HOLIDAY REVISION WORK

A. DATA COLLECTION & DISPLAY

1. **The Mango Harvest:** A farmer in a village near Jinja recorded the weights (in kilograms) of mangoes harvested from 50 trees in their orchard. The data is as follows (already grouped):

   | Weight (kg) | Number of Trees | Cumulative Frequency | |---|---|---| | 5 - 9 | 5 | 5 | | 10 - 14 | 12 | 17 | | 15 - 19 | 18 | 35 | | 20 - 24 | 10 | 45 | | 25 - 29 | 5 | 50 |

   a) Explain what the 'cumulative frequency' column represents in this context. How is the cumulative frequency for the class interval 15 - 19 kg calculated? (3 marks)

   b) Describe how you would use this data to construct an 'less than' ogive. What would be plotted on the horizontal and vertical axes? Sketch the general shape of the ogive you would expect. (4 marks)

   c) Explain how you would use the original 'Weight (kg)' and 'Number of Trees' data to construct a histogram. What would be represented by the height and width of each bar in the histogram? (3 marks)

2. **Student Travel Time to School:** A survey was conducted among 80 Senior Three students in a secondary school in Jinja to record the time (in minutes) it takes them to travel from home to school each day. The grouped frequency distribution is given below:

   | Time (minutes) | Number of Students | |---|---| | 0 - 10 | 15 | | 11 - 20 | 25 | | 21 - 30 | 20 | | 31 - 40 | 12 | | 41 - 50 | 8 |

   a) Calculate the cumulative frequencies for each class interval and create a cumulative frequency table. (3 marks)

   b) Draw a 'greater than' ogive for this data. Clearly label your axes and indicate the values you would plot. How could you use this ogive to estimate the number of students who take more than 35 minutes to travel to school? (4 marks)

   c) Construct a histogram to represent this data. Ensure your axes are clearly labeled. What information about the travel times is most easily visualized from the histogram? (3 marks)

3. **Rainfall Data in Jinja:** The daily rainfall (in millimeters) was recorded in Jinja for a period of 30 days during the rainy season. The data is summarized in the following frequency distribution:

| Rainfall (mm) | Number of Days | |---|---| | 0 - 4 | 7 | | 5 - 9 | 10 | | 10 - 14 | 8 | | 15 - 19 | 3 | | 20 - 24 | 2 |

a) Calculate the class boundaries for each rainfall interval. Why are class boundaries important when constructing a histogram? (3 marks)

b) Construct a histogram to display this rainfall data. Label your axes appropriately. What does the shape of the histogram tell you about the distribution of rainfall during this period? (4 marks)

c) Create a 'less than' ogive for this data. Use your ogive to estimate the number of days that had less than 12 mm of rainfall. (3 marks)

B. EQUATION OF A STRAIGHT LINE

4. **The Plot of Land:** Mr. Okello owns a rectangular plot of land in Jinja. One side of the plot lies along a straight path that can be represented by the equation $y=2x+3$. Two corners of the plot, A and B, lie on this path.

   a) Mr. Okello wants to build a fence along another straight line that is parallel to the path $y=2x+3$ and passes through a point C with coordinates (1, 5). Find the equation of the line representing this fence. (4 marks)

   b) Another side of the rectangular plot is perpendicular to the path $y=2x+3$ and passes through point A (which lies on the path and has an x-coordinate of -1). Find the equation of the line representing this perpendicular side. (4 marks)

   c) If point B on the path $y=2x+3$ has an x-coordinate of 2, find the coordinates of the midpoint of the line segment AB (which lies on the path). (2 marks)

5. **The Map of Jinja Town:** On a simple coordinate map of Jinja town, Main Street is represented by the line $3y-x=6$, and Nile Avenue is represented by the line $y=mx-2$.

   a) If Main Street and Nile Avenue are parallel, what is the value of m? (3 marks)

   b) If a new road, Bridge Road, is to be built perpendicular to Main Street and passes through the point (4, 1), find the equation of the line representing Bridge Road. (4 marks)

   c) Two important landmarks, the Source of the Nile (S) and Rippon Falls (R), are located at coordinates (-2, 4) and (4, -2) respectively on this map. Calculate the straight-line distance between these two landmarks. (3 marks)

6. **The Journey of a Boda-Boda:** A boda-boda starts its journey from point P (0, -2) and travels along a straight line to point Q (4, 6).

   a) Find the equation of the straight line representing the boda-boda's path. (4 marks)

b) A traffic police officer is stationed at the midpoint of the boda boda's journey from P to Q. Calculate the coordinates of the police officer's location. (3 marks)

c) A second boda boda travels along a straight path that is perpendicular to the first boda boda's path and passes through the midpoint you calculated in part (b). Find the equation of the second boda boda's path. (3 marks)

