SENIOR FOUR MATHEMATICS

Scenario-Based Examination Paper 3

Time: 2 Hours 30 Minutes

Instructions

Answer all items in Section A

Answer ONE item from Part I and ONE item from Part II in Section B

Answer FOUR items in total

Non-programmable calculators may be used

Show all working clearly

Section A (Compulsory)

Item 1

Three friends, Kato, Brian, and Sheila, started a rice milling business. Kato invested 6,000,000 shillings, Brian invested 4,000,000 shillings, and Sheila invested 2,000,000 shillings. They agreed to share profits according to the ratio of their investments.

At the start of operations, the total number of rice sacks in store was recorded as 144 written in base eight. After selling the rice, the business made a profit of 2,160,000 shillings. The profit was immediately reinvested, and the total number of sacks increased to 216.

The partners agreed that machine servicing would be done every 20 days, while financial records would be reviewed every 30 days. Both activities were first carried out on 15th May 2025.

Task

A. Determine the amount of profit reinvested by Sheila.

B. Calculate the percentage increase in the number of rice sacks.

C. Find the next date when machine servicing and financial review will occur on the same day.

Item 2

A printing company produces notebooks and textbooks. The company must print at least 90 notebooks and not more than 60 textbooks per day. Each notebook requires 1 hour of machine time, while each textbook requires 3 hours. The company has a maximum of 240 machine hours available per day.

The profit from one notebook is 5,000 shillings, while the profit from one textbook is 12,000 shillings. The manager wants to decide the number of notebooks and textbooks to print in order to maximize profit.

Task

A. Represent the above conditions using inequalities.

B. Draw the feasible region on a Cartesian plane.

C. Determine the number of notebooks and textbooks that should be printed to obtain the maximum profit and state that profit.

Section B

Part I (Answer ONE item from this part)

Item 3

A researcher investigated ownership of three household utilities in a village: electricity, piped water, and solar power systems. A total of 100 households were surveyed.

From the survey, 25 households had none of the utilities. A total of 40 households had electricity, 36 households had piped water, and 28 households had solar power systems. Eight households had all the three utilities. Twelve households had electricity only, while 10 households had piped water only. The number of households that had both electricity and piped water only was 4 more than the number of households that had both electricity and solar power systems only.

Task

A. Determine the number of households that had solar power systems.

B. Decide whether the village needs expansion of solar energy support, giving a reason.

Item 4

The following data shows the number of customers served daily by a shop over a period of 50 days:

18, 25, 31, 42, 38, 29, 47, 35, 40, 22,
33, 44, 39, 27, 36, 41, 30, 24, 45, 34,
28, 37, 43, 26, 32, 48, 41, 29, 35, 23,
39, 46, 34, 28, 31, 40, 27, 36, 44, 33,
25, 38, 42, 29, 47, 35, 30, 41, 26, 34

Task

A. Organize the data into a grouped frequency distribution table using class intervals of width 10.

B. Determine the number of customers above which half of the days recorded higher sales.

C. Find the number of days when the number of customers was 34.5 or less.

Part II (Answer ONE item from this part)

Item 5

A metal fabricator plans to construct a cylindrical water drum with a circular base area of 708 square centimeters. A customer can either pay 600,000 shillings in cash or pay a deposit of 300,000 shillings followed by two equal monthly installments of 170,000 shillings each.

The fabricator intends to cut a circular base from a triangular metal sheet whose sides measure 70 centimeters and 56 centimeters, with an included angle of 60 degrees.

Task

A. Advise the customer on the cheaper payment option and justify your answer.

B. Determine whether the largest possible circular base that can be cut from the sheet will fit the water drum.

Item 6

A district plans to develop a recreational site consisting of a triangular grass field enclosed by a circular jogging track. Two sides of the triangular field measure 80 meters and 60 meters, and the angle between them is 30 degrees. The jogging track touches all the three vertices of the triangular field.

The area between the grass field and the jogging track will be covered with gravel at a cost of 30,000 shillings per square meter.

Task

A. Construct an accurate diagram representing the design.

B. Identify the type of triangle formed and give a reason.

C. Calculate the total cost of spreading gravel in the region between the triangle and the jogging track.

END OF PAPER 3

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