S3: INTEGRATION ACTIVITIES ACROSS ALL 13 TOPICS.

Tr. Kabuzi maths.

NOTE: In some chapters or topics, a single Activity Of Integration (AOI) may be insufficient to cover all the learning outcomes. Therefore, it is necessary to provide more than one AOI to comprehensively address all the desired learning outcomes.

ACTIVITY OF INTEGRATION TOPIC 28

NAME: ....

STREAM: ....

TIME: 30 minutes**.**

TOPIC: Equation of a straight line.

THEME: Patterns and Algebra**.**

@africastruggle

SCENARIO.

A farmer is planting two rows of crops along straight lines. The first row follows the line $4y - 3x + 2 = 0$ and the second row must be parallel to it, passing through the point (8, 5). The farmer is also considering planting a third-row perpendicular to the first row. This third row must pass through the point (0, 7), and the farmer will plant it only if its y-intercept is greater than 4.

TASK:

Help the farmer find the equation of the second row and determine the equation of the third row. Advise whether the condition for planting the third row is met

ACTIVITY OF INTEGRATION TOPIC 29

NAME: ....

STREAM: ....

TIME: 30 minutes.

TOPIC: Trigonometry 1.

THEME: Geometry and Measures.

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SCENARIO.

A community is planning to construct a tower on top of a hill. The base of the hill is located at a distance of x meters from point A. The angle of elevation from point A to the top of the hill is 50°, and the angle of elevation from point A to the top of the tower is 60°. The community has set a safety requirement that the height of the tower should not exceed 50 meters for stability reasons.

The community seeks your help in calculating the height of the tower based on the given angles of elevation and the distance to the hill, and would like your advice on whether the tower can be constructed safely according to the stability requirement.

TASK:

Help advise the community whether the tower can be built safely according to the safety requirement.

ACTIVITY OF INTEGRATION TOPIC 30

NAME: ....

STREAM: ....

TIME: 30 minutes**.**

TOPIC: Data collection/Display.

THEME: Data and Probability**.**

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SCENARIO.

A survey was randomly conducted by the Ministry of Health in a community to assess the weights of children aged between 10 to 18 years. The survey collected the following data.

30	56	31	21	36	45
40	22	38	48	18	34
35	46	23	32	25	49
27	12	23	48	15	39
20	33	10	37	59	28

The Ministry of Health wants you to organize this data in a frequency table with five classes. They are considering providing relief food funds to families if the average weight of children in the community is below 40 kg, and they also want to know how many children weigh less than 40kg, as they plan to prioritize these children for aid.

TASK:

Assist the Ministry of Health in making decisions about distributing the relief food funds.

ACTIVITY OF INTEGRATION TOPIC 31

NAME: ....

STREAM: ....

TIME: 30 minutes.

TOPIC: Vectors.

THEME: Geometry and Measures.

@africastruggle

SCENARIO.

A village plans to construct two new roads, AB and CD, to connect key locations in their area. Road AB connects point $A(2,3)$ and point $B(8,7)$, while road CD connects point $C(4,2)$ and point $D(10,6)$. The village council wants to determine if these roads are parallel to avoid future intersections and ensure smooth traffic flow. If the roads are not parallel, they will consider altering one of the roads to make them non-intersecting. However, if the roads are parallel, they will consider constructing a flyover through the midpoints of the two roads and need you to find the length of this flyover.

TASK:
Verify whether the roads are parallel and if so, find the length of the flyover.

ACTIVITY OF INTEGRATION TOPIC 32

NAME: ....

STREAM: ....

TIME: 30 minutes**.**

TOPIC: Ratio and Proportion.

THEME: Patterns and Algebra**.**

@africastruggle

SCENARIO.

