THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

141

BASIC APPLIED MATHEMATICS

(For Both School and Private Candidates)

Duration: 3 Hours **Year: 2025**

Instructions

1. This paper consists of **ten (10)** questions.
2. Answer **all** the questions. Each question carries **ten (10)** marks.
3. All work done in answering each question must be shown clearly.
4. Non-programmable calculators and NECTA mathematical tables may be used.
5. All writing must be in **blue** or **black** ink **except** drawing which must be in pencil.
6. Communication devices and any unauthorized materials are **not** allowed in the examination room.
7. Write your **Examination Number** on every page of your answer booklet(s).

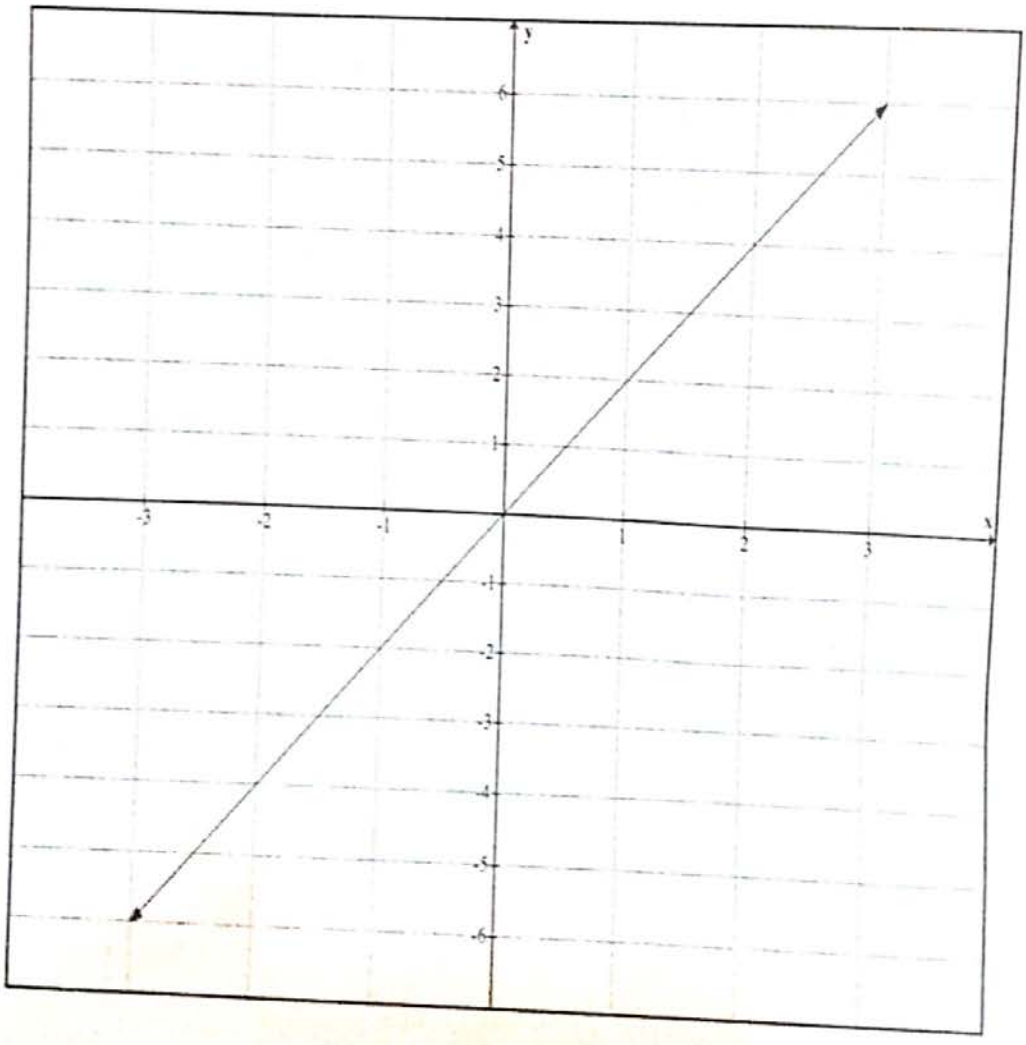
1. Use a non-programmable calculator to evaluate the following expressions correct to 4 significant figures:

