Item 9

A chemist has three different acid solutions. The first acid solution containing 10% acid, the second contains 40% acid and the third 60% acid. The chemist wants to use all three solutions to obtain a mixture of 100 liters containing 45% acid. The supply of 40% acid is low so twice as much 10% solution as 40% solution must be used.

Task:

Determine how many liters of each solution should be used?

Item 10

Your classmate missed a lesson on discriminant of roots, and the Teacher said that curve C with

Equation, $\boldsymbol{y = 1 - \frac{3x}{x^2 - 2x + 4}}$ has two coordinates of the stationary points. The teacher requests you to explain to your classmate what discriminant mean, and also find the coordinates of the stationary point of C

Task:

Help your classmate know what discriminant mean, and use a non-differentiation method to find the coordinates of the stationary point of C.

Item11

Mrs. Nabukalu, a farmer in Masaka, finds that the yield of her maize crop (in bags per acre), Y, depends on the amount of a specific fertilizer x used (in kg per acre). The relationship is modelled by the quadratic equation:

$(x) = -0.5x^2 + 20x + 50$. She wants to maximize her yield but also knows the fertilizer costs money.

Tasks:

a) Help Mrs. Nabukalu to determine the amount of fertilizer (x) that will give her the maximum maize yield.

b) Calculate the maximum possible yield in bags per acre.

c) If the cost of the fertilizer is UGX 1,500 per kg. Mrs. Nabukalu wants the yield to be at least 200 bags per acre. Formulate a quadratic inequality to represent this situation.

d) By solving the inequality in part (c) above determine the range of fertilizer amounts (in kg per acre) she can use to achieve a yield of at least 200 bags per acre.

Item 12

A community group in Gulu is managing the costs for drilling three boreholes (A, B, and C). The total cost was UGX 25,000,000. The cost of Borehole B was UGX 1,000,000 less than Borehole

A. The combined cost of Boreholes A and C was three times the cost of Borehole B. Let the costs of drilling boreholes A, B, and C be a, b, and c (in UGX) respectively.

Tasks:

a) Formulate a system of three linear simultaneous equations representing the information given.

b) By Using Row reduction, calculate the individual cost of drilling each borehole (a, b, and c).

c) If the cost per meter drilled was UGX 250,000 for all boreholes, determine the depth of Borehole A.

Item 13

A school in Mbarara wants to create a rectangular vegetable garden. They have 80 meters of fencing available. They want the area of the garden to be greater than 300 square meters to grow enough vegetables for the school lunch program. Let the length of the garden be L meters and the width be W meters.

Tasks:

a) Express the perimeter of the garden in terms of L and W and form an equation using the available fencing.

b) Using your equation in a) above formulate the area A of the garden purely in terms of L.

c) Formulate a quadratic inequality representing the condition that the area must be greater than 300 square meters and solve it to determine the possible range of values for the length (L) of the garden that satisfies both the fencing constraint and the area requirement.

TOPIC 4 COORDINATE GEOMETRY 1

Item 14

Mr. Kato owns a rectangular farm near Fort Portal. On a map grid, the corners of his main plot are at $(1, 2)$, $(9, 2)$, $C(9, 8)$, and $D(1, 8)$. He plans to install two straight irrigation pipes. *Pipe 1* will run from corner A to corner C. *Pipe 2* will run from the midpoint of side AB to the midpoint of side CD. A water source is located at point W (5, 5).

Tasks:

a) Determine the coordinates of the midpoints of sides AB and CD.

b) Formulate the equation of the line representing Pipe 1 (line AC) and the equation of the line representing Pipe 2.

c) Determine the shortest distance from the water source W (5, 5) to Pipe 1 (line AC). Will Pipe 1 pass directly through the water source? Justify your answer.

Item 15

A new road (Road 1) is being constructed in Kampala, represented by the equation $y = 2x + 3$. It will intersect an existing road (Road 2), represented by the equation $3x + 2y = 12$. A traffic light needs to be installed at the intersection point. Another planned road (Road 3) needs to be parallel to Road 1 and pass through the point $(4, 1)$. A fourth road (Road 4) must be perpendicular to Road 2 and pass through the same point $(4, 1)$.

Tasks:

a) Calculate the coordinates of the intersection point of Road 1 and Road 2 where the traffic light will be placed.

b) Determine the equation of the line representing the planned Road 3 and Road 4.

c) Calculate the acute angle between Road 1 and Road 2 at their

intersection point. Give your answer in degrees.

Item 16

Three villages, A, B, and C, are located on a map grid at coordinates A(2, 1), B(8, 3), and C(4, 7). A new health centre needs to be built such that it is equidistant from villages A and B. It must also lie on the line that passes directly between village C and the midpoint of the line segment connecting A and B.

Tasks:

a) Determine the coordinates of the midpoint M of the line segment connecting villages A and B.

b) Formulate the equation of the perpendicular bisector of the line segment AB. (This line represents all points equidistant from A and B).

c) Find the equation of the line passing through village C (4, 7) and the midpoint M calculated in Task 1.

d) Calculate the coordinates where the two lines found in b) and c) intersect. This point represents the ideal location for the health centre. Justify why this location satisfies both conditions.

TOPIC 5: PARTIAL FRACTIONS

Item 17

A local community in a rural area has a large water storage tank that supplies water to households through two distribution pipes. The rate at which water flows out of the tank through these pipes depends on how full the tank is. After conducting measurements, the engineers model the rate of water flow, R(x), with respect to time using a rational function:

$$= \frac{5x+3}{(x-1)(x-3)^2}$$

Where R(x) is the rate of water flow (in litres per minute) and x is the number

of hours after the start of the day.

The engineers must first decompose it into partial fractions before they determine the volume of the tank.

