Newton School of Technology

CODING NSAT PREPRATION KIT

Newton School of Technology

Test taking setup

- The test will be conducted online
- Students must appear for the test virtually from their PC/Laptop on a Chrome browser
- Students need to appear from a quiet location without background noise
- The test will be proctored via dual-camera setup (camera & microphone access required)
  - Primary camera: face visible (webcam)
  - Secondary camera: workspace view (mobile/external device)

Recommended Computer Configuration

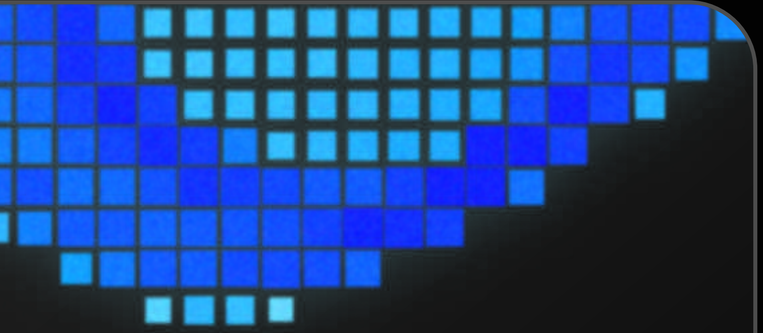
- Operating System: Windows or macOS
- Browser: Chrome (updated version)
- RAM: 8 GB or more
- Webcam & microphone (mandatory)
- Secondary device required (mobile phone/external camera) for workspace monitoring

Test Guidelines

- All sections are mandatory to attempt as it determines your **passing eligibility**
- Multiple choice questions have only one correct answer.
- **Select the most accurate and appropriate answer from the** given options.
- **Marking Scheme: +4 for correct answer, -1 for incorrect** answer for MCQ questions.
- Marking Scheme for coding section is based on number of **test cases passed**
- **Students will receive a normalised score in the range of 0-10.**
- Students can answer the coding question in any specific **language they want.**
- In any specific section, students can answer questions in the **order they want, i.e. students can go back and forth across** questions.

Total Time: 180 Minutes
Total Questions: 26 Questions

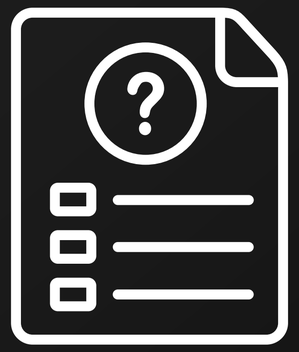
Objective



The test is designed to evaluate student's competency in

1. Basic Coding Skills
2. Algorithm Building
3. Pseudocoding
4. Functions Building

General Preparation



- Review sample questions to get an understanding of the difficulty level of questions.
- Avoid last minute hassles. Studying a new concept will not add a lot of value as compared to strengthening concepts you already know.
- Be calm & confident during the exam, this will result in better General Preparation performance than any other factor.
- Test takers can go through basic fundamental concepts of programming for preparation.

Sections

Section 1: Learnability

Learnability Comprehension
type question - 10 Questions (MCQs)

Section 2: Pseudocoding

Pseudocode to be answered -
5 Questions (MCQs)

Pseudocode to be corrected and
Code Comprehension - 5 Questions (MCQs)

Section 3: Coding Section

Basic Functions Building -
2 Questions - (Coding Ques)

Loops, Basic Strings and Arrays -
2 Questions - (Coding Ques)

Algorithm Building -
2 Questions - (Coding Ques)

Section wise Preparation

Section 1

Learnability

Why do we test Learnability?

Learnability is included to assess students' analytical, logical, and basic mathematical skills, ensuring their ability to understand, interpret, and solve problems

Prerequisite:

Students should possess a foundation in mathematical and analytical concepts to effectively solve and interpret problems.

Exam Syllabus and Topics:

Arithmetics, Basic mathematics.

Alien Travel and Wormholes in an Alternate Universe

In an alternate universe, a **galaxy** consists of exactly **three stars,** and **an alien** can travel from one star to another only if a wormhole exists in that galaxy system.

Each star is represented by a **3D plane equation** of the form:

ax+by+cz=d

A **wormhole entry** is a point in space where all three star planes intersect.

The God Formula

There exists a mysterious **God Formula** that determines whether a **wormhole** will form in a galaxy system. It is defined as:

$$g(f) = \det \begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{bmatrix}$$

where (a1,b1,c1), (a2,b2,c2), & (a3,b3,c3) are the coefficients of the three star equations.

If g(f)≠0 → A wormhole exists and aliens can travel freely between stars.

If g(f)=0 → No wormhole exists, meaning either the stars are parallel, or two of them are the same, preventing travel. For the following two galaxy systems, determine whether a wormhole exists. If a wormhole exists, find its entry coordinates (i.e., the intersection point of the three planes).

