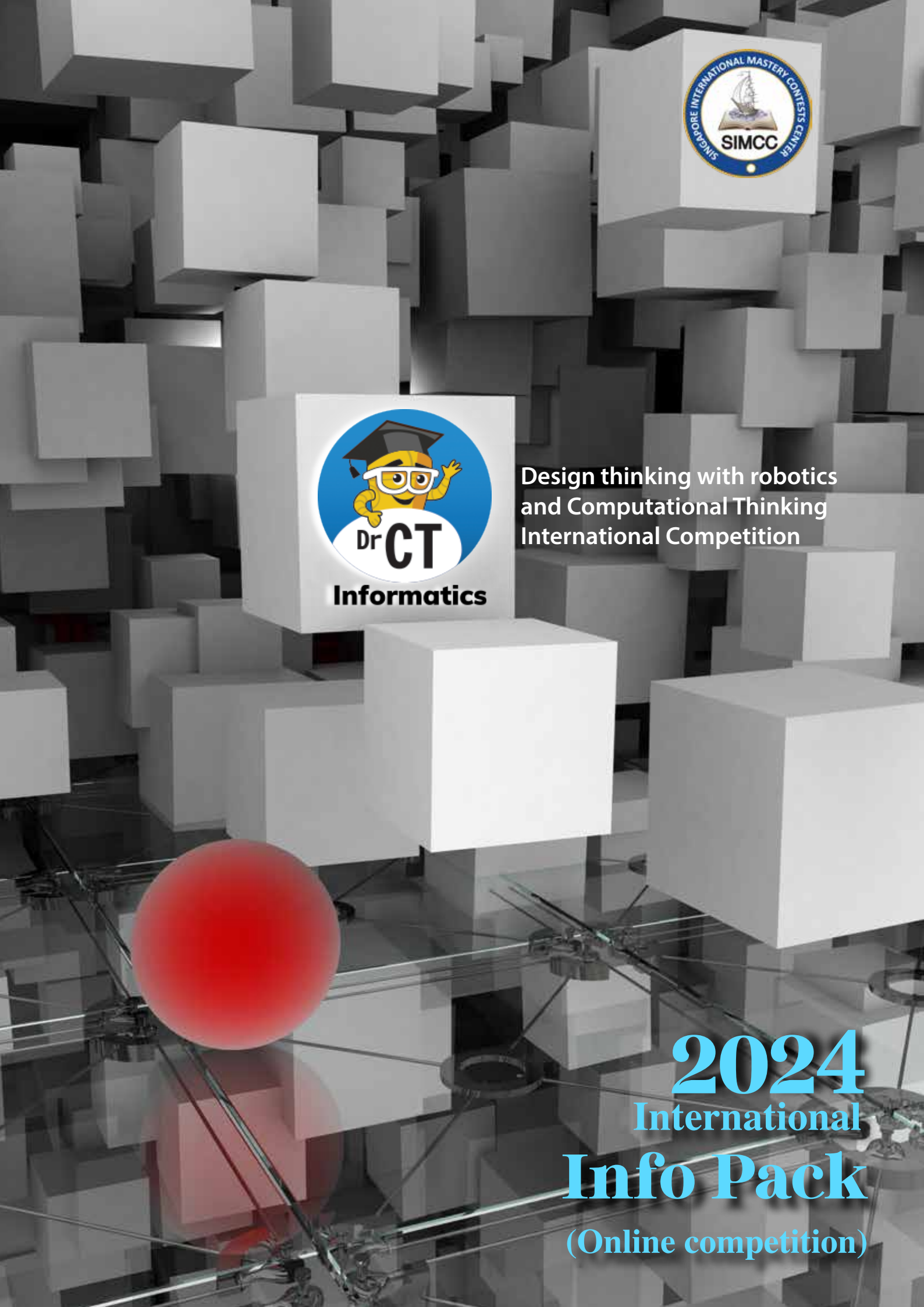


Design thinking with robotics and Computational Thinking International Competition

2024 International Info Pack

(Online competition)

The Value of SIMCC and STS

01 Many internationally recognized competitions

02 IJHS, YALA, GMOS Internships
Passion with a purpose project

03 Best Fit University with Scholarships

National Contests conducted in respective SIMCC Countries

National Contests - Lowest Cost.
Country Awards :-
Top 8% - Gold,
Next 12% - Silver
Next 20% - Bronze
Next 10% - Honorable Mention

Global Finals Online - Lower Cost.
Global Awards :
Top 10% - Gold,
Next 15% - Silver
Next 25% - Bronze
Next 20% - Honorable Mention

Global Competitions conducted Online

SOAR students who have achieved a Silver award in SASMO or AMO are eligible to participate in these global finals, at no cost

Global Finals - Travel Required, Reasonable Cost
Top 10% - Gold,
Next 15% - Silver
Next 25% - Bronze
Next 20% - Honorable Mention

Global Competitions hosted in Singapore (SIMOC) and rotated to one SIMCC Country annually (STEAM AHEAD)

Countries with more than 1,000 or more SASMO 2024 Contestants will be awarded a SIMOC Scholarship, which includes SIMOC training, contest fee to represent their country at SIMOC 2024.

A. One award for every 1000 SASMO contestant, for Top Scorer(S) based on ranking
B. One award for the Top Scoring SOAR student
C. One award for the Most Motivated student based on 300-500 word Essay submitted, and not IJHS Member, and not won higher than silver award in any SIMCC contest.

