SENIOR FOUR MATHEMATICS

Scenario-Based Examination Paper 1

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 scientific calculators and mathematical tables may be used

Show all working clearly

Section A (Compulsory)

Item 1

Two friends, Amina and Paul, started a wholesale shop dealing in sacks of beans. Amina invested shillings 4,500,000 while Paul invested shillings 3,000,000. They agreed to share profits in the ratio of their capital contributions.

At the beginning of the business, the total number of sacks of beans was recorded as (210) base ten. After three months of operation, they sold all the beans and realized a profit of shillings 1,350,000, which they immediately reinvested into the business. As a result of this reinvestment, the number of sacks increased to 252.

During the same period, the partners agreed to inspect stock every 14 days and balance their books of accounts every 21 days. The first inspection and book balancing were both done on 10th April 2025.

Paul later wanted to find out how much of the profit he reinvested, the percentage increase in the number of sacks, and when the two activities would next fall on the same day.

Task

A. Determine the amount of money Paul reinvested in the business.

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

C. Find the next date when both stock inspection and balancing of books will be done on the same day.

Item 2

A small factory produces plastic chairs and tables. The factory must produce at least 60 chairs and not more than 80 tables per week. Each chair requires 2 hours to manufacture, while each table requires 5 hours. The factory has a maximum of 320 working hours available per week. The profit on one chair is shillings 18,000, while the profit on one table is shillings 40,000. The manager wants to decide the number of chairs and tables to produce in order to maximize weekly profit.

Task

A. Represent the above conditions using inequalities.

B. Draw the feasible region on a Cartesian plane.
C. Determine the number of chairs and tables that should be produced to maximize profit and state the maximum profit.

Section B

Part I (Answer ONE item from this part)

Item 3

A survey was carried out among 90 residents of a municipality to study ownership of three documents: a national identification card, a driving permit, and a passport.
From the survey, 22 residents had none of the documents. A total of 36 residents had driving permits, while 28 had passports. Twelve residents had only driving permits, and 6 had only passports. Four residents had all the three documents. The number of residents who had both national ID cards and driving permits only was twice the number of those who had passports and driving permits only but no national ID cards.
The municipal planner needs to determine how many residents possess national ID cards in order to make a policy decision.

Task

A. Determine the number of residents who had national ID cards.
B. Advise whether there is need to establish an additional national ID registration office in the municipality, giving a reason.

Item 4

The following data shows the number of bags of maize harvested by 48 farmers in a farming zone during the first season after receiving improved seeds:
32, 45, 28, 51, 47, 39, 62, 55, 41, 36,
48, 53, 59, 44, 38, 61, 34, 46, 50, 57,
42, 49, 63, 40, 35, 58, 52, 43, 37, 56,
60, 54, 33, 47, 45, 41, 39, 62, 48, 51,
44, 36, 58, 55, 49, 46, 40, 53
The cooperative society wants to analyze the data using class intervals of width 10 to assess farmer performance.

Task

A. Present the data in a grouped frequency distribution table.
B. Determine the number of bags of maize above which half of the farmers harvested.
C. Find the number of farmers who harvested 44.5 bags or less.

Part II (Answer ONE item from this part)

Item 5

A confectioner was asked to bake a cylindrical cake with a base area of 706.5 square centimeters. The customer was given two payment options:
Pay shillings 420,000 in cash, or

Pay a deposit of shillings 200,000 followed by two equal monthly installments of shillings 125,000 each.

The confectioner plans to cut a circular tray from a triangular metal sheet. Two sides of the triangle measure 56 centimeters and 64 centimeters, with an included angle of 60 degrees. The confectioner is not sure whether the largest possible circular tray that can be cut from the sheet will support the base of the cake.

Task

A. Recommend the cheaper payment option and justify your answer.

B. Determine whether the circular tray will be sufficient for the base of the cake.

Item 6

A town council plans to construct a children's play park consisting of a triangular grass field surrounded by a circular walking path. Two sides of the triangular field measure 72 meters and 90 meters, and the angle between them is 45 degrees. The circular path touches all the three vertices of the triangular field.

The region between the triangular field and the circular path will be covered with decorative stones at a cost of shillings 38,000 per square meter.

Task

A. Construct an accurate diagram of the park.

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

C. Calculate the total cost of covering the region between the triangle and the circular path.

END OF PAPER 1