TASK

By expressing the function as partial fractions, help the engineers to:
Simplify the integration process by expressing it into partial fraction

Item 18

An Engineer in a chemical engineering plant in Namanve, want to use a chemical with concentration (t) of a product over time $\boldsymbol{t}$, which is modelled by complex rational functions.

Suppose the rate of change of concentration involves the expression: $\boldsymbol{f} = \frac{\mathbf{5}\boldsymbol{t}+\mathbf{3}}{(\boldsymbol{t}+\mathbf{1})(\boldsymbol{t}+\mathbf{2})}$

To analyse the long-term behaviour but doesn't know the appropriate techniques to use.

Tasks:

a) Help the engineer to identify the type of factors in the denominator of (t).

b) Express (t) as the sum of its partial fractions.

Item 19

An electrical engineering student at Makerere University is analysing a signal whose behaviour

over time x is related to the function. $\boldsymbol{g}(\boldsymbol{x}) = \frac{\mathbf{2}\boldsymbol{x}^{\mathbf{2}}+\boldsymbol{x}-\mathbf{1}}{\boldsymbol{x}(\boldsymbol{x}-\mathbf{1})^{\mathbf{2}}}$. This expression needs to be broken down

for further analysis.

Tasks:

a) Set up the appropriate form for the partial fraction decomposition of (x).

b) Determine the values of the unknown constants in the partial fraction decomposition.

c) Write the final partial fraction decomposition of (x).

Item 20

An economist is studying the relationship between investment I and national income Y. The relationship involves a complex function where a particular term is given by $h(Y) = \frac{Y^3+2Y^2-Y+5}{Y^2+Y-2}$. Before proceeding with the economic analysis, the economist needs to simplify

this expression.

Tasks:

Help the economist to;

a) Identify h(Y) as a proper or improper rational function. Justify your answer.

b) express h(Y) as the sum of a polynomial and a proper rational fraction.

c) Take the proper rational fraction part obtained in b) and decompose it into its partial fractions.

d) Combine the results from b) and c) to write the complete simplified expression for h(Y).

TOPIC 5: TRIGONOMETRY

Item 21

A surveyor is mapping a triangular piece of land in the hilly region of Kabale. The vertices are marked as fl, Q and R. The distance flQ is measured as 120 meters, and the distance flR is 150 meters. The angle at fl, $< QPR$, is measured as 75^0. The surveyor needs to find the length of the third side QR and the area of the land.

The Surveyor also had to test whether its true that

$Cos18^0 = \frac{\sqrt{10}+2\sqrt{5}}{4}$

Task.

(a) Determine the length of the side QR to the nearest meter and angle $< PQR$ to 1 decimal place.

(b) Calculate the area of the triangular piece of land flQR.

(c) If angle QflR was actually measured as $(45^0 + 30^0)$, apply an appropriate formula to find the exact value of $Cos\ 75^0$.

(d) Is it true that $Cos\ 18^0$ is equivalent to the given surdo Justify.

Item 22

A surveyor is mapping a triangular piece of land in the hilly region of Kabale. The vertices are marked as P, Q, and R. The distance PQ is measured as 120 meters, and the distance PR is 150 meters. The angle at P, $\angle QPR$, is measured as $75°$. The surveyor needs to find the length of the third side QR and the area of the land.

Tasks:

a) Determine the length of the side QR to the nearest meter and angle $\angle PQR$ to 1 decimal place.

b) Calculate the area of the triangular piece of land PQR.

c) If $\angle\ QPR$ was actually m easured as $(45° + 30°)$, apply an appropriate formula find the exact value of $\cos 75°$.

Item 23

An architect is designing a symmetrical roof truss for a community hall in Lira. The truss is shaped like an isosceles triangle ABC, with AB = AC. The base BC has a length of 16 meters. The angle at the apex A, $\angle\ BAC$, needs to be determined such that the height (altitude from A to BC) is exactly 6 meters. Let M be the midpoint of BC.

Tasks:

a) Consider the right-angled triangle AMB. Calculate the length of the side AB

b) In triangle AMB, determine the value of $\tan(\angle ABM)$ and hence find $\angle ABM$ in degrees.

c) determine the measure of \angle BAM hence calculate the angle at the apex, $\angle BAC$.

Item 24

A fishing boat leaves Kasenyi landing site (Point K) and travels 15 km on a bearing of $060°$ to reach Point A. From Point A, it then travels 20 km on a bearing of $135°$ to reach Point B. The boat captain now wants to know the direct distance and bearing from Kasenyi (K) back to Point B.

Tasks:

a) Help the captain to map the journey on a diagram, showing the points K, A, B, and their bearings.

b) By applying cosine rule calculate the direct distance KB, correct to one decimal place.

c) By applying sine rule calculate the angle $\angle AKB$. Hence, determine the bearing of Kasenyi (K) from Point B.

TOPIC 6: DESCRIPTIVE STATISTICS

Item 25

In certain school beginning of term exams results for end of term were recorded as shown in the table below by the class teacher showing the average of each student in all subjects and they were to be depended on to determine whether the modal average mark is less than 50 they should have external facilitators to boost performance

Average marks	Number of students
Below 10	6
10 and under 25	11
25 and under 35	17
35 and under 45	28
45 and under 50	20
50 and under 65	15
65 and under 80	3

Task; Using a statistical diagram, determine whether the school should have external help to boast learners' performance.

(07 scores)

Item 26

In **TrHX pharmaceutical** corps' research and development team has been testing new drugs where two drugs X and Y being approved have probabilities basing on the following conditions stated below; $P(X \cup Y) = \frac{17}{24}$, $P(X) = \frac{2}{3}$, $P(Y) = \frac{1}{4}$.

The company executives board wants to know after the first internal test what the probabilities that both are allowed ($\boldsymbol{X} \cap \boldsymbol{Y}$), drug X is allowed only ($\boldsymbol{X} \cap \boldsymbol{Y^1}$) and neither of the two are allowed $\boldsymbol{P}(\boldsymbol{X^1} \cap \boldsymbol{Y^1})$, for proper decision making on more funding or shutting down the program.