45 countries and territories

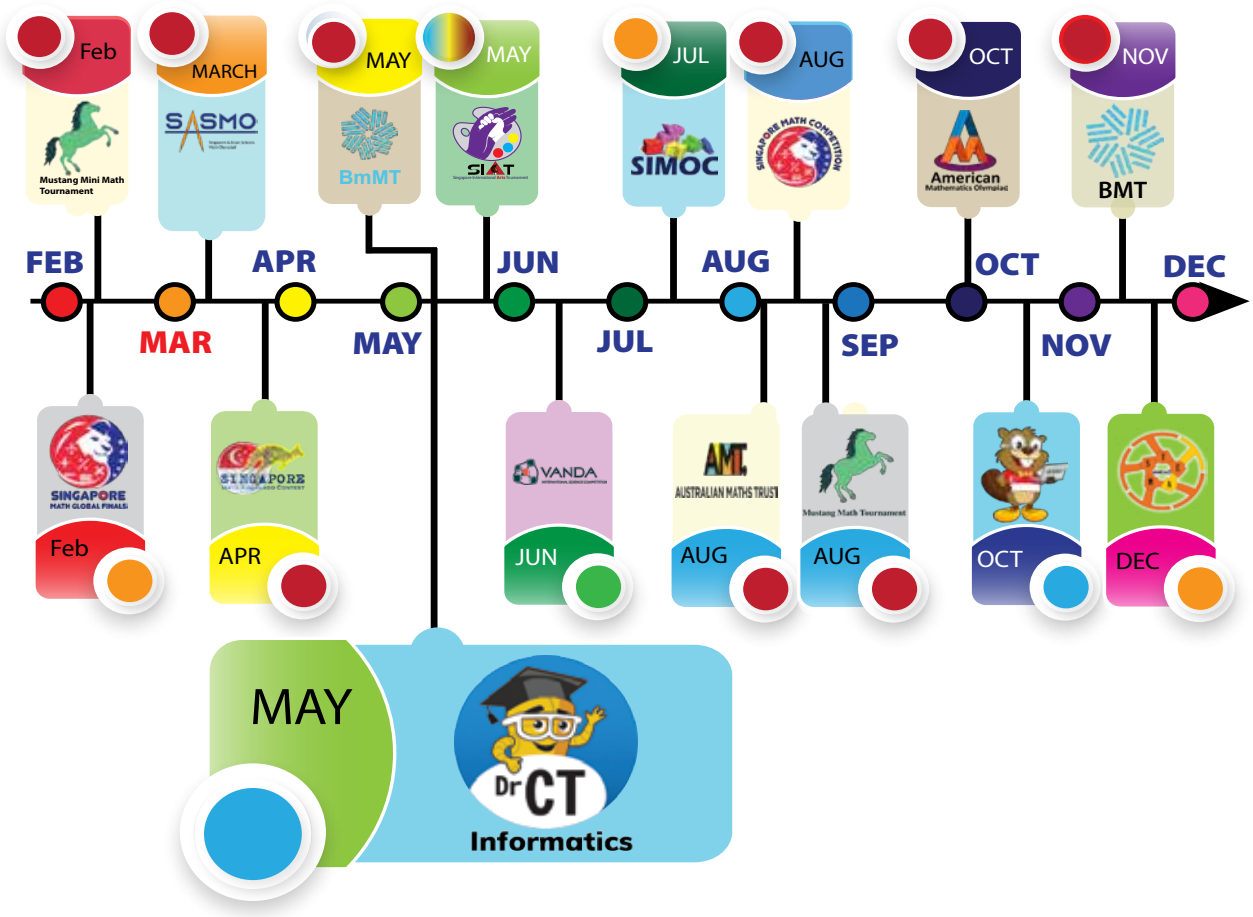
17 competitions and challenge

Over half a million contestants

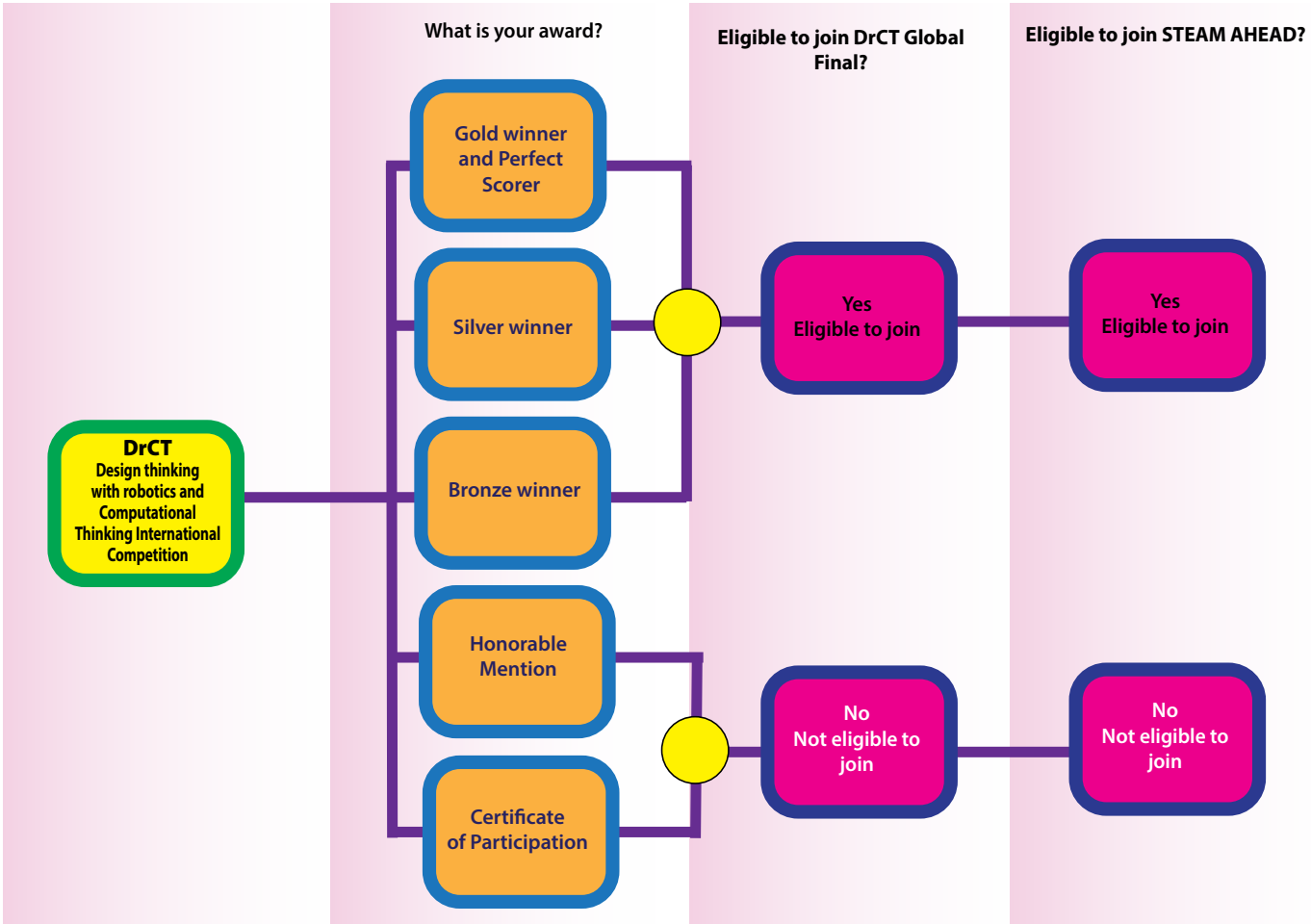
Scholarship Enhancement Initiatives

Over S$3 million in Scholarship Support to help students and teachers strengthen their portfolios and a Powerful Network to help our contestants to win more scholarships

SIMCC Competition Timeline



SIMCC Competition progression



STEAM INTERNATIONAL TOURNAMENT

There is a strong demand globally for STEAM talent led by corporations to get talent for their businesses. Hence, SIT is a great initiative to identify these talents for corporations and also various organisations giving scholarships to prepare talent for STEAM.

STEAM INTERNATIONAL TOURNAMENT (SIT)

SIMCC and Scholastic Trust Singapore (STS) is delighted to launch the STEAM International Tournament (SIT). SIT is a collection of reputable academic competitions in Science, Mathematics, Informatics, and Arts which help distinguish students' achievements in STEAM. Students who win awards in any of the qualifying contests below score points for the SIT Awards:

1. **Science** = National Junior Olympiad in Science (NJOS) / VANDA Science National Contest
2. **Informatics** = National Junior Informatics Olympiad (NJIO) / Design thinking with robotics and Computational Thinking (DrCT) International Competition
3. **Arts** = National Junior Arts Olympiad (NJAO) / Singapore International Art Tournament (SIAT)
4. **Mathematics** = American Mathematics Olympiad (AMO) or Singapore and Asian Schools Math Olympiad (SASMO)

Rules

1. Each student will be awarded SIMCC Scholarship points from each contest.
2. SIT points must be collected within one academic year from August 1 to July 31.
3. The SIT points collected will determine the SIT Award won for that year.

IJHS Scholarship points

Grant additional IJHS Scholarship points based on the combined awards received from AMO/SASMO, DrCT, VANDA, and SIAT.

SIT Star Award ⟶ Earn extra 3 IJHS Scholarship points (SPs)

SIT Platinum Award ⟶ Earn extra 2 IJHS Scholarship points (SPs)

SIT Tri Award ⟶ Earn extra 1 IJHS Scholarship points (SPs)

SIT Award ⟶ Earn extra 0.5 IJHS Scholarship points (SPs)

SIT Star Awardees will be trained as SIMCC STEAM camp leaders in 2024 and awarded S$200 voucher upon completion.

Top 5 SASMO Winners from each grade by country* get Contest Scholarship (CS) to compete in MMT.

No Travel needed, and earn more IJHS Scholarship points to advance to top schools and universities with scholarships

Earn additional scholarship points

Table of scholarship points from all SIMCC competitions

SIT awards will be announced together with the induction of IJHS Scholars annually on September 15, 2024.

National Contest award	Perfect Score	Gold	Silver	Bronze
IJHS Scholarship Point	3	2	1	0.5

Combined Qualifying National Contest IJHS Scholarship Points	≥ 10 points	8 to 9 points	6 to 7 points	5 points
Award	SIT Star	SIT Platinum	SIT Tri	SIT Award
Extra IJHS Scholarship Point For Award	3	2	1	0.5

Contents

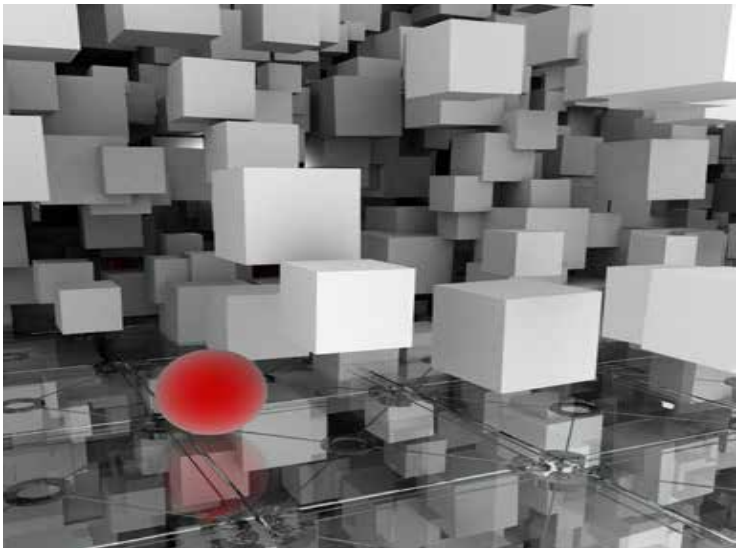
Overview

DrCT an innovative approach designed to spark students' interest in programming by leveraging the principles of computational thinking and block programming. This statement explains how DrCT accomplishes this goal by breaking down complex problems into manageable parts, fostering an engaging and accessible learning environment.

Objectives

Enhancing Problem-Solving Skills through Computational Thinking: DrCT integrates computational thinking into its core, a problem-solving process that involves understanding a problem, breaking it down into manageable parts, identifying patterns, abstracting the problem into a generalizable solution, and designing algorithms to solve it. This method teaches students to approach problems like a computer scientist, enhancing their analytical skills and making the programming process more logical and less intimidating. By engaging with computational thinking, students develop a foundational skill set that not only piques their interest in programming but also equips them with the tools necessary to tackle complex challenges in a systematic and efficient manner.

Making Programming Accessible with Block Programming: Block programming, a key component of DrCT, utilizes visual blocks that students can drag and drop to create programs. This approach eliminates the barrier of syntax errors, one of the most common hurdles for beginners in text-based programming. By focusing on the logic and structure of code rather than the intricacies of syntax, block programming makes programming more accessible and appealing to students, especially those who are just starting out or might be intimidated by traditional coding. . This hands-on, interactive method allows students to see immediate results of their logic, fostering a sense of accomplishment and motivating them to explore more complex concepts.



Interactive Learning Environment: DrCT offers an interactive and engaging learning environment that encourages experimentation. Students can see the real-time impact of their programming decisions, whether they're controlling a digital robot or creating an animation. This immediate feedback loop is crucial for learning and maintaining interest, as it allows students to experiment, learn from mistakes, and understand the principles of programming in a tangible way.

Encouraging Creativity and Innovation: By simplifying the programming process, DrCT allows students to focus on creativity and innovation. With computational thinking, they learn to see patterns and solutions in new ways, and with block programming, they can quickly implement and test their ideas. This freedom to experiment and innovate without the fear of failure is essential for fostering a deep interest in programming and technology.

DrCT, through its emphasis on computational thinking and block programming, demystifies the process of learning to code and makes it more accessible and enjoyable for students. By breaking down barriers to entry, encouraging problem-solving skills, and allowing for creative expression, DrCT not only sparks students' interest in programming but also prepares them with critical thinking skills that are applicable across various disciplines and in real-world scenarios.

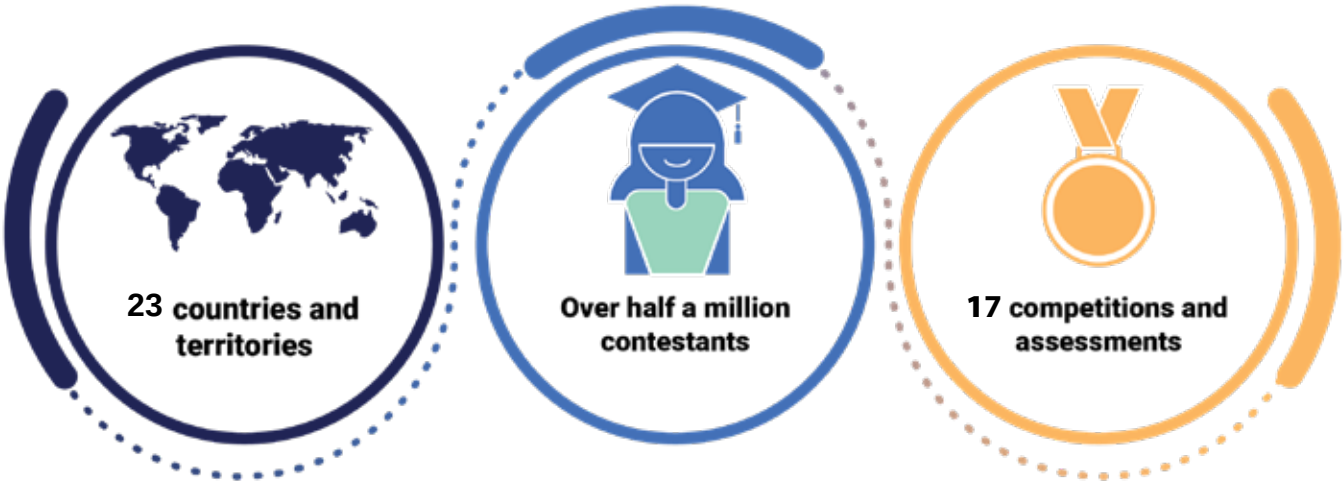
About STS

Scholastic Trust Singapore Ltd (STS) is a non-profit foundation that supports international academic and cultural competitions. With donations from revenue generated from these contests, STS awards scholarships and mentorship programs for students and teachers to transform lives. Using knowledge building pedagogies and Singapore's expertise in education, STS supports and mentors teachers and students through ACAs. We provide leading edge professional development for teachers in English, Mathematics, Science, IT, Pedagogy, and School Leadership to improve education in many developing countries. STS manages the International Junior Honor Society (IJHS), Young Achievers Leadership Academy (YALA), a live-in 5-day 4 night leadership camp, and Southern Illinois University (SIU) Dr. Jared Dorn Scholarship and SIU International Student Tuition Grants.