In your village, the cost of irrigating a farm is partially variable, depending on the amount of water used and a fixed setup fee for the irrigation system. It was observed that irrigating a small farm using 5,000 litres of water costs UGX 250,000, while irrigating the same farm with 10,000 litres costs UGX 400,000. With the planting season approaching, the Farmers' Cooperative wants to estimate irrigation costs for farms requiring 15,000 litres of water. They also want to know the fixed setup fee to help them budget for the upcoming season. Additionally, they are curious to know how many litres of water they can use if they have a budget of UGX 1,500,000.

Task:
Help the Farmers' Cooperative develop a formula for the irrigation cost as a function of water usage and determine the setup fee, the cost of irrigation for their needs, and the amount of water they can use within their budget.

ACTIVITY OF INTEGRATION TOPIC 33

NAME: ....

STREAM: ....

TIME: 30 minutes**.**

TOPIC: Business Mathematics.

THEME: Geometry and Measures**.**

@africastruggle

SCENARIO.

In your community, the local cooperative society (SACCO) plans to purchase a delivery truck to expand its services. The truck currently costs Shs 50,000,000, but due to the rising demand for delivery services, its value is expected to appreciate at an annual rate of 8% for the next three years. Meanwhile, the SACCO has identified a bank offering a loan with a compound interest rate of 10% per annum, to be repaid in three years, to finance the purchase.

The SACCO has savings of $12,500 savings and the exchange rate of 1 dollar = Shs 3,600 and is considering whether they need to take a loan to cover the remaining cost. Additionally, if the cooperative decides to buy the truck now, they anticipate annual depreciation on the truck's value due to wear and tear, estimated at 5% per year after purchase. They are unsure whether it would be more beneficial to buy the truck now using their savings and a loan or to wait three years to purchase it at the appreciated price while factoring in potential depreciation.

TASK:

Help advise the SACCO on the best financial decision.

ACTIVITY OF INTEGRATION TOPIC 34

NAME: ....

STREAM: ....

TIME: 30 minutes.

TOPIC: Trigonometry 2.

THEME: Geometry and Measures.

@africastruggle

SCENARIO.

A community is planning to construct a triangular park using points A, B, and C. The distance between points A and B is 100 meters. The angle of elevation from point A to point C is 70°, and the angle of elevation from point B to point C is 50°. The community wants to determine the lengths of the other two sides, AC and BC, in order to properly budget for the construction of the park. However, if the sum of the lengths of these three sides exceeds 500 meters, the community will abandon the project because it will be expensive.

TASK:

Advise the community whether the park construction should proceed or be abandoned.

ACTIVITY OF INTEGRATION TOPIC 35

NAME: ....

STREAM: ....

TIME: 30 minutes.

TOPIC: Matrices.

THEME: Data and Probability.

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SCENARIO.

In a swimming competition, there were four senior classes, each participating in various events. Points were awarded based on placement: 7 points for first place, 4 points for second place, and 2 points for third place. Senior One had 4 first-place finishes, 7 second-place finishes, and 3 third-place finishes. Senior Two had 8 first-place finishes, 9 second-place finishes, and 1 third-place finish. Senior Three had 10 first-place finishes, 5 second-place finishes, and 3 third-place finishes. Senior Four had 3 first-place finishes, 3 second-place finishes, and 6 third-place finishes.

The competition organizers want to determine the overall winner based on the total points accumulated by each senior class. To do this, they decided to use matrix multiplication to calculate the total points for each senior class. The matrix for the points system (based on 1st, 2nd, and 3rd place finishes) is multiplied by a matrix representing the number of each type of finish for each senior.

TASK:

Help the organizers by using matrix multiplication to determine which senior class won the competition.

ACTIVITY OF INTEGRATION TOPIC 36

NAME: ....

STREAM: ....

TIME: 30 minutes.

TOPIC: Matrix transfromations.

THEME: Geometry and Measures.

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SCENARIO.

The school design team is working on a new triangular logo graphically with coordinates $A(3,1)$ $B(5,1)$ and $C(5,3)$, with an area 2 square centimetres but they are challenged with a process of finding the matrices of transformation and the area of the final image. First, they need to reflect the triangle across the line $y = x$ and then enlarge it by a factor of 2. After these transformations, they want to determine the matrix that will return the transformed triangle to its original position. Additionally, they need to know the coordinates of every transformed triangle at each stage.