Task:

Help executive managers come to a decision to continue funding the development of drug X provided;

(i) if chance for both being allowed is less than 0.25 but the one for X only being allowed more than 0.422

(ii) Or shut down the whole program if the chance of neither being accepted is more than 0.25

Item 27

The numbers of male and female candidates admitted at a certain university in a certain year to offer different courses A, B, C, D, E, F, G, H, I and J were as follows:

Course	A	B	C	D	E	F	G	H	I	J
Male	66	54	60	70	62	46	74	58	80	58
Female	50	38	54	68	60	32	62	46	70	49

Given that the dean of students of this university has been asked to present the data showing the co-relationship of the male students (x) and female students (y) and comment on the nature/relationship of his report to the ministry of gender under Girl child education empowerment.

As well the university will receive scholarship grant provided the relationship is significant at 5% level.

Task:

a) Use a scatter diagram to help the dean of students show the relationship. Given that a new course that has been set up with a survey conducted among the current students where only 40 males showed interest, estimate using line of best fit to find the possible number of girls to the nearest whole number who would be interested.

b) Determine whether they would receive a grant provided they follow Spearman's co-efficient.

Item 28

In a certain calendar printing factory, the length of each calendar made has been organized into a cumulative frequency distribution as shown below

Length (cm)	<20	<30	<35	<40	<50	<60
Cumulative Frequency	4	20	32	42	48	50

From market research team, it has been duly determined that the commonest calendar length sold is the one with a median length. And the production team will produce more of these.

Task:

a) Using a cumulative frequency curve help the production team determine the median length they have to produce for the next output units.
b) As well a certain client has sent instruction to produce for them a length in 80th percentile, but the production team needs the actual length to the nearest whole number to be considered for this client.

Determine the standard deviation of the length.

At the start of the school term, a Physical Education (P.E) teacher decided to record the weights of 50 students in Senior Three as part of the school health monitoring program.
If the average weight turns out to be below 40 kg, the school administration plans to add eggs to the students' breakfast menu to help improve their nutrition.
The teacher also wants to know the most common weight among the students. Additionally, if the common weight is above 51kgs, the teacher needs to find out how many students are above this common weight so that they can be put on morning jogging aimed at maintaining healthy body mass.
The weights (in kilograms) were grouped as follows:

Age	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79
No. of patients	8	12	15	10	5

Task:
help the teacher:
(a) find out if they need to introduce eggs on breakfast menu.
(b) if they need to put some students on morning jogging, if yes how many?

Item 29

A cooperative society of farmers in Luwero recorded the cassava yield (in tonnes per hectare) from 50 small plots. The data is grouped as follows:

Yield (Tonnes/Hectare)	**Number of Plots (Frequency)**
5 - < 10	6
10 - < 15	10
15 - < 20	15
20 - < 25	11
25 - < 35	8

Tasks:

a) Construct a histogram to represent this data.
b) Using the histogram, estimate the modal yield of cassava per hectare.
c) Calculate an estimate of the mean yield and the standard deviation of the yield for these plots.

Item 30

The scores of 80 Senior Five students in a Mathematics mock exam at a school in Arua are summarised in the following cumulative frequency table:

Score (x)	Cumulative Frequency
$x \leq 20$	5
$x \leq 30$	15
$x \leq 40$	35
$x \leq 50$	55
$x \leq 60$	70
$x \leq 70$	77
$x \leq 80$	80

Tasks:

a) Represent the data on a cumulative frequency curve (ogive) to represent this

data and use it to estimate:

i) The median score.

ii) The interquartile range of the scores.

iii) The 80th percentile score.

b) If the pass mark was set at 45 marks, estimate from your ogive the number of students who passed the exam.

c) Explain what the interquartile range tells you about the spread of the students' scores.

Item 31

Two market vendors, Aisha and Ben, operating in Owino Market, Kampala, recorded their daily sales (in thousands of UGX) over a period of 30 days. The data is summarized below:

Aisha: Mean Sale = 150, Standard Deviation = 25 **Ben:** Mean Sale = 160, Standard Deviation = 40 **Tasks:**

a) Determine which vendor has higher average daily sales.

b) Calculate the coefficient of variation for both Aisha and Ben.

c) Using the coefficient of variation, determine whose sales are relatively more consistent. Justify your answer.

TOPIC 7: SCATTER DIAGRAMS AND CORRELATIONS

Item32

In a research project conducted by the National Agricultural Research Institute, scientists are studying whether there's a relationship between soil fertility scores and crop yield on various farm plots.

Soil fertility is measured on a scale of 0 to 100, and crop yield is measured in kilograms per hectare. A total of 12 sample plots were tested. The team believes that higher soil fertility should result in higher yields, but wants

statistical proof. They will take a conclusion if the correlation of the results is moderate or above.

Unfortunately, 2 of the plots had incomplete data due to equipment malfunction:

- Plot 4 is missing a crop yield reading, and
- Plot 9 is missing a soil fertility score.

Plot no.	1	2	3	4	5	6	7	8	9	10	11	12
Soil fertility	75	60	85	90	55	70	68	88		62	80	66
Crop yield	78	58	92		54	74	72	90	70	60	85	69

TASK.

Help the scientist

(a) find the missing values for sample from plot 4 and 9

(b) Can the institute reasonably conclude that higher soil fertility leads to higher yield?

Item 33

An agricultural officer in the Bugisu region collects data on the annual rainfall (in mm) and the coffee yield (in kg per tree) for 8 different farms over the past year.