About SIMCC

SIMCC is a social enterprise and donates 20% of her contest revenues to support students and teachers. SIMCC is one of the largest academic contest organizers in Singapore and Asia. We are committed to popularizing education through thinking games and competitions, and allowing students to interact, cooperate and build lasting bonds of friendship that transcend borders.

SIMCC has sales offices in Cambodia (Phnom Penh), Indonesia (Jakarta), and Singapore along with partners in 39 countries and territories with over half a million contestants in 19 competitions and assessments.

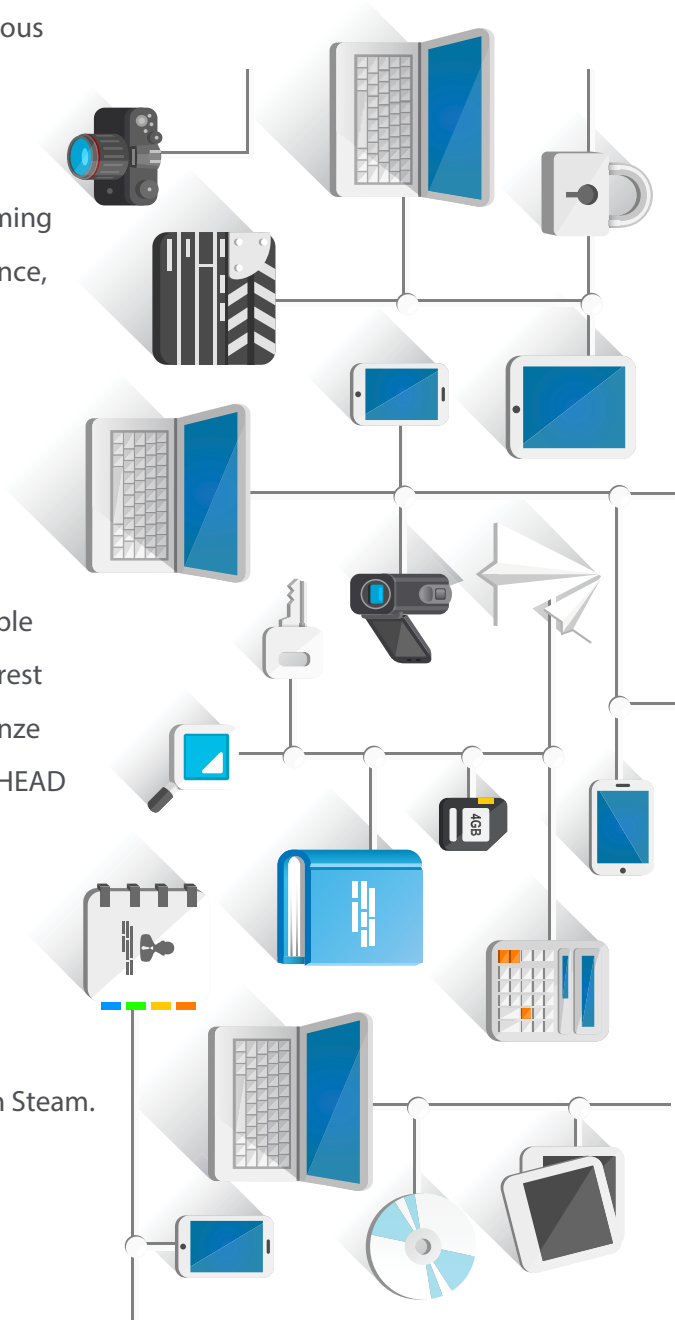


Benefits of DrCT

DrCT contest presents a unique and innovative competition that focuses on enhancing participants' computational thinking skills through engaging challenges involving block programming. This contest offers numerous benefits to students and educators alike, fostering not only a deeper interest in programming and technology but also cultivating essential 21st-century skills. Here are some key benefits of participating in a DrCT national contest:

1. Enhanced Problem-Solving Skills

Participants are encouraged to apply computational thinking strategies to break down complex problems into manageable parts, identify patterns, and devise effective solutions. This process significantly enhances their problem-solving skills, making them more adept at tackling various challenges both inside and outside the realm of programming.



2. Increased Interest in STEM

By making programming accessible and fun through block programming , the DrCT national contest helps to increase students' interest in science, technology, engineering, and mathematics (STEM) fields.
This can lead to a more diverse and robust pipeline of future professionals in these critical areas.

3. Recognition and Motivation

Participating in and possibly winning awards or recognition in a DrCT contest can be highly motivating for students. It provides tangible validation of their skills and effort, potentially sparking a lifelong interest in technology and programming. Perfect scorer, Gold, Silver and Bronze Medalists of DrCT national contest will be invited to join STEAM AHEAD to compete in the ***STEAM AHEAD 2024 – International Junior Informatics Olympiad (IJIO) for Grade 1 to Grade 7 and International Junior CyberSecurity Olympiad (IJCO) organized by National University of Singapore, School of Computing for Grade 8 onwards.***

They will have a chance to win the President's Award for Excellence in Steam.

Format of the Test

Lower Primary Division Grade 1 & 2

Module Aims

Computational Thinking (CT) is a set of knowledge and skills that involves breaking down complex problems into smaller manageable parts, and using logical reasoning and algorithms to solve them. This module aims to develop the critical thinking and problem-solving skills in students by imparting to them the introductory knowledge and skills of CT such as pattern recognition, sequencing, sorting, logical thinking and basic coding. Students will also learn how problems can be represented in text, images and graphs; loops, conditionals and how they can be solved through optimization.

Competition Structure

Section	Number of questions	Marks
Section A	10 CT questions	30 marks
Section B	5 Block programming	60 marks
Bonus points		10 marks
Total		100 marks

Mode of competition	Duration
Online	60 mins

SECTION A:
3 marks for correct answer, 0 mark for unanswered questions, -1 mark for wrong answer

SECTION B:
12 marks for correct answer, 0 mark for unanswered or wrong answer

REFERENCE

1. Dagiene, V., Sentance, S., & Stupuriene, G. (2017). Developing a Two-Dimensional Categorization System for Educational Tasks in Informatics. Informatica (Netherlands), 28(1), 23-44. DOI: 10.15388/Informatica.2017.119.

2. Classic Computer Science Unplugged. Classic CS Unplugged

3. Computer Science Fundamentals. CS Curriculum for Grades K-5 | Code.org

4. Bebras Challenge. https://www.bebraschallenge.org/

5. Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives: Complete edition, New York : Longman. Table 5.1, pages 67-68

Table of Specifications

	Abilities (%)			
Topics	**K**	**C**	**A/HA**	**Total**
A. Abstraction, Generalization and Decomposition	8	10	16	34
B. Data and Representations	6	8	7	21
C. Algorithms and Algorithmic Thinking	7	7	10	24
D. Basic Block Programming	6	6	9	21
Total	27	31	42	**100**

Notes:

1: The letters K, C, A and HA in the table of specifications denote the knowledge, comprehension, application and higher than application levels of Bloom's Taxonomy in the cognitive domain.

- Knowledge refers to the recalling of facts, concepts, procedures and theories.
- Comprehension refers to the ability to interpret, explain, infer, summarize, compare, classify and exemplify.
- Application refers to the ability to implement and / or execute.
- Higher than Application refers to the ability to analyze, evaluate, and create.

2: In the detailed syllabus which follows, all objectives should be understood to be prefixed by the words "At the end of instruction, the learner should be able to ...".

Content Outline

Topic A: Abstraction, Generalization and Decomposition

This topic introduces what Abstraction, Generalization and Decomposition are in the domain of computational thinking. These concepts are fundamentally important in critical thinking and problem solving. In Abstration, students will learn how unnecessary details are removed from a given problem and to focus on the important information. In Generalization, students will learn to identify patterns, similarities and connections. In Decomposition, students will learn to think about problems in terms of component parts and about how tasks can be broken into more managable sub tasks.

Topic B: Data and Representations

In this topic, students will be introduced to the Binary system of representing numbers. Binary system is the basic system that computers used to store information. Students will also learn how problems can be represented and interpreted in terms of text, images and graphs. This will enable students to better visualize and understand the problem.

Topic C: Algorithms and Algorithmic Thinking

In this topic, students will learn to use reasoning and organization to solve problems. In the process of reasoning and organizing, students will also learn to put instructions in the correct order or sequence or different ways the sequence can be arranged. In addition, students will learn basic algorithmic constructs like loops, conditionals and sorting, and the situations on when these constructs should be used in problem solving.

Topic D: Basic Block Programming

In this topic, students will be introduced to basic block programming using drag-and-drop tools. Online programming tools like Blockly and / or Microbit will be used, and students will learn how data like numbers, text, strings, instructions, loops and conditionals can be programmed and implemented in these platforms.

A.	**Abstraction, Generalization and Decomposition**
1	**Understand and Apply Abstraction**
1.1 1.2 1.3	Explain what Abstraction is Remove unnecessary details from a problem Spot key elements in a problem
2	**Understand and Apply Generalization**
2.1 2.2	Explain what Generalization is Recognize similarities, patterns or connections in a problem
3	**Understand and Apply Decomposition**
3.1 3.2 3.3	Explain what Decomposition is Breakdown a problem into smaller components Modify a given system to use fewer resources (optimization)
B.	**Data and Representations**
4	**Represent Data in Binary**
4.1 4.2	Explain and identify what a Binary system is Represent a number using the Binary system
5	**Represent Data in Text, Images and Graphs**
5.1 5.2 5.3	Explain and identify representations of text Explain and identify representations of images Represent data / problem using graphs

C	**Algorithms and Algorithmic Thinking**
6	**Use Logical Thinking and Sequencing**
6.1 6.2	Use reasoning and organization to solve problems Put instructions in the correct order based on rules
7	**Implement Loops, Conditionals and Sorting**
7.1 7.2 7.3 7.4 7.5	State what a loop is Identify when a loop is used State what conditionals are Identify when conditionals are used Sort data based on attributes
D	**Basic Block Programming**
8	**Understand Programming Tools**
8.1 8.2 8.3	State what programming tools like Blockly and Microbit are Start a programming tool like Blockly and/or Microbit Navigate and use the features in a programming tool like Blockly and/or Microbit
9	**Implement Data in a Program**
9.1 9.2 9.3	Define and implement numbers in code Define and implement text and strings in code Implement correct sequencing in code
10	**Implement Loops and Conditionals in a Program**
10.1 10.2 10.3	Recap what loops and conditionals are Implement loops in code Implement conditionals in code

Middle Primary Division Grade 3 & 4

Module Aims

This module aims to continue to build on Computational Thinking (CT) knowledge and skills for students in the mid primary stage. The module dwells deeper into CT thinking concepts and examples related to abstraction, decomposition, evaluation and generalization. The module also introduces how data can be represented in stack and memory and related mathematical concepts like sets, graphs, trees, permutations and combinations. Students will continue to learn algorithmic thinking skill by being introduced to well known algorithms releated to, for example, searching, sorting, shortest path, and optimization. Students will also enhance their computer knowledge, programming and logical thinking skills by learning security, and coding different kinds of variables, images, loops, conditionals to solve problems.

