**The Open University of Sri Lanka**
**Faculty of Natural Sciences**
# Diploma in Food Science

| | |
|---|---|
| Department | : Chemistry |
| Level | : 3 |
| Name of the Examination | : Final Examination |
| Course Title and Code | : Basic Mathematics and Statistics for Food Science (ADD3200) |
| Academic Year | : 2024-2025 |
| Date | : 18ᵗʰ January 2025 |
| Time | : 9.30 a.m. – 11.30 a.m. |
| Duration | : 2 hours |

## General Instructions

1. Read all instructions carefully before answering the questions.

2. This question paper consists of (4) essay questions in (3) pages.

3. **Answer all (4) questions.**

4. Use a blue or black pen not a pencil. Use the given book to write answers for (4) essay questions.

5. **Answer for each question should commence from a new page.**

6. Draw fully labelled diagrams where necessary.

7. The use of a non-programmable electronic calculator is permitted.

8. Clearly state your **index number in your answer script.**

9. Involvement in any activity considered an exam offense **will lead to punishment.**

---

1) A rectangular cake has a length of $24 + 2\sqrt{5}$ inches.

   i) If the perimeter and area of the cake are both rational numbers, find the width of the cake.

   (15 marks)

   ii) Find the length of the diagonal of the rectangular shaped cake and state whether the value you obtained is rational or irrational.

   (20 marks)

   iii) Find integers $m$ and $n$ such that $n - m = 1$ and $m < 2\sqrt{5} < n$.

   (15 marks)

   iv) Find the largest integer $a$ and the smallest integer $b$ such that the length of the cake satisfies : $a < 24 + 2\sqrt{5} < b$.

   (20 marks)

v) A piece was cut from the cake and the length was reduced by 2.0122 inches. Using the approximation $\sqrt{5} \approx 2.2361$, calculate the new length of the cake, correct to three decimal places.

(20 marks)

vi) Express the length of the remaining part of the cake obtained in part (iv) in scientific notation and determine the number of significant digits.

(10 marks)

2) a) Determine the set of real values of $x$ that satisfy each of the following inequalities:

i) $|x - 2| > 4$

ii) $\frac{(x-3)}{x^2-4} > 0$, $x \neq -2, 2$

iii) $x < \frac{2}{x} + 1$, $x \neq 0$

(30 marks)

b) If $\log_2 3 = a$, $\log_2 7 = b$, express the values of each of the following, in terms of $a$ and $b$:

i) $\log_3 4$      ii) $\log_2 42$      iii) $\log_3 \left(\frac{2}{3}\right)$

(15 marks)

c) Substituting $\log_2 x = t$, find $x$ that satisfy the equation $\log_2 x + \log_4 x - 3 = 0$.

(20 marks)

d) Write down each of the following using base 2.

i) 37            ii) 306

(10 marks)

e) Fried peanuts and fried cashews are added to snack packets so that each packet contains equal weights of the two ingredients. Fried peanuts are available in 1200-gram packets, and fried cashews are available in 360-gram packets. The weights of the ingredients to be added should be decided so that no leftovers remain from the available packets after addition.

Determine the maximum number of snack packets that can be made using one packet of fried peanuts and one packet of fried cashews. Also, calculate the weight of each ingredient added to a single snack packet.

(25 marks)

3) A food science lab conducted a study to analyze the nutritional composition of a certain brand of flour used in making bread. The following frequency table was constructed from the measured protein content (in grams) in flour samples of 100 grams each.

| Protein content (grams/100 grams of flour) | Number of samples |
|---|---|
| 11.5 - 11.7 | 5 |
| 11.7 - 11.9 | 8 |
| 11.9 - 12.1 | 22 |
| 12.1 - 12.3 | 30 |
| 12.3 - 12.5 | 15 |

i) Calculate the mean protein content in 100 grams of flour.

( 20 marks)

ii) Calculate the median protein content.

( 20 marks)

iii) Write down the class limits of the interval that contains the mode of this data.

( 10 marks)

iv) Compare the mean and median values calculated in parts (i) and (ii) and state what these values indicate about the data distribution?

( 15 marks)

v) Using an appropriate measure, estimate the expected protein content in 100 grams of flour used in this study. Give reasons for your choice of the measure.

( 20 marks)

vi) The bread recipe requires flour with at least 12 grams of protein per 100 grams. Estimate the proportion of flour samples that meet this requirement.

( 15 marks)

4) The moisture content (in percentage) measured on 30 batches of dried fruits, arranged in ascending order are given below:

| 14.0 | 14.1 | 14.2 | 14.2 | 14.2 | 14.4 | 14.4 | 14.5 | 14.5 | 14.5 |
|------|------|------|------|------|------|------|------|------|------|
| 14.5 | 14.6 | 14.6 | 14.7 | 14.7 | 14.8 | 14.8 | 14.8 | 15.0 | 15.0 |
| 15.1 | 15.1 | 15.2 | 15.2 | 15.2 | 15.4 | 15.4 | 15.5 | 15.6 | 15.6 |

i) Calculate the range of the data.

( 5 marks)

ii) Calculate the first quartile of the data and explain what it measures in relation to this study.

( 20 marks)

iii) Calculate the inter-quartile range of the data.

( 25 marks)

iv) Propose four measures of dispersion that can be calculated from this data. **(You need not calculate the values.)**

( 20 marks)

v) The acceptable range for moisture content in dried fruits is 14.8%–15.4%. State whether a pie chart is appropriate to highlight the proportion of samples that had acceptable percentage of moisture content. If not, give reasons. If the answer is yes, describe how you construct the pie chart. **(You need not construct the pie chart.)**

( 15 marks)

vi) Clearly describe all the key features of the data that can be highlighted using a frequency polygon constructed from data collected on 400 batches.

( 15 marks)