C. TRIGONOMETRY

7. **The Mango Tree and the Ladder:** A farmer in a village near Jinja leans a 5-meter long ladder against a mango tree to pick fruits. The base of the ladder is 2 meters away from the base of the tree on level ground.

   a) Draw a diagram to represent this situation, clearly labeling the tree, the ladder, and the ground. Indicate the given lengths. (2 marks)

   b) Calculate the angle that the ladder makes with the ground. Give your answer to the nearest degree. (4 marks)

   c) How high up the tree does the ladder reach? Give your answer to two decimal places. (4 marks)

8. **The Boat on Lake Victoria:** A boat sails from the shore of Lake Victoria in a straight line for 3 kilometers in a direction of N 35° E (35 degrees East of North).

   a) Draw a diagram to represent the boat's journey, indicating the starting point, the direction, and the distance traveled. (2 marks)

   b) Calculate how far East of its starting point the boat is after traveling 3 kilometers. (4 marks)

   c) Calculate how far North of its starting point the boat is after traveling 3 kilometers. Give your answers to two decimal places. (4 marks)

9. **The Hill and the Observer:** An observer standing at point A on level ground notices a hill. The angle of elevation to the top of the hill (point B) is 28°. The observer then walks 50 meters directly towards the base of the hill to a new point C. From point C, the angle of elevation to the top of the hill is 45°.

   a) Draw a diagram to represent this situation, labeling points A, B, and C, the angles of elevation, and the distance AC. Let the height of the hill be h and the distance from C to the base of the hill be x. (3 marks)

   b) Using trigonometric ratios, form two equations involving h and x based on the information given. (4 marks)

c) Solve these two equations simultaneously to find the height of the hill, h, to the nearest meter. (3 marks)

D. SETS

10. **The School Prefects' Election:** In a Senior Three class of 50 students at a school in Jinja, an election was held for three prefect positions: Head Prefect (H), Deputy Head Prefect (D), and Games Prefect (G). The results showed:
    1. 20 students voted for the candidate who became Head Prefect.
    2. 15 students voted for the candidate who became Deputy Head Prefect.
    3. 18 students voted for the candidate who became Games Prefect.
    4. 8 students voted for both the Head Prefect and the Deputy Head Prefect.
    5. 7 students voted for both the Deputy Head Prefect and the Games Prefect.
    6. 9 students voted for both the Head Prefect and the Games Prefect.
    7. 4 students voted for all three prefect candidates.

    Let U be the set of all 50 students, H be the set of students who voted for the Head Prefect, D be the set of students who voted for the Deputy Head Prefect, and G be the set of students who voted for the Games Prefect.

    a) Draw a Venn diagram to represent this information, clearly showing the number of students in each of the eight regions. (6 marks)

    b) Determine the number of students who voted for the Head Prefect *only*. (2 marks)

    c) Find the number of students who voted for at least two of the prefect candidates. (2 marks)

11. **The Mobile Phone Survey:** A survey was conducted among 60 residents of a neighborhood in Jinja about their mobile phone usage. The three main activities considered were making calls (C), using mobile money services (M), and browsing the internet (I). The results were:
    1. 35 residents use their phones for making calls.
    2. 30 residents use mobile money services.
    3. 25 residents browse the internet.
    4. 18 residents use their phones for calls and mobile money.
    5. 15 residents use mobile money and browse the internet.
    6. 12 residents use their phones for calls and browsing the internet.
    7. 8 residents use their phones for all three activities.

    Let U be the set of all 60 residents, C be the set of residents who make calls, M be the set of residents who use mobile money, and I be the set of residents who browse the internet.

    a) Use the principle of inclusion-exclusion to find the number of residents who use their mobile phones for at least one of these three activities ($|C \cup M \cup I|$). Show your working clearly. (6 marks)

b) Determine the number of residents who use their phones for exactly two of these activities. (2 marks)

c) How many residents do not use their mobile phones for making calls? Express your answer using set notation. (2 marks)

12. **The Sports Day Participants:** During a Senior Three sports day at a school in Jinja, 45 students participated in three main events: football (F), netball (N), and athletics (A). The participation was as follows:
    1. 22 students played football.
    2. 18 students played netball.
    3. 25 students participated in athletics.
    4. 10 students played both football and netball.
    5. 8 students played both netball and participated in athletics.
    6. 12 students played both football and participated in athletics.
    7. x students participated in all three events.
    8. 5 students did not participate in any of the three events.

    Let U be the set of all 45 students, F be the set of students who played football, N be the set of students who played netball, and A be the set of students who participated in athletics.

    a) Draw a Venn diagram to represent this information, leaving the number of students in the central intersection (all three events) as x. Fill in the number of students in the other regions in terms of x. (6 marks)

    b) Using the total number of participants (45) and the information provided, form an equation in terms of x and solve for the value of x. (2 marks)

    c) Determine the number of students who participated in football only. (2 marks)

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