Competition Structure

Section	Number of questions	Marks
Section A	10 CT questions	30 marks
Section B	10 Block Programming questions	60 marks
Bonus points		10 marks
Total		100 marks

Mode of competition	Duration
Online	60 mins

SECTION A:
3 marks for correct answer, 0 mark for unanswered questions, -1 mark for wrong answer

SECTION B:
6 marks for correct answer, 0 mark for unanswered or wrong answer

REFERENCE

1. Dagiene, V., Sentance, S., & Stupuriene, G. (2017). Developing a Two-Dimensional Categorization System for Educational Tasks in Informatics. Informatica (Netherlands), 28(1), 23-44. DOI: 10.15388/Informatica.2017.119.

2. Classic Computer Science Unplugged. Classic CS Unplugged

3. Computer Science Fundamentals. CS Curriculum for Grades K-5 | Code.org

4. Bebras Challenge. https://www.bebraschallenge.org/

5. Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives: Complete edition, New York : Longman. Table 5.1, pages 67-68

Table of Specifications

	Abilities (%)			
Topics	**K**	**C**	**A/HA**	**Total**
A. CT Skills	5	6	8	19
B. Data and Representations 2	7	7	9	23
C. Algorithms and Algorithmic Thinking 2	8	8	15	31
D. Computers & Block Programming	7	7	13	27
Total	27	28	45	**100**

Notes:

1: The letters K, C, A and HA in the table of specifications denote the knowledge, comprehension, application and higher than application levels of Bloom's Taxonomy in the cognitive domain.

- Knowledge refers to the recalling of facts, concepts, procedures, and theories.
- Comprehension refers to the ability to interpret, explain, infer, summarize, compare, classify and exemplify.
- Application refers to the ability to implement and / or execute.
- Higher than Application refers to the ability to analyze, evaluate, and create.

2: In the detailed syllabus which follows, all objectives should be understood to be prefixed by the words "At the end of instruction, the learner should be able to ...".

Content Outline

Topic A: CT Skills

This topic continues to inculcate the Comptutational Thinking (CT) skills of Abstraction, Generalization, Decomposition and Evaluation. In Abstraction, students, given a problem, will learn how a representation of the system is chosen. In Generalization, students will learn to how new problems can be solved by adopting solutions from already-solved problems. In Decomposition and Evaluation, students will learn to think about problems in terms of sub-tasks or functions and how the best fitting solution can be obtained by optimizing resources based on certain constraints.

Topic B: Data and Representations 2

In this topic, students will be introduced to the concepts on representing data and information in Sets, Graphs and Trees and the scenarios where these can be applied. Students will also learn how data can be manipulated using Permutations and Combinations, thus exposing them to their application in real-life examples of arranging and selection of resources and information.

Topic C: Algorithms and Algorithmic Thinking 2

In this topic, students will continue to build their algorithmic thinking skills by learning the key concepts of various algorithms and their real-life applications relating to the function of searching, sorting and finding the shortest path. Linear and Binary Searches, as well as Dijkstra's Algorithm will be used as examples. In addition, students will also learn the application of concepts relating to calculating the Maximum Flow and Minimum Cost in various problem scenarios.

Topic D: Computers & Block Programming

In this topic, students will learn the basics of how computers make use of memory. Security relating to Cryptography, encoding, and decoding will also be introduced. In addition students will learn how various loops and conditionals like if-then-else, repeat, do, and for loops are being programmed to solve problems.

A.	**CT Skills**
1	**Apply Abstraction and Generalization**
1.1 1.2 1.3 1.4	Recall what Abstraction is Select a representation of a system Recall what Generalization is Solve new problems based on available solutions
2	**Apply Decomposition and Evaluation**
2.1 2.2 2.3 2.4	Recall what Decomposition is Divide problem into sub-tasks (functions) Explain what Evaluation is Optimize solutions based on purpose and resource
B.	**Data and Representations 2**
4	**Represent Data in a Set, Graph or Tree**
4.1 4.2 4.3 4.4 4.5 4.6 4.7	Explain what a Set is Represent data and solve problems using Sets Explain what a Graph is Represent data and solve problems using Graphs Explain what a Tree is Recall what the Binary system of representation is Represent data and solve problems using Trees (Binary or non-Binary)
5	**Apply Permutation and Combination**
5.1 5.2 5.3 5.4	Explain what Permutation is and when it is used Apply Permutation to a set of numbers Explain what Combination is and when it is used Apply Combination to a set of numbers

C	**Algorithms and Algorithmic Thinking 2**
6	**Use Search, Sort and Shortest Path Algorithms**
6.1 6.2 6.3 6.4 6.5 6.6	Explain what Linear Search and Binary algorithms are when they are used Apply Linear Search and Binary Search to solve problems Explain what Selection Sort and Bubble Sort algorithms are and when they are used Apply Selection Sort and Bubble Sort to solve problems Explain what Shortest Path means using a Graph Understand and apply Dijkstra's Algorithm to solve problems
7	**Optimize using Maximum Flow or Minimum Cost**
7.1 7.2 7.3 7.4 7.5 7.6	Explain, using a Graph, what Maximum Flow is State the scenarios where Maximum Flow calculation is used Apply a Maximum Flow algorithm in a problem Explain, using a Graph, what Minimum Cost is State the scenarios where Minimum Cost calculation is used Apply a Minimum Cost algorithm in a problem
D	**Computers & Block Programming**
8	**Understand Computers & Security**
8.1 8.2 8.3 8.4	Understand what LIFO, FIFO are Explain how Computers use Stack memory Explain what Cryptography is and when it is used Encode and decode text and numbers
9	**Program Variables**
9.1 9.2	Recall the implementation of numbers in code Recall the implementation text and strings in code
10	**Program Loops and Conditionals**
10.1 10.2 10.3	Program if-then-else statements Program for loop Program Repeat and Do loops

Upper Primary Division Grade 5, 6

Module Aims

This module for upper primary students builds upon the Computational Thinking (CT) knowledge and skills achieved in earlier stages. The module introduces functions and arrays commonly used in programming and their applications. Students will be refreshed on Searching and Sorting algorithms as well as Dijkstra's Algoritm. In addition, students will learn recursive algorithm based on the 0/1 Knapsack Problem, the Travelling Salesman Problem, Greedy Approach, and further explore problem solving using Optimization, Maximum Flow and Minimum Cost algorithms. Students will contiune to enhance their Data Structure and Representations knowledge in the areas related to Graphs, Finite State Machines and Trees. Students will also learn the basics of Cryptographic Protocols, Public-Key Cryptogrpahy and be introduced to floating point numbers, arrays, logical operations, nested loops, recursive and sorting functions and how they are programmed.

Competition Structure

Section	Number of questions	Marks
Section A	10 CT questions	30 marks
Section B	10 Block programming questions	60 marks
Bonus points		10 marks
Total		100 marks

Mode of competition	Duration
Online	60 mins

SECTION A:
3 marks for correct answer, 0 mark for unanswered questions, -1 mark for wrong answer

SECTION B:
6 marks for correct answer, 0 mark for unanswered or wrong answer

REFERENCE

1. Dagiene, V., Sentance, S., & Stupuriene, G. (2017). Developing a Two-Dimensional Categorization System for Educational Tasks in Informatics. Informatica (Netherlands), 28(1), 23-44. DOI: 10.15388/Informatica.2017.119.

2. Classic Computer Science Unplugged. Classic CS Unplugged

3. Computer Science Fundamentals. CS Curriculum for Grades K-5 | Code.org

4. Bebras Challenge. https://www.bebraschallenge.org/

5. Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives: Complete edition, New York : Longman. Table 5.1, pages 67-68

Table of Specifications

	Abilities (%)			
Topics	**K**	**C**	**A/HA**	**Total**
A. Algorithms	7	10	10	27
B. Data Structures and Representations	8	7	7	22
C. Communications and Networking	6	7	6	19
D. Block Programming	9	8	15	32
Total	30	32	38	**100**

Notes:

1: The letters K, C, A and HA in the table of specifications denote the knowledge, comprehension, application and higher than application levels of Bloom's Taxonomy in the cognitive domain.

- Knowledge refers to the recalling of facts, concepts, procedures and theories.
- Comprehension refers to the ability to interpret, explain, infer, summarize, compare, classify and exemplify.
- Application refers to the ability to implement and / or execute.
- Higher than Application refers to the ability to analyze, evaluate, and create.

2: In the detailed syllabus which follows, all objectives should be understood to be prefixed by the words "At the end of instruction, the learner should be able to ...".

Content Outline

Topic A: Algorithms

In this topic, students will revisit the Linear Search and Binary search algorithms, the Bubble Sort and Selection Sort algorithms as well as using the DijkStra's Algorithm, Maximum Flow and Minimum Cost approaches. Students will learn the approaches of breadth-first search and depth-first search. Anpother sorting algorithm, Quick Sort will be introduced to widen the students' knowledge on different sorting methods. Students will also be introduced to common algorithmic problems and how they are solved. The 0/1 Knapsack Problem, the Travelling Salesman Problem, and the Greedy Algorithm will be used as exmaples and students will learn to solve problems using a combination of approaches.

Topic B: Data Structures and Representations

In this topic, students will be introduced to the concepts on representing data and information in Arrays, Lists and Queues and the scenarios where these can be applied. In addition, students will learn what Finite State Machines (FSM) are and the way systems can be represented and modelled using Finite State Machines (FSM) to solve problems. More examples will also be introduced to illustrate the use of Trees.

Topic C: Communications and Networking

In this topic, students will enhance their knowledge of computer communications, network topology and security. Students will learn more about passwords, encryption, and cryptography like Public-Key Cryptography. Secured communications protocols like Secure Sockets Layer (SSL) and Transport Layer Security (TLS) will be introduced. Students will also learn the basics of network topology using different kinds of Graphs how problems relating to networks are solved using Graphs

Topic D: Block Programming

This topic builds upon the foundation from the previous stages to enhance the programming skills of students. Students will learn how floating point variables are implemented, and how various loops like the while loop is coded. Students will learn how Boolean logic is implemented and how functions can be used to efficiently to solve more complex problems. Programming Search and Sort algorithms will also be introduced.