TASK:

Help the team with this process and find the required matrices, along with the coordinates and calculate area of the transformed triangle.

ACTIVITY OF INTEGRATION TOPIC 37

NAME: ....

STREAM: ....

TIME: 30 minutes.

TOPIC: Simultaneous Equations.

THEME: Patterns and Algebra.

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SCENARIO.

Your mother went to the supermarket to buy a set and a ruler, but she was told that due to a school-going offer, they couldn't sell the items separately. She was informed that a set and a ruler together cost 5,000 shillings, and the cost of 3 rulers and 2 sets is 11,000 shillings. Your mother wants to buy 8 sets and 6 rulers for you and your sibling, and she has a budget of 40,000 shillings. She's unsure if this amount will be enough, and she thinks you can help.

Task:
Help your mother figure out if 40,000 shillings will be enough.

ACTIVITY OF INTEGRATION TOPIC 38

NAME: ....

STREAM: ....

TIME: 30 minutes.

TOPIC: Probability.

THEME: Data and Probability.

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SCENARIO.

A boy and a girl are playing a game with a tetrahedral die (a four-sided die) and a regular six-sided die. They throw the two dice simultaneously, and the outcome of their product is noted. The boy scores if the product is an even number and a multiple of 3, while the girl scores if the product is an even number and a multiple of 2. If neither of these conditions are met, or if their probabilities are equal, it will be a draw.

The winner is determined by who has a higher probability of scores based on the overall outcomes. The challenge they face is developing the sample space for all possible outcomes of their throws.

TASK:

Help the boy and the girl develop the sample space and determine who the winner is.

NAME: ....

STREAM: ....

TIME: 30 minutes.

TOPIC: Quadratic Equations.

THEME: Patterns and Algebra.

@africastruggle

SCENARIO.

The Community Water Council is working on improving the water pressure in the village's main pipeline. The current pipeline, which was modelled using a quadratic equation $y = x^2 - 5x + 6$ runs between two key junctions, points A and B. To enhance water pressure and reduce the distance water travels, the council plans to replace the existing pipeline with a new one modelled by a linear equation $y = x + 1$. For cost efficiency, the new pipeline must pass through the same junctions, A and B, where the old pipeline is connected. Additionally, to avoid encroaching on private land beyond the designated area, the council has restricted all construction to the region $0 \leq x \leq 7$. The council needs your help to determine the exact locations of points A and B by solving the equations graphically, ensuring that the new pipeline aligns with the current junctions and stays within the specified area.

Task:
Help the Community Water Council by plotting the equations graphically, identifying points A and B.

ACTIVITY OF INTEGRATION TOPIC 40

NAME: ....

STREAM: ....

**TIME**: 30 minutes.

TOPIC: Circle properties.

THEME: Geometry and Measures.

@africastruggle

SCENARIO.

In your hometown, two roads branch off from junction P, extending to a 60m radius circular roundabout with centre O. Each road is a tangent, touching the roundabout at points S and T. The city council plans to install lights along the roads and pathway connecting P to O, and plant grass inside the enclosed area by the roads and circumference. However, they need to calculate the lengths of the roads, pathway, and area for planting grass to create an accurate budget. The original design of the roundabout will be provided to aid calculations.

SUPPORT: (design)
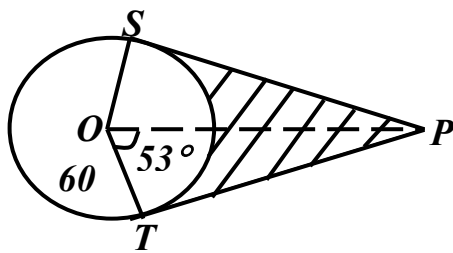
TASK:

Help the council solve this problem.