(a) $$\frac{\sin 49^{\circ} \times \ln\left(\frac{1+\cos 50^{\circ}}{\sqrt{276}}\right)}{\sqrt{1234}}.$$

(b) $$\frac{e^{\log 5} \times {}^{6}C_{6}}{\sin\left(\frac{\pi}{6}\right)+\tan^{-1}(1.4)}.$$

(c) $$\sqrt[4]{\left(\frac{5e^{\left(\frac{5}{6}\right)} \div \sin^{-1}(0.5)}{\ln 3 \times \log_2 3}\right)^{3}}.$$

2. (a) Calculate the slope of the function $f(x)$ described by the following graph:



(b) Given $h(x) = \frac{1}{4-x}$,

(i) determine the vertical and horizontal asymptotes.

(ii) evaluate $h(10)$.

(c) A particle moves along the path described by the function $g(t) = -t^2 + 5t - 4$.

(i) Sketch the graph of $g(t)$.

(ii) State the domain and range of $g(t)$.

3. (a) Find the value of $\sum_{1}^{4}(1+x)^2$.

(b) The first and tenth terms of an arithmetic progression are -2 and 43, respectively. Find the sum of the first ten terms of the progression.

(c) The difference between the areas of two squares is 16 and the sum of the length of a side of a large square and the length of a side of a small is 8. Provided that x and y represent the lengths of the sides of small and large squares respectively;

(i) formulate the simultaneous equations representing the given information.

(ii) calculate the length of the side of the small square.

4. (a) Use the first principles of differentiation to find the derivative of the function $f(x) = x^2 + 6x + 9$.

(b) Use the product rule to find the first derivative of the function $f(x) = (x+4)(3x^2 + 2x)$.

(c) A curve is described by the function $3x^2 - 7y^2 + 4xy - 8x = 0$. Calculate the gradient of the curve at the point $(-1, 1)$.

5. (a) (i) Solve $\int(4x+5)^{10}\,dx$.

(ii) Find the value of $\int_2^5 (x^2 - 2x + 1)\,dx$.

(b) Find the volume of the solid generated by rotating the region bounded by the curve given by the function $y = x^2$ and the straight line represented by the equation $y - 2 = 0$ about the y - axis.

6. (a) The weights (in kg) of ten people who attended a meeting were as follows:

60, 72, 82, 66, 102, 123, 79, 88, 93 and 81.

(i) Find the range of their weights.

(ii) Compute the standard deviation of their weights.

(b) The following table shows the weights (in kg) of patients admitted at Godegode Hospital in March 2024.

Weight (in kg)	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
Number of patients	10	16	19	15	18	2

(i) Use the assumed mean, $A = 55$ to calculate the mean weight of patients.

(ii) Draw a cumulative frequency curve representing the information.

7. (a) (i) Evaluate ${}^{12}C_9 + {}^{7}P_3$ using factorial notation.

(ii) A reception office has one bench with 5 seats. In how many ways should 11 people be seated on the bench?

(b) A biased coin is such that the probability of obtaining a head when it is tossed is $\frac{3}{7}$. If the coin is tossed twice, determine the probability of obtaining:

(i) 2 tails.

(ii) at least one tail.

8. (a) (i) Find the value of $\sin 45^\circ \cos 60^\circ + \tan 45^\circ \cos 45^\circ$ and express the answer in surd form.

(ii) Show that $\frac{2\cos^2 A - 1}{\sin A \cos A} = 2\cot 2A$.

(b) (i) Solve $\int \sec^2(2x+10)dx$.

(ii) Given $y = \sin(x^2 - 4)$, find $\frac{dy}{dx}$.

9. (a) (i) Find the first derivative of the function $f(x) = \ln(2x+1)$.

(ii) Find the solution of $\int e^{9x-2} dx$.

(b) Sketch the graphs of both $f(x) = 2^x$ and $g(x) = \log(3+x)$ on the same $xy-$plane.