A.	**Algorithms**
1	**Apply Search and Sort Algorithms**
1.1	Recall what Linear Search and Binary Search are
1.2	Know the difference between breadth-first search and depth-first search
1.3	Recall what Selection Sort and Bubble Sort are
1.4	Explain what Quick Sort is
1.5	Apply searching and sorting algorithms to solve problems
2	**Understand Well-Known Algorithmic Problems**
2.1	Understand the 0/1Knapsack Problem and its applications
2.2	Understand the Travelling Salesman Problem and its applications
2.3	Explain what the Greedy Approach is and its applications
2.4	Recall what DijkStra's Algorithm, Maximum Flow and Minimum Cost are
2.5	Solve algorithmic problems using a combination of above approaches
B.	**Data Structures and Representations**
4	**Represent Data in an Array, List and Queue**
4.1	Explain what an Array is
4.2	Represent data and solve problems using Arrays
4.3	Explain what a List is
4.4	Represent data and solve problems using Lists
4.5	Recall what FIFO and LIFO are
4.6	Explain what a Queue is
4.7	Represent data and solve problems using Queues
5	**Apply Finite State Machines and Trees**
5.1	Explain what a Finite State Machine (FSM) is
5.2	Know when FSM is applied
5.3	Represent models using FSM
5.4	Recall what Trees are
5.5	Use Binary Search Tree to solve problems

C	**Communications and Networking**
6	**Understand Secured Communications**
6.1 6.2 6.3 6.4	Recall why security like passwords and encryption are important Recall what Cryptography is and when it is used Know secured communication protocols like SSL and TLS Explain what Public-Key Cryptography is and when it is used
7	**Understand Network Topology and Graph Theory**
7.1 7.2 7.3 7.4	Represent Networks using Graphs Know what Directed Graphs and Weighted Graphs are Explain what Regular Graphs, Grid Graphs and Bipartite Graphs are Solve problems related to Networks using Graphs
D	**Block Programming**
8	**Program Floating Point Variables and Loops**
8.1 8.2 8.3 8.4 8.5	Recall how variables like numbers, text and strings are programmed Explain what a floating point variable is and when it is used Program floating point variables Recall how if-then-else, for, do are programmed Understand and program while loops
9	**Program Boolean Logic and Functions**
9.1 9.2 9.3 9.4	Explain what Boolean Logic is and when they are used Program Boolean logic Know what a function is and when it is used Program Functions to solve problems
10	**Program Search and Sort**
10.1 10.2 10.3	Recall Search and Sort algorithms Program a Search function Program a Sort function

Lower Secondary Division GRADE 7, 8

Module Aims

This module covers more advanced computational thinking concepts, technique and knowledge. The module introduces divide and conquer in algorithmic design, refreshes depth-first and breadth-first searches, as well as apply the Greedy approach and Maximum Flow, Minimum Cost algorithm and Recursion in advanced problem solving. In Data Structure and Representations, students will learn Modulo Arithmetic, Clusterization, Regular Expressions (Regex) and continue to apply Permutations, Binary system, Arrays, Lists, Queues, Trees, Finite State Machines (FSM) and Graphs to solve more complex problems. Students will learn the basics of TCP and IP, different network toplogies and will be refreshed on Cryptographic Protocols and Public-Key Cryptogrpahy. In programming, Object-Oriented concepts will be introduced as well as using Boolean logic, For, While, nested Loops and Conditionals in coding to solve problems.

Competition Structure

Section	Number of questions	Marks
Section A	7 CT questions	21 marks
Section B	12 Block programming questions	72 marks
Bonus points		7 marks
Total		100 marks

Mode of competition	Duration
Online	90 mins

SECTION A:
3 marks for correct answer, 0 mark for unanswered questions, -1 mark for wrong answer

SECTION B:
6 marks for correct answer, 0 mark for unanswered or wrong answe

REFERENCE

1. Dagiene, V., Sentance, S., & Stupuriene, G. (2017). Developing a Two-Dimensional Categorization System for Educational Tasks in Informatics. Informatica (Netherlands), 28(1), 23-44. DOI: 10.15388/Informatica.2017.119.

2. Classic Computer Science Unplugged. Classic CS Unplugged

3. Computer Science Fundamentals. CS Curriculum for Grades K-5 | Code.org

4. Bebras Challenge. https://www.bebraschallenge.org/

5. Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives: Complete edition, New York : Longman. Table 5.1, pages 67-68

Special Requirements

Prerequisite:	Recommended to complete Grade 5 & 6
Software:	Coding tools like Blockly or Microbit
Hardware:	Windows 10 or Windows 11 PC / laptop, and / or other handheld smart devices.

Table of Specifications

	Abilities (%)			
Topics	**K**	**C**	**A/HA**	**Total**
A. Algorithms 2	6	10	12	28
B. Data Structures and Representations 2	7	9	8	24
C. Communications and Networking 2	8	7	5	20
D. Object-Oriented Programming	8	8	12	28
Total	29	34	37	**100**

Notes:

1: The letters K, C, A and HA in the table of specifications denote the knowledge, comprehension, application and higher than application levels of Bloom's Taxonomy in the cognitive domain.

- Knowledge refers to the recalling of facts, concepts, procedures and theories.
- Comprehension refers to the ability to interpret, explain, infer, summarize, compare, classify and exemplify.
- Application refers to the ability to implement and / or execute.
- Higher than Application refers to the ability to analyze, evaluate, and create.

2: In the detailed syllabus which follows, all objectives should be understood to be prefixed by the words "At the end of instruction, the learner should be able to ...".

Content Outline

Topic A: Algorithms 2

In this topic, students will solve more complex problems using a combination of Graphs, Search and Sort algorithms, DijkStra's Algorithm, Maximum Flow and Minimum Cost approaches. Students will learn the divide-and-conquer algorithmic approach and how it is applied in recursion. Students will also be introduced to Factorials and Fibonacci related algorithmic problems and how they are solved as well as refreshing on the 0/1 Knapsack Problem, the Travelling Salesman Problem, and the Greedy Algorithm.

Topic B: Data Structures and Representations 2

In this topic, students will apply the concepts on representing data and information in Arrays, Lists and Queues and Trees to solve problems and refresh on what Finite State Machines (FSM) are and the way systems can be represented and modelled using Finite State Machines (FSM) to solve problems. Students will learn more applications of Combination and Permutation, especially in the area of pattern analysis. Modulo Arithmetic, Clusterization and Regular Expression (Regex) will also be taught along with how they are used in problem solving.

Topic C: Communications and Networking 2

In this topic, students will learn about computer network topologies like the Star topology, the Bus topology and the Mesh topology and how these networks are modelled. Students will learn what Client-Server architecture is and how it is used in computer networks. Students will also learn Transmission Control Protocol / Internet Protocol (TCP/IP) and its application in the Internet. Public-Key Cryptography and Private-Key Cryptography will be taught. Secured communications protocols like Secure Sockets Layer (SSL) and Transport Layer Security (TLS) will also be refreshed.

Topic D: Object-Oriented Programming

This topic builds upon the foundation from the previous stages to enhance the programming skills of students. Students will continue to apply sequential programming to solve problems. Variables like floating point, strings, images and Boolean logic, loops, nested loops and conditionals will continue to be used. Students will learn what Object-Oriented (OO) concepts are how real world problems can be modelled using OO. Students will also learn the building blocks of OO including Classes and Objects, Inheritance, and Polymorphism. OO programming languages and platform will be introduced.

A.	**Algorithms 2**
1	**Apply Well Known Algorithms and Graphs**
1.1 1.2 1.3 1.4 1.5	Recall and apply Linear and Binary Search algorithms to solve problems Recall and apply Quick Sort, Selection Sort and Bubble Sort to solve problems Recall how different Graphs like Bipartite Graphs are used to represent problems Recall and apply Maximum Flow, Minimum Cost to solve problems Recall and apply Dijkstra's Algorithm to solve problems
2	**Understand Divide and Conquer Concepts**
2.1 2.2 2.3 2.4 2.5 2.6	Understand what Divide and Conquer algorithm is Use Divide and Conquer in Recursion to solve problems Understand Factorial and Fibonacci numbers Recall the 0/1 Knapsack Problem and its applications Recall the Travelling Salesman Problem and its applications Recall and apply the Greedy algorithm to solve problems
B.	**Data Structures and Representations 2**
4	**Apply Array, Queue, Trees, FSM and Binary system**
4.1 4.2 4.3 4.4 4.5 4.6	Recall what Arrays, Lists, Trees, Queues, Graphs and Binary system are Solve problems using a combination of Arrays, Lists, Trees, Graphs and/or Binary Recall what FSMs are Solve problems using FSMs Understand what Combination is Solve problems using Permutations and Combinations
5	**Understand and Apply REGEX**
5.1 5.2 5.3 5.4 5.5 5.6	Explain what Modulo Arithmetic is Apply Modulo Arithmetic to solve problems Explain what Clusterization is Apply Clusterization to solve problems Explain what Regular Expression (REGEX) is Apply REGEX to solve problems

C	**Communications and Networking 2**
6	**Understand and Model Computer Networks**
6.1 6.2 6.3	Know the different network topologies like Bus, Star, Mesh topologies Use Graphs to represent network topologies Understand what Client-Server architecture means
7	**Understand TCP/IP and Public and Private Key Cryptography**
7.1 7.2 7.3 7.4 7.5	Know what reliable and un-reliable communications are Understand Transmission Control Protocol (TCP) Understand Internet Protocol (IP) Recall what Public-Key Cryptography is Understand what Private-Key Cryptography is
D	**Object-Oriented Programming**
8	**Program Arrays, Sorting, Searching, Loops, Boolean Logic and Recursion**
8.1 8.2 8.3 8.4	Recall how variables like floating points, strings and images are programmed Recall how Arrays, Loops, Conditionals and Functions are programmed Program Search and/or Sort Functions to solve problems Program Recursive function to solve problems
9	**Understand Object-Oriented (OO) Concepts**
9.1 9.2 9.3 9.4 9.5 9.6	Explain what Classes and Objects are Explain what Abstraction is Explain what Encapsulation is Explain what Inheritance is Explain what Polymorphism is Model real world problems using OO
10	**Know OO Programming Languages**
10.1 10.2	Install an OO Programming Language platform like Visual Basic or Java Navigate and explore the features of an OO programming platform

Module Aims

This module builds on and covers more advanced computational thinking concepts, technique and knowledge. The module empahsises on applying well-known algorithms and design like breadth-first searches, the Greedy approach, Maximum Flow, Minimum Cost, Recursion, Brute-Force and Dijkstra's algorithm in advanced problem solving. In Data Structure and Representations, students are refreshed on Modulo Arithmetic, Clusterization, Regular Expressions (Regex) and continue to apply Permutations, Binary system, Arrays, Lists, Queues, Trees, Finite State Machines (FSM) and Graphs to solve more complex problems. Students will learn Probability theory and Markov's Chain and will apply these together with Combination and Permutation to solve problems. Students will learn the basics of web protocols like Hypertext Transfer Protocol (HTTP), HTTPS and File Transfer Protocol (FTP) and will be refreshed on Public-Key and Private-Key Cryptogrpahy. In coding, more examples on modelling real world problems using Object-Oriented (OO) concepts will be introduced. An OO language and platform like Python along with Dynamic Programming will be used to solve problems.