Rainfall (mm), x	Yield (kg/tree), y
1200	2.5
1400	3.0
1000	2.0
1600	3.2
1800	3.5
1100	2.2
1500	3.1
1300	2.8

Tasks:

a) Construct a scatter diagram to visually represent the relationship between rainfall and coffee yield.
b) Based on the scatter diagram, describe the type of correlation you observe between rainfall and yield.
c) By ranking the data for both rainfall (x) and yield (y), calculate Spearman's rank correlation coefficient.
d) Interpret the value of Spearman's rank correlation coefficient you calculated in the context of rainfall and coffee yield in this region. Does it support your observation from the scatter diagram?

Item 34

A teacher at Exodus College School wants to investigate if there's a relationship between the average number of hours students spend studying per week and their score on a recent Physics test. Data for 7 students is collected:

Study Hours/Week (x)	Test Score (y)
5	65
8	75
2	50
10	85
4	60
12	90
6	72

Tasks:

a) Help the teacher to represent this data on a scatter diagram.
b) Visually, draw a line of best fit through the points on your scatter diagram.
c) Comment on the apparent relationship between study hours and test scores based on your diagram and line of best fit.
d) Would it be reasonable to use this relationship to predict the score of a

student who studies for 20 hours a week? Explain your reasoning, considering the limitations of extrapolation.

Item 35

An economics student is researching the relationship between the average weekly price of a bunch of Matooke (in UGX) in Nakasero market and the estimated quantity demanded (in hundreds of bunches). Data over 6 weeks is collected:

Price (UGX), P	Quantity (hundreds), Q
5000	80
6000	70
4500	90
7000	60
5500	75

Price (UGX), P	Quantity (hundreds), Q
6500	68

Tasks:

a) Calculate the Spearman's rank correlation coefficient between the price and quantity demanded.

b) Interpret the calculated correlation coefficient. Does it align with typical economic principles of demand?

c) Plot a scatter diagram for the Price (P) vs Quantity (Q). Does the visual pattern support the calculated correlation?

TOPIC 8: DYNAMICS 1

Item36

A car travels along a straight road from Kampala to Gulu, passing through Kawempe and Matugga, the car passes Kawempe at $u\ ms^{-1}$ and maintains this speed for $60\ s$, during which it travels $900\ m$. Approaching a junction at

Kawanda, the car then slows at a uniform rate of $a\ ms^{-1}$ over the next $125\ m$ to reach a speed of $10\ ms^{-1}$, at the instant, with the road clear, the car accelerates uniformly at $0.75\ ms^{-2}$. This acceleration is maintain for $20\ s$ by this time the car

has reached a speed of $v\ ms^{-1}$ which is then maintained. The car passes Matugga, $45\ seconds$ after its speed reaches $v\ ms^{-1}$.

TASK:

(a) Determine the values of $u, a\ and\ v$.

(b) Sketch a velocity time graph for the motion of the car between between Kawempe and Matugga.

(c) Determine the distance between Kawempe and Matugga and the time taken by the car to travel this distance.

(d) Determine the distance covered by the car in the 82nd of its motion.

Item 37

Two farm workers, Okello and Lanyero, are pulling a heavy sack of maize (mass 80 kg) across level ground in a Kireka warehouse. Okello pulls with a force of 300 N at an angle of $20°$ above the horizontal. Lanyero pulls with a force of 250 N at an angle of $15°$ above the horizontal, in the same direction as Okello. The coefficient of kinetic friction between the sack and the ground is 0.3. (Assume $g = 9.8\ m/s^2$).

Tasks:

a) Represent all the forces acting on the sack on a diagram.

b) Resolve the forces applied by Okello and Lanyero into horizontal and vertical components.

c) Calculate the total upward vertical component from the workers' pulls and hence determine the Normal Reaction force exerted by the ground on the sack.

d) Calculate the maximum possible frictional force and the total horizontal component of the pulling forces hence determine the net horizontal force acting on the sack.

Item 38

In a mechanics lab, a block A of mass 5 kg rests on a rough inclined plane

angled at 30° to the horizontal. The coefficient of kinetic friction between block A and the plane is 0.2. Block A is connected by a light inextensible string passing over a smooth pulley at the top of the incline to a block B of mass 3 kg, which hangs freely. The system is released from rest. (Assume $g = 9.8m/s^2$).

Tasks:

a) Illustrate the forces acting on block A and block B on separate diagrams.
b) For block A, resolve its weight into components parallel and perpendicular to the inclined plane. Calculate the normal reaction force on block A.
c) Determine the frictional force acting on block A as it slides (assume it slides up the plane initially, if unsure, calculate net force without friction first to determine direction).
d) Apply Newton's Second Law to both block A and block B to formulate two simultaneous equations involving the acceleration (a) of the system and the tension (T) in the string. Solve these equations to find the values of a and T.

Item 39

A lorry of mass 5000 kg is parked on a road in Kisoro inclined at an angle θ to the horizontal, where $\sin\theta = 0.1$. The coefficient of static friction between the lorry's tyres and the road is 0.4. The driver has applied the handbrake. We want to determine if the lorry will remain stationary. (Assume $g = 9.8\, m/s^2$).

Tasks:

a) Come up with a diagram showing the forces acting on the lorry assuming it is about to slide down the slope.
b) Resolve the weight of the lorry into components parallel and perpendicular to the road surface, hence find the Normal Reaction force acting on it.

c) Determine the maximum possible static frictional force that can be exerted by the road on the tyres ($F_{\max} = \mu_s N$). Compare this maximum friction with the component of the lorry's weight acting down the slope. Establish wether lorry will remain stationary or slide down. Justify your conclusion.

TOPIC 9: PROBABILITY THEORY

ITEM 40

Over a period of time , Nancy finds that on a long distance flight, he flies economy class on 82% of the flights and the rest of the flights, he flies first class. When he flies economy class, the probability that he gets a good night sleep is Q. When he flies the first class, the probability that he gets a good night sleep is 0.9. The probability that Nancy gets a good night sleep on a random flight is 0.285. Nancy also has two boxes A and B, box A contains 1 red ball, 3 green balls and 1 blue ball. Box B contains 2 red balls, 1 green ball and 2 blue balls. A balanced die is thrown and if the throw is a six, box A is chosen otherwise box B is chosen. Nancy picked a ball at random from the chosen box.