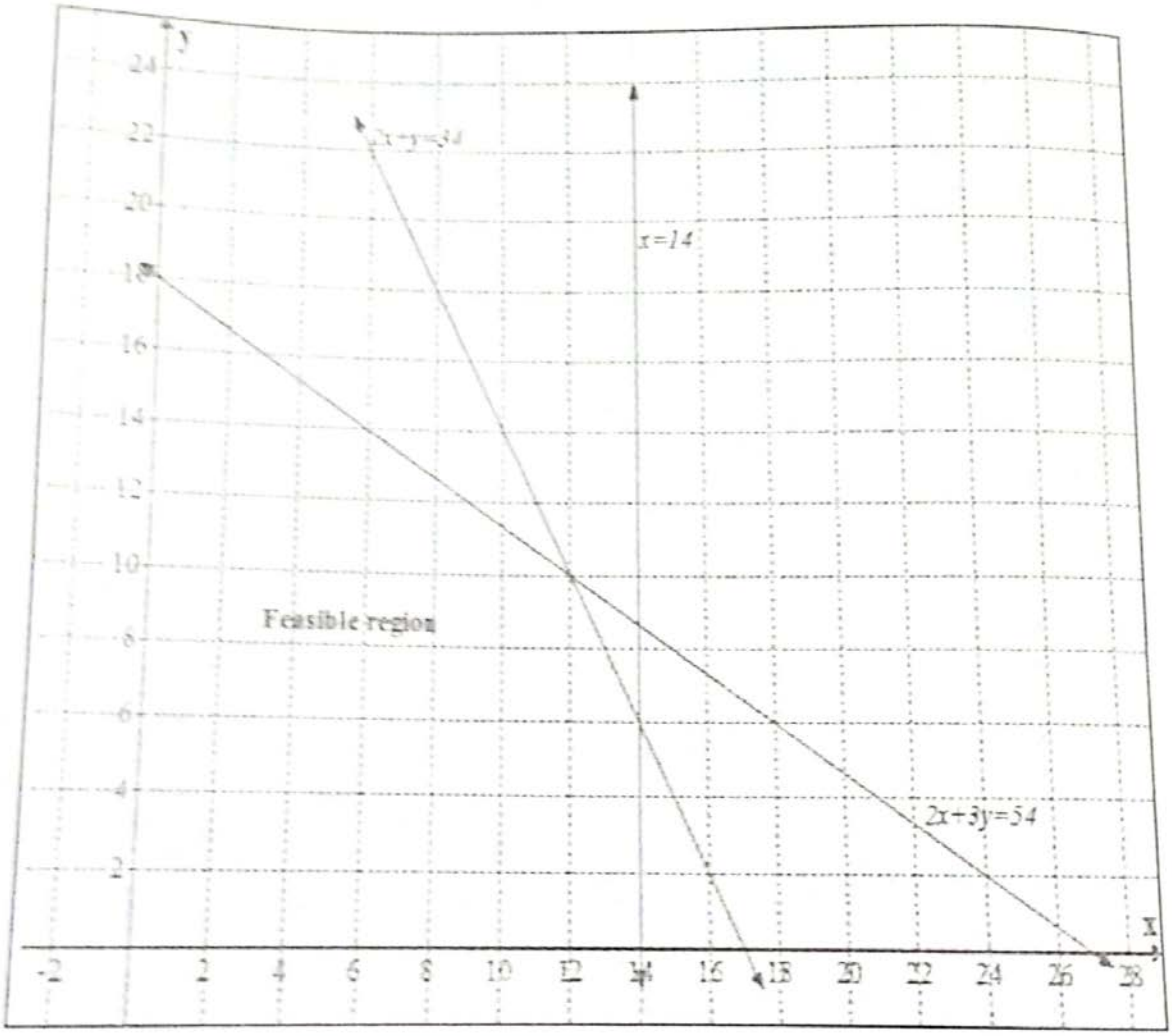
(c) The analysis of the 2022 demographic census in Tanzania revealed that the population doubles after every 50 years. In how many years does the population be triple?

10. (a) A company produces three types of products, namely P, Q and R. Each product is inspected by three different experts before being sold. The following table shows the time (in minutes) spent by each expert to inspect a product.

	P	**Q**	**R**	**Total time available per day**
1st expert	10	8	12	184
2nd expert	7	9	14	193
3rd expert	12	14	16	270

Use Cramer's rule to find the number of product P inspected per day.

(b) The following graph illustrates a certain problem related to linear programming.



Using the information given in the graph, formulate the constraints of the problem.