Competition Structure

Section	Number of questions	Marks
Section A	7 CT questions	21 marks
Section B	12 Block Programming questions	72 marks
Bonus points		7 marks
Total		100 marks

Mode of competition	Duration
Online	90 mins

SECTION A:
3 marks for correct answer, 0 mark for unanswered questions, -1 mark for wrong answer

SECTION B:
6 marks for correct answer, 0 mark for unanswered or wrong answer

REFERENCE

1. Dagiene, V., Sentance, S., & Stupuriene, G. (2017). Developing a Two-Dimensional Categorization System for Educational Tasks in Informatics. Informatica (Netherlands), 28(1), 23-44. DOI: 10.15388/Informatica.2017.119.

2. Classic Computer Science Unplugged. Classic CS Unplugged

3. Computer Science Fundamentals. CS Curriculum for Grades K-5 | Code.org

4. Bebras Challenge. https://www.bebraschallenge.org/

5. Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives: Complete edition, New York : Longman. Table 5.1, pages 67-68

Special Requirements

Prerequisite:	Grade 7 & 8
Software:	Coding tools like Blockly or Microbit
Hardware:	Windows 10 or Windows 11 PC / laptop, and / or other handheld smart devices.

Table of Specifications

	Abilities (%)			
Topics	**K**	**C**	**A/HA**	**Total**
A. Algorithms 3	4	7	15	26
B. Data Structures and Representations 3	5	7	12	24
C. Computers, Communications and Networking	6	6	2	14
D. Dynamic and Object-Oriented Programming	7	7	11	25
E. Interactions and Society	4	5	2	11
Total	26	32	42	**100**

Notes:

1: The letters K, C, A and HA in the table of specifications denote the knowledge, comprehension, application and higher than application levels of Bloom's Taxonomy in the cognitive domain.

- Knowledge refers to the recalling of facts, concepts, procedures and theories.
- Comprehension refers to the ability to interpret, explain, infer, summarize, compare, classify and exemplify.
- Application refers to the ability to implement and / or execute.
- Higher than Application refers to the ability to analyze, evaluate, and create.

2: In the detailed syllabus which follows, all objectives should be understood to be prefixed by the words "At the end of instruction, the learner should be able to ...".

Content Outline

Topic A: Algorithms 3

In this topic, students will enhance their learning of algorithmic concepts to solve complex problems. Students will learn Brute-Force search and Kruskal's algorithm. A refresh of using divide-and-conquer, Graphs, Search and Sort algorithms, Greedy algorithm, DijkStra's algorithm, Recursion, Maximum Flow and Minimum Cost approaches will be done. Students will also be exposed to more complex problems relating to Optimization, the 0/1 Knapsack Problem, and the Travelling Salesman Problem.

Topic B: Data Structures and Representations 3

In this topic, students will learn Data Analytics to extract meaning from raw data using specialized computer systems. These systems transform, organize, and model the data to draw conclusions and identify patterns. In addition students will be refreshed on Graph theory. Students will continue to apply the concepts of Formal Grammar, Arrays, Lists, Queues, Finite State Machines, Trees, Modulo Arithmetic, Clusterization and Regular Expression (Regex) to solve problems. Students will also learn Probability and Markov's Chain and more applications of Combination and Permutations.

Topic C: Computers, Communications and Networking

In this topic, students will learn about common computer architecture and processes like deadlock, fetch-execute cycle, image processing and multi-threading. Students will continue in their learning of World-Wide-Web (www) communications protocols like HTTP(S) and FTP and their applications in the Internet as well as how they make us of TCP/IP. Public-Key Cryptography and Private-Key Cryptography will be refreshed. Secured communications protocols like Secure Sockets Layer (SSL) and Transport Layer Security (TLS) will also be refreshed.

Topic D: Dynamic and Object-Oriented Programming

In this topic, students will build upon the foundation from the previous stages to enhance their programming skills. Students will continue to apply Dynamic Programming to solve optimization problems. Object-Oriented (OO) concepts and how real-world problems are modelled using OO will be refreshed. Students will also learn to install and use an OO programming platform and use an OO language like Python.

Topic E: Interactions and Society

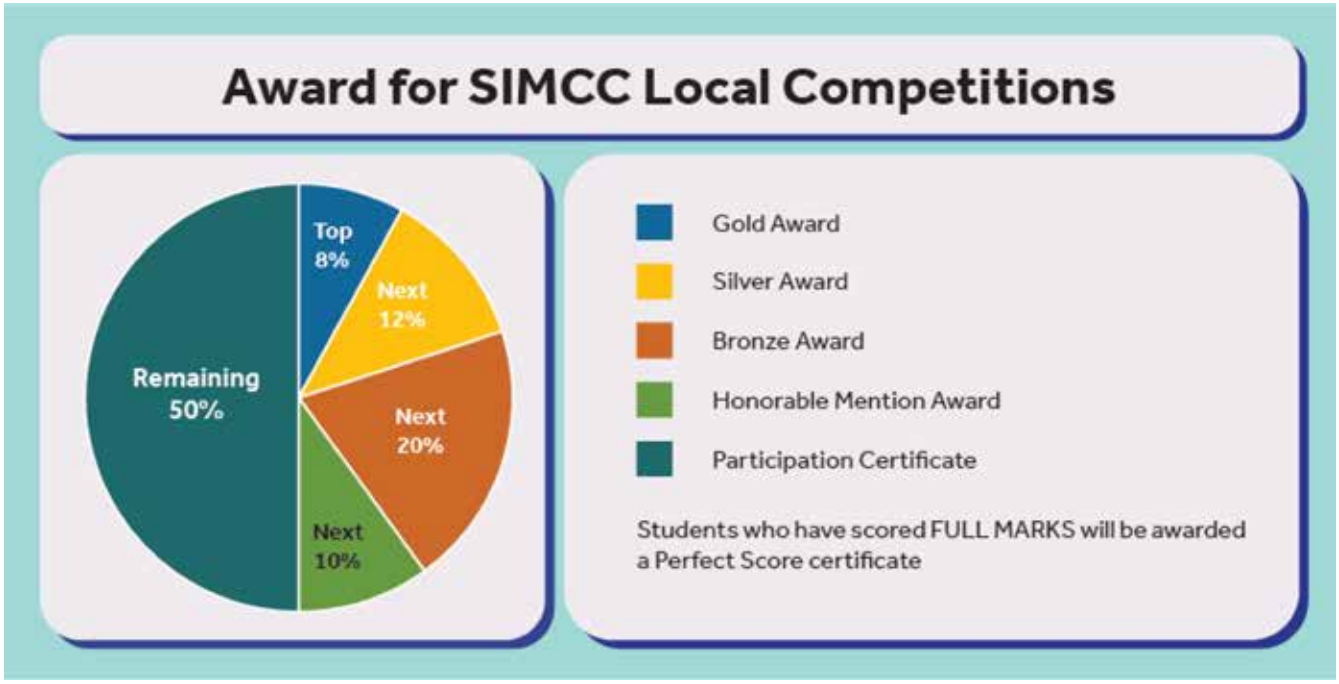
In this topic, students will be introduced to the fundamentals of Human-Computer Interaction (HCI) principles. There are four fundamental principles of HCI, these are: perception, behaviour models, descriptive modelling and those covered by Schneiderman's 8 rules. Students will also learn the social and ethical issues that may be brought about by the use of technology, like the abuse of the internet in scams, and / or infecting computers using viruses.

A.	**Algorithms 3**
1	**Apply Brute-Force Search and Kruskal's Algorithm**
1.1 1.2 1.3 1.4	Explain what Brute-Force Search is Apply Brute-Force Search to solve problems Explain what Kruskal's Algorithm is Apply Kruskal's Algorithm to solve problems
2	**Apply Algorithmic Concepts**
2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8	Recall what Divide and Conquer algorithm is Recall what Linear Search and Binary Search are Recall what Bubble Sort, Selection Sort, Quick Sort are Recall what Greedy and Dijkstra's Algorithms are Recall what Recursion, Maximum Flow and Minimum Cost approaches are Recall what the 0/1 Knapsack Problem is Recall what the Travelling Salesman Problem is Apply a combination of the above to solve complex problems
B.	**Data Structures and Representations 3**
4	**Understand Data Analytics**
4.1 4.2 4.3 4.4 4.5	Know the different types of data analytics Understand the steps used in the process of analyzing data Know the tools and skills needed for data analytics Explore one tool such as Microsoft Excel for data analytics Understand how insights can be drawn from such a tool
5	**Apply Data Structure Concepts**
5.1 5.2 5.3 5.4 5.5 5.6	Recall what Graphs are Recall what Modulo Arithmetic is Recall what Arrays, Lists, Queues, Finite State Machines are Recall what Trees are Recall what Regular Expression (REGEX) is Apply a combination of the above to solve complex problems

6	**Apply Probability, Combination and Permutation**
6.1 6.2 6.3 6.4 6.5 6.6	Explain what Probability theory is Find the probability of events Understand Markov's Chain Recall what Permutation is Recall what Combination is Apply a combination of the above to solve complex problems
C	**Computers, Communications and Networks**
7	**Understand Computer Architecture and Processes**
7.1 7.2 7.3 7.4 7.5	Know the trends in Computer Architecture design Understand the connection between microprocessor, memory and I/O Understand Operating System and Fetch-and-Execute Understand Multi-threading and Deadlock Understand how images are processed
8	**Understand Web Protocols and Cryptography**
8.1 8.2 8.3 8.4 8.5	Understand Hypertext Transfer Protocol (HTTP) and HTTPS Understand File Transfer Protocol and well-known ports Recall Transmission Control Protocol (TCP), TLS, and SSL Recall Internet Protocol (IP) Recall what Public-Key and Private-Key Cryptography are
D	**Dynamic and Object-Oriented Programming**
9	**Program Arrays, Sorting, Searching, Loops, Boolean Logic and Recursion**
9.1 9.2 9.3 9.4	Recall how variables like floating points, strings and images are programmed Recall how Arrays, Loops, Conditionals and Functions are programmed Recall how Search and/or Sort Functions are programmed Recall how Recursive function are programmed

10	**Understand Object-Oriented (OO) Concepts**
10.1 10.2 10.3 10.4 10.5 10.6	Recall what Abstraction, Encapsulation, Inheritance, Polymorphism are Model real world problems using Classes and Objects Know what OO languages and platforms there are Install an example of an OO Integrated Development Environment (IDE) Navigate through the features of the IDE Code an OO program to solve problems
E	**Interactions and Society**
11	**Know HCI Principles**
11.1 11.2	Understand the 4 principles of HCI: Perception, Behaviour, Descriptive Modelling and Schneiderman's 8 rules Know examples of good and bad HCI designs
12	**Understand Ethics and Impact on Society**
12.1	Understand the Ethical issues when using technology
12.2	Understand the impact on society relating to scams, viruses

Awards



The top 50% of the participants will receive an award certificate.