TASK:

(a) Help Nancy to find the value of Q.

(b) Given on a particular flight, Nancy does not get a good night sleep, find the probability that he is flying economy class.

(c) Given that the ball Nancy picked was green, find the probability that the ball came from box A.

Item 41

In a certain region of Uganda, it is estimated that 2% of the population has a particular disease. A medical test is developed to detect the disease. The test is not perfect:

If a person has the disease, the test correctly gives a positive result 95% of the time (Sensitivity). If a person does not have the disease, the test correctly gives a negative result 90% of the time (Specificity). A person from the region is

selected at random and tested.

Tasks:

a) Construct a tree diagram and use it to calculate the overall probability that a randomly selected person tests positive.

b) Using Bayes' Theorem, determine the probability that a person actually has the disease given that they tested positive.

c) Interpret your result from b) above. What does this tell you about the reliability of a positive test result in this scenario?

Item 42

A factory in Jinja produces light bulbs using three machines: Machine A, Machine B, and Machine C.

Machine A produces 40% of the total output, and 5% of its bulbs are defective. Machine B produces 35% of the total output, and 3% of its bulbs are defective.

Machine C produces 25% of the total output, and 2% of its bulbs are defective.

A bulb is selected at random from the factory's output.

Tasks:

a) Determine the probability that the selected bulb was produced by Machine A AND is defective. Similarly, calculate the probabilities for Machine B being defective and Machine C being defective.

b) Using the results from a), determine the overall probability that a randomly selected bulb from the factory's output is defective.

c) Given that the selected bulb is found to be defective, calculate the probability that it was produced by Machine B.

Item 43

In a class of 60 students at a Kampala school, 40 own an Android phone (A), 25 own an iPhone (I), and 15 own both types.

Tasks:

a) Represent this information on a Venn diagram.

b) Determine the number of students who own:

   i) Only an Android phone.

   ii) Only an iPhone.

   iii) Neither type of phone.

c) A student is selected at random from the class. Calculate the probability that the student owns:

   i) An Android phone or an iPhone.

   ii) Exactly one type of phone.

d) Given that a selected student owns an Android phone, calculate the probability that they also own an iPhone.

TOPIC 10: DIFFERENTIATION 1

Item44

1. ABC pharmacy has just opened a branch in Mitooma Town.
   It wants to transport syrups in cubical containers packed in a large box.

   The designing team has a rectangular material of dimensions; $\mathbf{80}\boldsymbol{cm} \times \mathbf{50}\boldsymbol{cm}$**.** Equal sides of; $\boldsymbol{x\ cm}$ are to be removed from each corner and the edges turned up to make a box of volume, $\boldsymbol{V\ cm^3}$**.**
   They need your help since they want to transport as many syrups in a so- formed box as possible.
   TASK:

   a) Show that; $\boldsymbol{V = 4x^3 - 260x^2 + 4000x}$

   b) What should be the value of; $\boldsymbol{x}$ if their plan is to be **fulfilled**?

c) What will be the capacity of the box so formed?

It's known that they want to transport **2,250** syrup cubical containers.

d) Of what dimensions should each cubical container be?

Item45

Mukwano company has planned to design premium Hemispherical plates of radius, $\boldsymbol{r}$ and volume, $\boldsymbol{V}$.

A worker in production team has made a **6**% error in the volume of each plate manufactured for a full week.

Each day, the company produces **160** plates, and for each plate errored, it costs a company **UGX. 16,000** of the error made in the surface area of the same plate, to modify it.

The team has approached you for help.

TASK:

Help the designing team to;

e) Know the percentage error made in the surface area of each plate.

f) Know how much the company must incur to modify the errored plates.

Item46

During class discussion, Muteesi has been tasked to approximate the value of;

$\boldsymbol{sin30.2^0}$ using small changes.

She has been given a hint that; $\boldsymbol{sin30^0}=\frac{1}{2}$ by the teacher.

She, however, needs your help to finish the task.

TASK:

Help Muteesi to;

g) Generate a small change in the output of; $\boldsymbol{sin30.2^0}$

h) determine the value of; $\boldsymbol{sin30.2^0}$**.** Hence, show that;

$$\boldsymbol{sin30.2^0 \cong \frac{\sqrt{3}}{1800}\ (\pi + 300\sqrt{3})}$$

Item47

The profit made, $\boldsymbol{y}$ **(in ten thousands of UGX)** with $\boldsymbol{x}$ **(in hundreds of kg)**

sales by a local retail shop in a day in Mukono town is given by;

$$\boldsymbol{y = mx - x^2 - 8}$$ where $\boldsymbol{m}$ is a constant.

On a random day, it makes a maximum profit of; **UGX. 170,000**. **TASK:**

i) Find the value of; $\boldsymbol{m}$

j) What are total sales of the shop if it's to realize maximum profits?

k) How many kilograms are sold for a shop to break even? Write your answers to the nearest **kg.**

Item48

A fixed point, O lies on a straight road along which a car races.

A racing car moves on the road such that at a time, **t** hours, $\boldsymbol{t \geq 0}$**,** after passing through O, the velocity of the car, $\boldsymbol{V\ kmhr^{-1}}$ is modelled as;

$$\boldsymbol{V(t) = \frac{1}{20}(t^3 - 8t^2 + 15t)}$$

The driver starts racing at **08:00AM TASK:**

Help the car driver to;

l) Determine the times of the day when He's at instantaneous rest

m) Find the magnitude of acceleration when $\boldsymbol{t = 1hr}$

n) Obtain the maximum speed he can race in the interval; $\boldsymbol{0 \leq t \leq 3}$**.** And at what time of the day is it always?