Galaxy System 1:
x+y+z=6
2x−y+3z=14
3x+2y+z=10

Galaxy System 2:
x+y+z=5
2x+2y+2z=10
3x+3y+3z=15

Will an alien be able to travel freely using a wormhole in these two galaxy systems?
If a wormhole exists, find its entry coordinates.

1. System 1 : No wormhole found, System 2 : (2/7, 5/7, 3/7)
2. System 1 : (12/7, 4/7, 26/7), System 2 : (2/7, 5/7, 3/7)
3. System 1 : (12/7, 4/7, 26/7), System 2 : No wormhole found
4. System 1 : No wormhole found, System 2 : (12/7, 4/7, 3/7)

Answer: Option 3

Cannon Fireball Exhibition Event

During an exhibition event, a cannon was used to fire a fireball at different angles. The fireball achieved a maximum horizontal range of 25.6 meters when fired from the ground.
Later, the same cannon was used to fire the fireball from a tower of height 30 meters above the ground.

A firing formula is given to determine the angle of projection for maximum range when launched from a height:

$$\tan(2\theta) = \frac{2u^2}{gh}$$

Where:
u = Initial velocity of fireball
g = Acceleration due to gravity (10 m/s^2)
h = Vertical height of launch

Also the relation of velocity, displacement, time and acceleration(uniform) of an object can be represented by following equations:

$$v + u = at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

where →
v = Final velocity
u = Initial velocity
a = Acceleration
t = Time
s = Displacement

Q1: What is the initial velocity of the fireball when fired from the ground?

1. 12 m/s
2. 14 m/s
3. 16 m/s
4. 18 m/s

Answer: Option 3

Q2: What is the maximum horizontal range when the fireball is fired from the tower? (Given, $\tan^{-1}(1.7067)=60°$)

1. 35.4 m
2. 40.2 m
3. 45.6 m
4. 47.0 m

Answer: Option 4

Q3: The same cannon is now used on a different planet, where the gravitational acceleration is 5 m/s^2. The fireball is fired from the same tower of height 30 meters, with the same initial velocity of 16 m/s.

1. $\tan^{-1}(0.853)$
2. $\tan^{-1}(0.753)$
3. $\tan^{-1}(0.893)$
4. $\tan^{-1}(0.793)$

Answer: Option 1

Section wise Preparation

Section 2

Pseudocoding

Why do we test Pseudocoding?

The pseudocoding section is included to test students' ability to navigate through code, analyze logical flows, and reach correct outputs, while also assessing their debugging skills.

Prerequisite:

Basic Programming Concepts and Syntax.

Exam Syllabus and Topics:

Input & Output , Language Basics, Coding Syntax, Basic Functions.

Q1: What will be the output of the following pseudocode?

```
x = 5
y = 10
x = x + y
y = x - y
x = x - y
print x, y
```

Options:

1. 5, 10
2. 10, 5
3. 0, 15
4. 15, 0

Answer: Option 2

Q2: What is the purpose of the following pseudocode?

```
n = 7
a = 1
for i = 1 to n
  a = a * i
print a
```

Options:

1. Prints the sum of numbers from 1 to 7
2. Prints the factorial of 7
3. Prints the product of even numbers up to 7
4. None of the above

Answer: Option 2

Q3: What will be the output of the following pseudocode
a.) t=0, b.) t=1

```
a = 2
for i = t to 2
  a = a * a * i
```

Options:

1. a) 2, b) 16
2. a) Error, b) 32
3. a) 0, b) 32
4. a) 2, b) Error

Answer: Option 3

Section wise Preparation

Section 3

Coding Section

Why do we have coding section?

The coding section is included to evaluate the coding skills of students, testing their ability to solve problems efficiently using programming techniques.

Prerequisite:

Algorithm & Functional Analysis and Basic Coding Skills.

Exam Syllabus and Topics:

Basic Functions, If Else Statements, Loops, Arrays, Strings.

Problem Statement: Easy
Write a function that takes an integer n as input and returns a boolean value:
Prime number is a number which is divisible by 1
and the number itself

Print true if n is a prime number,

false otherwise.

Function:
input will an integer and output will be true / false.

Problem Statement: Medium
Write a function that takes an array of integers and its size as input and returns the second largest element in the array.
If there is no second largest element (i.e., all elements are the same), return -1.

Function:
input will an integer array, integer and output will be an integer.

Problem Statement: Hard
Write a function that takes a string s representing a sentence and returns the longest word in the sentence.
If there are multiple words with the same maximum length, return the first occurring longest word.

Function:
Input will be a string and output will be a string.

Wishing you *all the best*