Perfect scorer, Gold, Silver and Bronze Medalists of DrCT national contest will be invited to join STEAM AHEAD to compete in the STEAM AHEAD 2024 – International Junior Informatics Olympiad (IJIO) for Grade 1 to Grade 7 and International Junior CyberSecurity Olympiad (IJCO) organized by National University of Singapore, School of Computing for Grade 8 onwards. They will have a chance to win the President's Award for Excellence in Steam Star. Students must register with the SIMCC country organizer and contest entry is available on a first come first served basis, so register as soon as possible to avoid disappointment.

Participation Awards

Schools and participants will receive the following:

1. SGD100 voucher each (up to a maximum of $5000) for Perfect Scorers.

2. Medals and Certificates for Perfect Scorers, Gold, Silver and Bronze winners (Except for countries that opt out of medal awards).

3. Personalized medals for Perfect Scorers.

4. E-certificates are also given to participants who qualify for Honorable Mention or attain Certificate of Participation.

5. All participants will receive an Online performance report which analyses their capabilities across different topics and benchmarks their performance with other participants in the same grade and country/territory.

6. For countries with 1,000 or more contestants participating in DrCT 2024, SIMCC will grant our country partners with free contest passes to select the top 6 students to represent their country at the STEAM AHEAD 2024.

*Only available if 6 or more countries qualify, for the Global Country Team Championship.

Selection for the top 6 country representatives will be selected by Country partner. These top 6 country contestants will be in the exclusive Global Country Team Championship.
There will be 3 winning teams –
1. Global Country Champion Team,
2. Global Country Runner-Up Team
3. Global Country 2nd Runner-Up Team
The winning country team will take home the President's Champion Country Trophy and each team member will get a certificate and personalised Global Country Team medal with their name engraved on it.

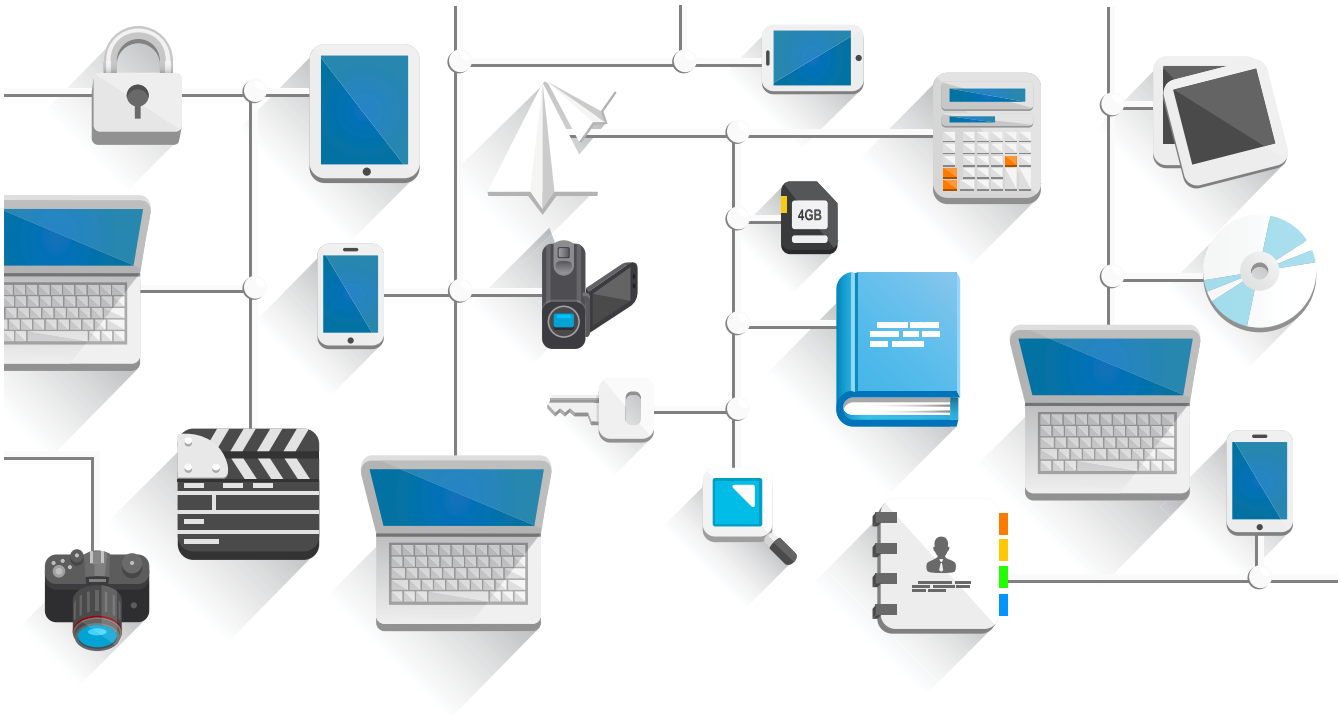
The winning team will be the Global Country team with the lowest score based on the position of the 6 team members (must be the nominated 6 and cannot change)

How Points will be calculated?
It will the global rank of the 6 Team members.

So, if the members are ranked Global Rank 1st, 3rd, 7th, 12th, 5th, and 8th, Country Team Score = 36 points,

the country with the lowest score will be declared the champion country, followed by the 2nd lowest score, and the 3rd lowest score. Each country can assign their team members from any grade level, but the grade level must have at least 50 contestants, else they will have to assign that role to another team representative at another grade level.

The winning country team will take home the President's Champion Country Trophy and each team member will get a certificate and personalised Global Country Team medal with their name engraved on it.



Sample Questions

Grades 1 - 2: Preparatory Computational Thinking

For more sample questions, visit https://form.simcc.org/lms-home/

Please register an account at our Member Development Portal (https://form.simcc.org/) to access the questions.

Grade 1, BeeBug: A bee and a bug fly together from one flower to the next one from left to right. The flowers are shown in the picture below. If the next flower is higher than the previous flower the bee increases its number by 1. If the next flower is lower than the previous one, then the bug increases its number. If they start with their numbers equal to 0, with what numbers will they end this trip ?

a) Bee – 1, Bug – 1

b) Bee – 2, Bug – 2

c) Bee – 3, Bug – 2

d) Bee – 2, Bug – 3

Answer: c

Grade 2, Swap Sorting: There are seven numbers in a row: 7 6 5 4 3 2 1. Alice wants to have the numbers written in ascending order: 1 2 3 4 5 6 7. She can swap any two numbers having another number between them. For example, she can swap 7 and 5, as there is 6 between them, but she cannot swap 7 and 6 or 7 and 4. What is the minimum number of swaps required to sort the numbers ?

a) 6

b) 7

c) 8

d) 9

Answer: d

Sample Questions

Grades 3 - 4: Computational Thinking 1

For more sample questions, visit https://form.simcc.org/lms-home/
Please register an account at our Member Development Portal (https://form.simcc.org/) to access the questions.

Grade 3, Change in the pocket: Liam is planning to go to a store to buy some candies. But he doesn't know how much he will have to pay, and he only likes paying the exact amount. Liam knows that candies can't cost more than $20. There are bills of $1, $5, and $10, as well as coins of 1c, 5c, 10c, 25c, and 50c. So Liam wants to take with him enough bills and coins to pay any price between 1c and $20, but carry as few bills and coins as possible. How many bills and coins in total will Liam have with him?

a) 13

b) 14

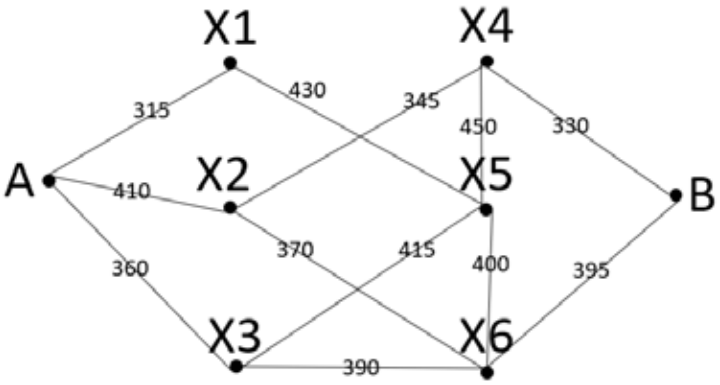
c) 15

d) 16

Answer: c

Grade 4, Go through tunnels: You own a delivery company in Switzerland where your trucks deliver goods to customers. But there are a lot of tunnels through the mountains in that country, and every tunnel has a prescribed limit (in cm) on the height of the vehicle that can go through that tunnel. Here is a map of tunnels between two cities A and B.

What is the height of the tallest truck that can go from A to B? (trucks can go using any road available if their height is smaller or equal to a tunnel height limit)



a) 410

b) 370

c) 330

d) 360

Answer: b

Sample Questions

Grades 5 - 6: Computational Thinking 2

For more sample questions, visit https://form.simcc.org/lms-home/
Please register an account at our Member Development Portal (https://form.simcc.org/) to access the questions.

Grade 5, Ascend: Kyle has the following sequence of numbers and he wants to eliminate as few of them as possible so that all remaining numbers are in increasing order. What is the fewest number of numbers he can eliminate?

5, 6, 10, 7, 19, 25, 3, 44, 24, 72, 17, 31, 5, 42, 28, 56, 69

a) 8

b) 9

c) 10

d) 11

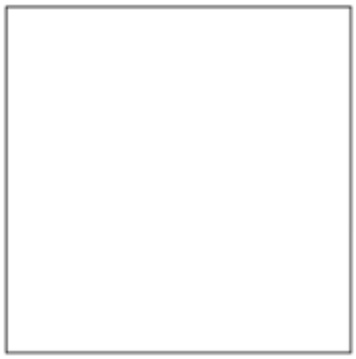
Answer: a

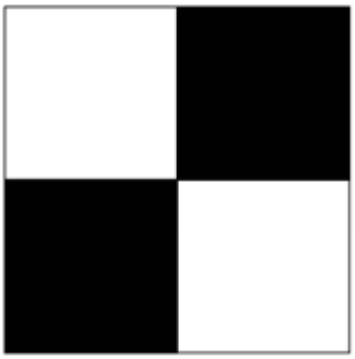
Grade 6, Painting squares: Alice has a white square. She divides it into four equal smaller squares and paints lower left and upper right squares black. She repeats this procedure to two smaller white squares, obtaining more smaller white and black squares.