Item 49

A farmer in Mukono wants to create a rectangular enclosure for chickens next to a long, straight existing wall. He has 100 meters of fencing wire available for the other three sides of the rectangle. He wants to maximize the area enclosed for his chickens. Let the side parallel to the wall have length x meters, and the other two sides perpendicular to the wall have length y meters each.

Tasks:

a) Help the farmer to express the total length of the fencing used in terms of x and y, and formulate an equation based on the available wire.
b) Express the area A of the enclosure ($A = xy$) as a function of only one variable x. Hence, find the value of x that maximizes the area.
c) Determine the maximum possible area of the enclosure and confirm it is a maximum.

Item 50

The displacement s (in meters) of a particle moving along a straight line from a fixed point O, at time t (in seconds), is given by the equation $(t) = t^3 - 6t^2 + 9t + 5$, for $t \geq 0$.

Tasks:

a) Determine the expressions for the velocity (t) and acceleration (t) of the particle at time t by differentiating the displacement function.
b) Calculate the initial velocity and initial acceleration of the particle $at\ t = 0$.
c) Find the time(s) when the particle is momentarily at rest $(t) = 0$.
d) Determine the acceleration of the particle at the time(s) when it is at rest. Describe the motion of the particle during the first 4 seconds.

Item 51

A scientist has a spherical balloon is which being inflated. Its radius r is increasing at a constant rate of 0.1 cm per second. The volume of a sphere is given by $V = \frac{4}{3}\pi r^3$. He wants to find the

rate at which the volume is increasing when the radius is 5 cm. He also wants to estimate the approximate increase in volume as the radius increases from 5 cm to 5.1 cm.

Tasks:

a) Help the scientist to determine the rate at which the volume of the bowl is changing with respect to the radius.

b) Determine the rate at which the volume is increasing when the radius $r = 5\ cm$.

c) Estimate the approximate increase in volume (δV) as the radius increases from $r = 5\ cm$ to $r = 5.1\ cm$.

TOPIC 11: INTEGRATION 1

Item 52

Water flows into a storage tank in Mbale at a rate given by $(t) = 10 + 0.5t$ liters per minute, where t is the time in minutes from the start ($t = 0$). The tank was initially empty.

Tasks:

a) Obtain expression for the volume V(t) of water in the tank as an indefinite integral.

b) Using the initial condition, determine the value of the constant of integration C.

c) Calculate the volume of water in the tank after 60 minutes

d) Determine the average rate of flow into the tank during the first 60 minutes using the mean value function.

Item 53

A piece of land is bounded by a river whose shape can be modelled by the curve $y = \sqrt{x}$, the straight line $x = 9$, and the x-axis (representing a straight fence). The coordinates are measured in meters. The owner wants to calculate the area of this piece of land.

Tasks:

a) Help the owner to sketch the region bounded by the land.

b) Set up the definite integral that represents the area of this region hence use it to calculate the exact area of the piece of land.

c) If this area were revolved around the x-axis, it would form a solid shape. Set up the definite integral representing the volume of this solid of revolution hence Calculate this volume.

Item 54

A boda-boda rider accelerates away from a traffic light in Fort Portal. His velocity v (in m/s) after time t (in seconds) is given by $(t) = 6t - t^2$ for $0 \leq t \leq 6$.

Tasks:

a) Obtain an expression for his displacement (t) (assume $(t = 0) = 0$).

b) Determine the displacement of the boda-boda from the traffic light after 3 seconds.

c) Calculate the total distance travelled by the boda-boda in the first 6 seconds.

d) Determine the time t at which the boda-boda reaches its maximum velocity within the interval $0 \leq t \leq 6$. Hence Calculate its maximum velocity.

TOPIC 12: PERMUTATIONS AND COMBINATIONS

Item55

In the village of Harmony Hill, community leaders are preparing for a major cultural festival by forming a youth choir. A total of 5 boys and 7 girls have
expressed interest in joining. However, due to space and budget constraints, the choir can only include 6 members.

To promote fair gender representation, the organizers are considering two possible selection options:

(a) A choir made up of exactly 3 boys and 3 girls, or

(b) choir with at least 4 girls

(c) a choir with at most 2 boys.

The problem is—they are unsure how many different ways each option can be formed. To make the selection process easier and more organized, they have
decided to go with the option that has the fewest possible combinations, in order to avoid confusion and potential conflict.

Task:

Help the organizers by:

- Calculating the number of possible ways the choir can be formed under each option.
- Determining which option should be selected based on the least number of combinations.

Item 56

A student at Ntare School has 4 distinct Mathematics books, 3 distinct Physics books, and 2 distinct Chemistry books. He wants to arrange them on a single shelf.

Tasks:

Help the student to know

a) how many different ways he can arrange 9 books be on the shelf if there are no restrictions?

b) how many ways he can arrange the books if all the Mathematics books must be kept together, all the Physics books must be kept together, and all the Chemistry books must be kept together?

c) In how many ways he can arrange the books if only the Mathematics books must be kept together?

Item 57

Exodus College School needs to form a student committee of 5 members. There are 8 eligible students from Senior Five and 6 eligible students from Senior Six.

Tasks:

a) In how many ways can the committee of 5 be formed if there are no restrictions on the class level?
b) In how many ways can the committee be formed if it must consist of exactly 3 students from Senior Five and 2 students from Senior Six?
c) In how many ways can the committee be formed if it must include at least 4 students from Senior Five?
d) Suppose two specific Senior Six students, Mary and Jane, refuse to be on the committee together. In how many ways can the committee be formed if it must have exactly 3 Senior Five students and 2 Senior Six students, considering this restriction?

Item 58

A mobile banking App requires users to create a 4-digit PIN using the digits 0 to 9.

