# INTERSECONDARY SCHOOLS EXAMINATION SERIES
# ISESE

## FORM SIX SERIES No.01
## BASIC APPLIED MATHEMATICS
## (For both schools and private candidate)

**Time: 3 Hours** **Year 2026**

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**Instructions**

1. This paper consists of **ten (10)** compulsory questions.
2. All work done in answering each question must be shown clearly.
3. Mathematical tables and non-programmable calculators may be used.
4. Cellular phones and any unauthorized materials are **not** allowed in the examination room.
5. Write your **Names** on every page of your answer booklet(s).

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| ALL SUBJECTS | DATE |
|---|---|
| SERIES - 01 | 07th August 2026 |
| SERIES - 02 | 14th August 2026 |
| SERIES – 03 | 21th August 2026 |
| SERIES - 04 | 28th August 2026 |
| SERIES – 05 | 31st August 2026 |

**N.B# SERIES 06 – SERIES 15 (SEPTEMBER - NOVEMBER)**
**SERIES 16 – SERIES 30 (JANUARY - MAY)**

1. Out of 1000 students who sat for the mock examination, 658 sat for Basic Mathematics, 372 sat for Biology, 590 sat for Chemistry, 166 sat for Basic Mathematics and Biology, 434 sat for Basic Mathematics and Chemistry, and 126 sat for Biology and Chemistry. If all students sat for at least one of the three subjects, find the number of students who sat for:

(a) All three subjects.
(b) Basic Mathematics but not Chemistry.
(c) Biology but not Basic Mathematics.
(d) Chemistry but not Biology.

2. (a) If $f(x) = a^x$ where $X \in R$, write down the condition(s) on "a" such that $f(x)$ is an exponential function.
Draw graph of the function $f(x) = 3^x - 2$
(b) Given the function $f(x) = 1 + \frac{x}{x^2-1}$
(i) Find asymptotes of $f(x)$
(ii) Find intercepts of $f(x)$
(iii) Sketch graph of $f(x)$

3. An engineer is designing a high-efficiency solar tracking system in Dodoma. The intensity of sunlight captured by the panels at any given time depends on the angle of incidence x. The engineering software calculates the energy output using two different mathematical models:

- **Model A:** Predicts output based on the function f(x) = cos 2x.
- **Model B:** Predicts output based on the complex wave function g(x) = $\cos^4 x - \sin^4 x$.

The project manager is concerned that using two different models will lead to conflicting data for the power grid. As a lead consultant, show mathematically that these two models are identical, ensuring the tracking system remains accurate regardless of which formula the software chooses to use.

4. (a) Differentiate with respect to $x$, for $f(x) = e^{x^2}(x+1)^5 \cos x$
(b) The parametric equations of a curve are $x = e^t$ and $y = sint$. find $\frac{d^2y}{dx^2}$ of function of t.
(c) The radius $(r)$ mm of circular plot is increasing at a rate of 1.5mm/sec. find the rate of which the area is increasing when the radius is 2mm.

5. A Biologist studied the growth of rabbits in a controlled environment and discovered that the rate of the population growth of the rabbits is influenced by both linear and quadratic factors. The linear factor was represented by the equation P=100+5t and the quadratic factor which modelled the impact of limited resources was represented by the equation $P=-0.25t^2+5t+100$, where t is the time in months and *P* is the population of the rabbits at time *t*. Use graphical method to determine at what time and what sustainable population of the rabbits the biologist will remain with.

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6. (a) (i) Sketch the graph of $f(x) = \frac{2x+5}{x^2-x-6}$

(ii) Write the value of $x$ for which $f(x)$ is not defined

(b) Given $f(x) = 2x^3 + ax^2 + bx - 6$ where $a$ and $b$ are constant, when $f(x)$ is divided by $(x + 2)$ there is no remainder and when divided by $(2x - 1)$ the remainder is $-5$

(i) Find the value of $a$ and $b$

(ii) Factorize $f(x)$

7. (a) Apply first principle of differentiation to find the derivative of $f(x) = \sqrt{x}$

(b) Find the slope of the tangent to the curve $8x^3 + xy^3 - 5y^2 = 0$ at $(1, -1)$

(c) Use second derivative test to classify the stationary points of the curve

$$f(x) = 2x^3 + 3x^2 - 12x - 5$$

8. If n(u)=68, n(A)=41, n(B)=17. n(C)=21, n(AnB)=19, n(AnC)=23, n(BnC)=11. And n(AnBnC)=27, Use the formula to find

a) n(AuBuC)

b) n(AuBuC)'

9. (a) (i) Solve the simultaneous equation by substitution method

$$\begin{Bmatrix} 2c + 2d = c - d \\ 2d + 2 = c + 1 \end{Bmatrix}$$

(ii) Find the value of $x$ satisfying the equation $4^x - 6(2^x) - 16 = 0$

(b) The sum to infinite of geometrical series whose second term is 4 is 16. Find

(i) The first term

(ii) The common ratio

10. (a) Draw the graph of $f(x) = 2^{x+5}$ and $g(x) = log_2(2x + 3)$ on the same $xy$ – plane

(b) The equation $C = (2.1 \times 10^4)(\frac{3}{5})^t$ describe the value of a car in dollar, $t$ years after purchase

(i) What was the initial; value of the car

(ii) What was the rate of depreciation?

(iii) What will be the car's value 5 years after purchase?

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