Tasks:

a) How many different 4-digit PINs can be created if digits can be repeated?
b) How many different 4-digit PINs can be created if digits cannot be repeated?
c) How many different 4-digit PINs can be created if digits cannot be repeated and the PIN must be an even number?
d) How many different 4-digit PINs can be created if digits can be repeated, but the PIN cannot start with 0?

ARITHMETIC PROGRESSIONS (AP)

ITEM 59:

Upon his arrival at work in Quatar, Bbosa plans to save for 60

months in order to raise Enough funds to purchase a small house back in Uganda worth **UGX 56M**.

He wish to start by saving **$300** in Jan, 2026 and each two successive weeks thereafter, to save extra;

- Plan A: **$15,**
- Plan B: **$25,** compared to the previous two weeks.

Given that His annual work salary will be **$25,000**, and he's to work in Quatar for only 60 months starting from 1st Jan, 2025, and his expected expenditure is as follows.

Item	**Status**	**Cost**
Food	Monthly	$70
Water	Monthly	$40
Mobile token	Monthly	$35
Rent	Monthly	$130
Return Air ticket	one time	$900

TASK:

Help Bbosa to determine;

a) how much he'll have saved by the end of August, 2027 using;
   i) Plan A
   ii) Plan B
b) how much will be his expenditure throughout his stay in Quatar.
c) the best saving plan to go for. And why?

Assume: 1$=UGX. 3500

ITEM 60

Wedding halls in Mbarara town are designed in such a way that the ground floor accommodates 90 seats, first floor accommodates 115 seats, second floor accommodates 140 seats and so on.

A groom invited **4050** people to his wedding. The chairperson of the party has three potential halls to hire as follows;

- A 9 – storey hall.

- A 10 – storey hall.
- A 13 – storey hall.

As per the wedding chairperson's plan, two people are to occupy one seat during the function.

TASK:

Help the chairperson to determine;

a) the storey hall to go for if the hall chosen has to be fully occupied.
b) number of seats in the;
   i) Fifth floor
   ii) Seventh floor
   iii) Ninth floor
c) how many more seats will be required if every two invited attendees come with their one uninvited friend.

ITEM 61

On 1st birthday, Trebbo was given **UGX. 50,000** as a present by his godmother Maria.

For every birthday ever since, Cleo gave Trebbo **UGX.16,000** more than how much he gave him on his previous birthday.

TASK:

Help Trebbo and his Mom to determine;

a) how much his son will receive from his godmother on his;
   i) 9th ,
   ii) 12th ,
   iii) 23rd ,
   iv) 17th, birthday
b) what his birthday will be if Trebbo receives **UGX.7.448M** from godmother.

ITEM 62

A new Gym opened, and during its first trading month, **26** people joined its membership.
A business forecast for the Gym membership is drafted for the next twelve months.

TASK:
Help the group chairperson to predict the number of people that will;

a) join in the twelfth month,
b) have joined during the first twelve months, if extra **15** members join Gym's membership every month.

The business plan foresees that in order for the business to succeed in long term, it needs a total membership of **1500** during its first twelve months.

c) What **extra number** of members should join monthly to have the target accomplished?

ITEM 63
At Fort Lugard Museum, one of its buildings has a sloping shape with the roof tiles arranged neatly in horizontal rows. There are **28** roof tiles in the top row and each row below the top row has an extra **4** tiles than the row above it. The bottom row has **184** tiles.

TASK:
Help the Architectural tourist to know the number of tiles on the;

a) 13th row from the top
b) 16th row from the bottom
c) 9th row from the top
d) 21st row from the bottom
e) On the roof of the building.

PART II: GEOMETRIC PROGRESSION (GP)

ITEM 63

Mr. Jk shared his Maths online resource to His **three** unique WhatsApp contacts at 1PM. After a **hour**, each of the **three** WhatsApp contacts shared the same resource to other **three** unique contacts. Then at 3PM, each of the contacts shared it with **three** other unique contacts, and so on.

TASK:

Help Mr. Jk to determine how many contacts received the resource by;

a) 06PM
b) 11PM
c) 08PM
d) 03PM

ITEM 64

Isiah's parents want to invest in a University fund for Him. On his 1st birthday, they would like to invest **UGX. 200,000** and the Fund program promises them a 9% growth on it every year. Parents will invest the same amount every year through his 25th birthday.

TASK:

Help Isiah's parents to predict how much they'll in the program on Isiah's;

a) 19th,
b) 12th ,
c) 23rd,
d) 08th,
e) 25th, birthday.

ITEM 65

Shivan is a fresh graduate from university. In a search for job, she ran into two job adverts whose jobs had the following information;

JOB A:

- Starting monthly salary: **UGX. 850,0000**
- Effective working year: 1st Jan, 2025
- Salary increase annually: 6%

JOB B:

- Starting Annual salary: **UGX. 9,000,000**
- Effective working year: 1st Jan, 2025
- salary increase annually: 7%

Her plan is to be with atleast **UGX. 57,000,000** in her bank account by the end of 2030 since she will be saving all the money from the job she'll take. **TASK:**

Help Shivan to

a) predict the amount of money she's like to have earned by the end of;
   i) 2027,
   ii) 2032, in each of the above jobs if taken.
b) choose the job she should apply for. And why?

ITEM 66

Joseph drops a ball from a point 100 metres above the ground. The ball rebounds to 80% of each of the heights its falling from.

TASK:

As a Mathematician, help Joseph to predict;

a) how high his ball will rebound in the;
   i) 5th rebound
   ii) 7th rebound
   iii) 17th rebound
   iv) 31st rebound

b) the total distance travelled by the ball in;
   i) 20,
   ii) 40
   iii) 15
   iv) 06, rebounds vertically.

ITEM 67

Pilgrims from Lira City started their pilgrimage on 13th May, 2025 to Namugongo Martyrs Shrine. The first day, they walked **18 kilometers.** To catch up with the celebrations on 3rd June, 2025 at Namugongo, they planned to arrive at the place one day before the Event. They thus decided to always walk 90% of what they covered the day before.

TASK:

Help the Pilgrims determine;

a) the distance they covered at the end of the;
   i) 10th day,
   ii) 06th day,
   iii) 12th day,
b) how far the Shrine is from Lira City if they timely arrived at Namugongo as per their initial plan.

Item68

You are given three points $(-2\ -3), (2\ 0) and\ R(8\ -8)$. Illustrate that $P\hat{Q}R = 90^0$ and generate the area of ΔPQR.

Item69

It's known that $(x) \equiv 3 - 7x + 5x^2 - x^3$, explain mathematically the fact that $3\ -x$ gives a reminder zero and identify the other two factors which give zero reminder.

Item70

Identify the range of values of x for which $4x^2 - 12x + 5 < 0$

Item71

Trigonometry is a branch of mathematics which uses identities. Use knowledge of this branch of mathematics to explain the fact that $sec^2A + cosec^2A = 4cosec^22A$.

Item72

James is a farmer dealing in carrots He monitors production depending on number of sacks got due climatic factors basing on the equation $Q = 8cosx - 15sinx$, where Q is number of sacks and x is in degrees.($0^0 \leq x \leq 60^0$) Help James to know the price of each sack when the Quantity Q is zero, given that;

$$\boldsymbol{P = \frac{x}{360} \times 10000shs}$$

Item 73

The distance covered by a car depends on the velocity V of the car according to the equation $D = 3(2^{2v}) + 2(2^v)$. Find the velocity V when the distance is 1 unit.

Item74

In how many ways can seven boys and three girls sit on a bench is girls must not sit together and two of the girls are identical twins.

Item75

Evaluate the value of the sum $\frac{\propto}{\beta}$and$\frac{\beta}{\alpha}$ the value of the product of $\frac{\propto}{\beta}$ an $\frac{\beta}{\alpha}$,by applying the equation $2x^2 - 3x + 2 = 0$

ITEM 76

A community has been contributing towards the construction of a new place of worship. Their plan is to have face with an isosceles triangular roof shape. The corners are assumed to be at $(5\ , -3)$ $(-6, 1)$ and $(1,8)$. A construction company

has been contracted to develop the
building and you are one of the engineers in charge of the task. The challenge is to identify which points should form the horizontal base and which point to form tip. Further more a big cross is to be placed in the middle of the shape as an identification symbol of the faith.

The community also requested that the front compound should be in a triangular shape with total perimeter of 4200m, one side to be of length 1400m and total area of compound to be $2100\sqrt{15}m^2$

Task: As the head of the team of engineers help the company to accomplish the request of the community by identifying the horizontal corners, tip and how to place the cross. Also identify the Other lengths of the compound and make sure the cosine of the largest angle formed is $-\frac{1}{4}$.

ITEM 77.

A chemical company has come up with a new jelly product on the market developed Using the formula $\frac{11x+12}{2x^3+x^2-15x-18}$ From three different components. The feedback from the market

Shows that the product has been rejected due to fact that affects the skin which has caused losses to the company. Their chemist believes that the percentages of the three components used where not balanced so there is need to separate the formula into different units to identify the
Percentages used of each component. The chemist is challenged with this task and the company has contacted a mathematic consultancy company to solve the task.

Task; As an expert in this area in the mathematic company identify the units from the formula so that the chemist can balance the percentages.

ITEM 78

One side of a container at KUKU sea port has a rectangular face marked as PKMN with PK being on a horizontal plane having a length of 8 meters and MN being 6 meters. The
container is to be lifted by a crane attached at point N and turned through an angle of 30^0 at
point P. The driver of the crane is concerned about vertical and horizontal distance of the point N from point P before he continues to lift the container due to risks that

might occur.

At the same port there are two observation tours in a straight line one kilometer apart. Peter and Tom are in charge of them to observe incoming ships with containers. Tom is due east of Peter. Peter observes a ship on baring of 167^0 and Tom observe the same ship on bearing of 205^0.

Task: You are tasked with generating the distance Vertical and horizontal distance of point N from point P so that the driver of the crane is aware of the risks involved in lifting he
container.

Also help Peter and Tom Know how far the ship is from the port so that their get set to off load the containers

ITEM 79

A road from Kampala towards Entebbe goes via a hill is expressed using the equation $y = x^3 - 9x^2 + 20x - 8$. Due to heavy trucks which use the road a company has been contracted to find the inclination of the road at a point 1600m horizontally and 4000m vertically where trucks find it hard to ascend the hill so that adjustments are made to ease movement of the trucks

An alternative road is to be constructed at a lower point on the same hill 1100m horizontal and 3000m vertical but parallel to the original road in case trucks find it hard to use the main road.

Task: As a young engineer you are tasked with find the inclination of the road at that point (1600m, 4000m) and the angle of inclination. Also form the expression of the alternative road in terms of x and y at the point (1100m, 3000m)

ITEM 80

In mathematics students study a branch dealing with factorial and arrangements. Mary has arranged a birth day party and invited twelve friend's young boys and girls from her form schools. She has one round table to fit the friends

A couple is organizing a party to thank friends who have stood with them during the period of organizing their wedding successfully but they want to use invitation cards with six-
digit figures. They have decided to use these six digits 5, 1, 6, 4, 6, 6 to form the figure

but the value of the figure formed should not be less than 400,000. This will determine the number of cards to be printed hence eliminating n invited visitors. The cost of print a card is 6500 shillings

Task: Help Mary identify the different ways in which she can arrange the friends around the table in order without fighting for chairs.

A friend advised her that among the invited friends there are two who cannot sit next to each other, help Mary make adjustments in the different ways of siting the friends on the table.

Also help the couple to know how many visitors they can invite and the total cost needed to print the cards

END

F.5 PACKAGE