A square screen is initially white. The following procedure is applied to the screen four times:

"Find all white squares on a screen, divide each of them into four smaller squares and paint left lower and right upper small squares black".

How many small white squares will be on the screen in the end? Below is the image of the screen after the first iteration.





a) 14

b) 15

c) 16

d) 17

Answer: c

Sample Questions

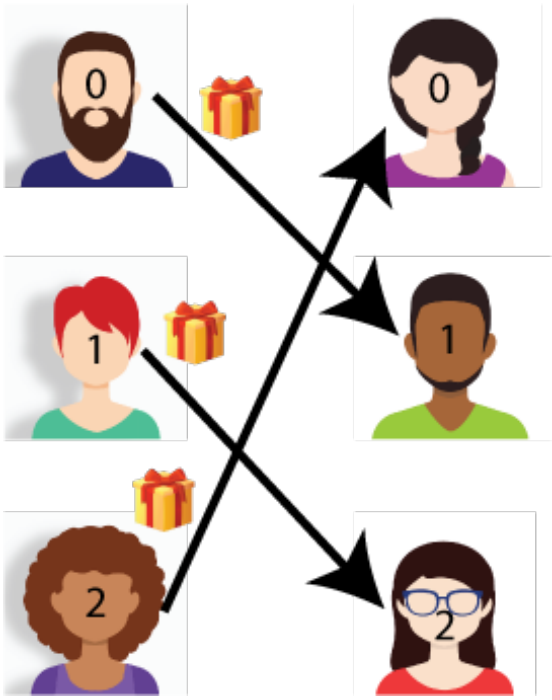
Grades 7 - 8: Programming 1

For more sample questions, visit https://form.simcc.org/lms-home/
Please register an account at our Member Development Portal (https://form.simcc.org/) to access the questions.

Grade 7, Gifts: N people, labelled 0, 1, 2, … N - 1 are exchanging gifts. Person i gives a gift to P[i].

Now, each person wants to find out whose gift he received (array Q).

For example, if P = {1, 2, 0}, then Q = {2, 0, 1}.



Explanation: 2 gave his gift to 0, 0 gave his gift to 1, 1 gave his gift to 2.

If P = {4, 1, 5, 2, 8, 9, 7, 3, 6, 0}, find Q.

a) 9, 1, 3, 7, 0, 2, 8, 6, 4, 5

b) 9, 3, 1, 0, 7, 8, 2, 6, 4, 5

c) 5, 1, 3, 7, 0, 2, 8, 6, 4, 9

d) 5, 3, 1, 0, 7, 2, 8, 6, 4, 9

Answer: a

Grade 8, log2: For example, log2(2) = 1. Since 2/2 = 1. log2(7) = 2 since 7/2 = 3.5, 3/2 = 1.5.

What is the value of log2(2020)?

a) 9

b) 10

c) 11

d) 20

Answer: b

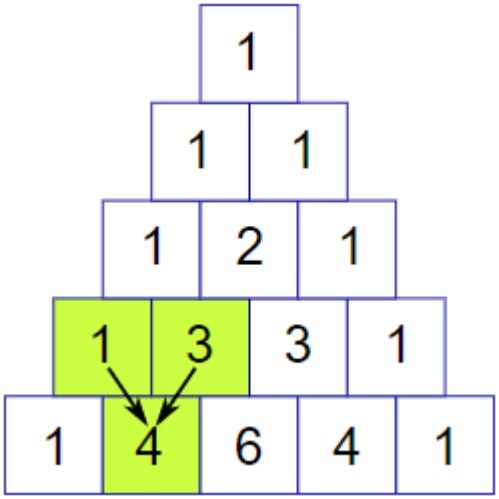
Sample Questions

Grade 9 - 10: Programming 2

For more sample questions, visit https://form.simcc.org/lms-home/
Please register an account at our Member Development Portal (https://form.simcc.org/) to access the questions.

Grade 9, Pascal: The rows of Pascal's triangle start with row n = 0 at the top (the 0th row). The entries in each row are numbered from the left beginning with k = 0 and are usually staggered relative to the numbers in the adjacent rows. For example, the number at n=4, k=1 is 4.

The triangle may be constructed in the following manner: In row 0, there is an entry of 1. Each entry of each subsequent row is constructed by adding the number above and to the left with the number above and to the right, treating blank entries as 0.



What is the number at n=12, k=5?

a) 970

b) 792

c) 972

d) 729

Answer: b

Grade 10, findnumber: I am thinking of an integer x from 1 to 100. You want to find out what x is by asking questions that go like: "is x greater than y?", where y is an integer of your choice.

What is the minimum number of questions you must ask to guarantee you can find the correct value of x?

a) 5

b) 6

c) 7

d) 8

Answer: c

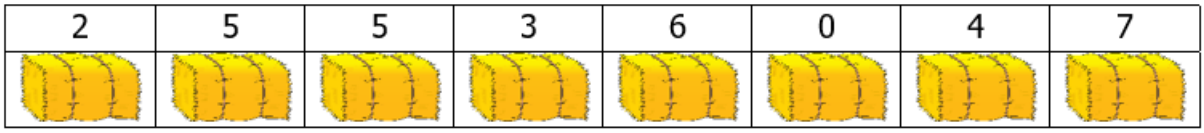
Sample Questions

Grade 11 - 12: Introduction to Algorithm Design 2

For more sample questions, visit https://form.simcc.org/lms-home/
Please register an account at our Member Development Portal (https://form.simcc.org/) to access the questions.

Haystack: There are 8 haystacks arranged from left to right, each with a certain number of haybales. We can move haybales, where each move involves shifting 1 single haybale from 1 haystack to an adjacent haystack.

How many moves are required to make it such that every haystack has the same number of haybales?



a) 8

b) 9

c) 10

d) 11

Answer: d

Meal: There is a line of 10 dishes, with weights = {9, 8, 2, 3, 7, 2, 4, 8, 5, 6} grams. What is the maximum number of consecutive dishes to eat with a total of at most 20 grams?

a) 4

b) 5

c) 6

d) 7

Answer: b

Registration Information

Competition Dates	Registration Fees	Platform Online only

Candidates outside of Singapore

Kindly check with your country partner for registration and competition details.

Refund Policy

The contest fees paid by students to the competition are non-refundable. To host the competition, our organization invests a significant amount of time and resources, not to mention the various charges incurred to process the payments and registration.

As a social enterprise, SIMCC operates with a very lean team and limited resources to keep our operating costs low in order to make our competition affordable to all students. Hence, we will not be able to offer any refunds for competition fees to students who withdraw or cancel beyond our control.

If any student has been wrongly charged by SIMCC, or we cancel an event due to reasons under our control, we will happily refund the fees paid by the students.

STEAM AHEAD

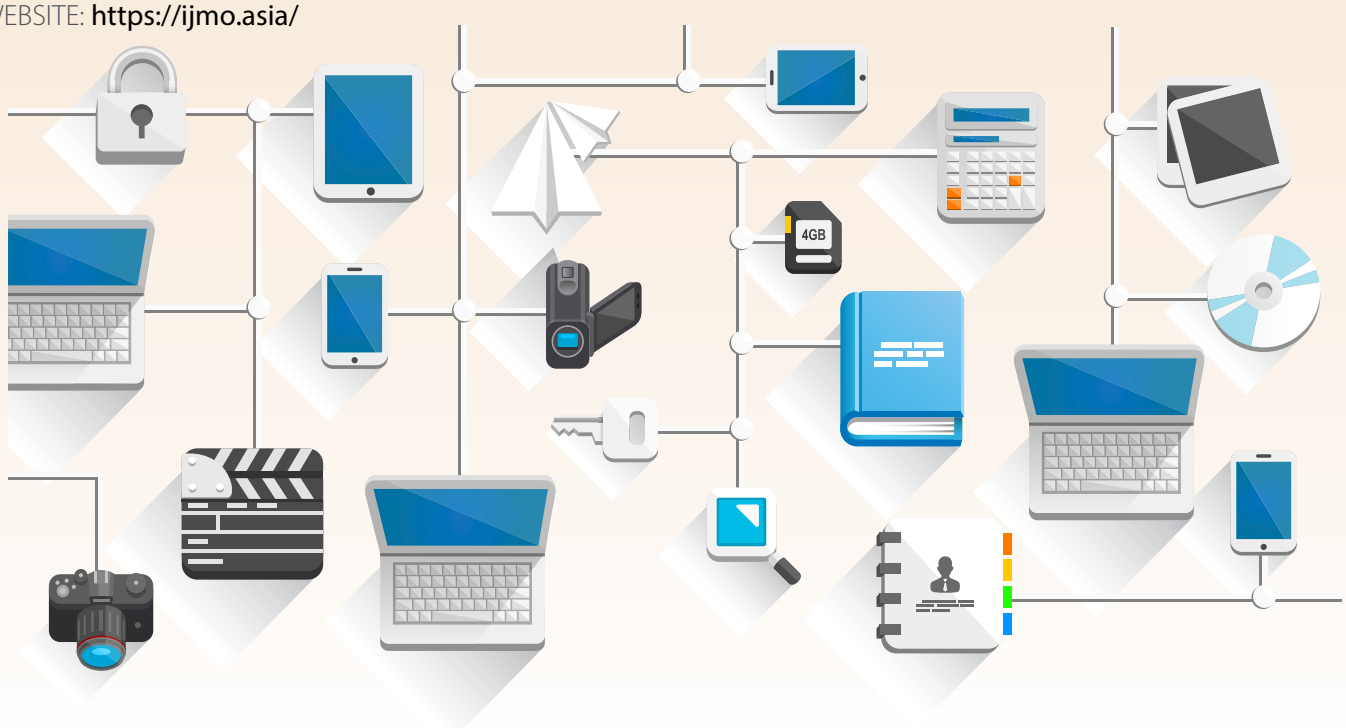
(A COMBINATION OF 4 COMPETITIONS: IJMO, VANDA SCIENCE Global Finals, **IJIO/IJCO** and SIAT Global Finals)

STEAM stands for Science, Technology, Engineering/Entrepreneurship, Arts and Mathematics. STEAM AHEAD is our initiative to combine our international academic competitions to educate students and bring them international exposure about possible career choices in these fields.

So, STEAM AHEAD offers multiple opportunities for students to win awards in IJMO, VANDA Science Global Finals**, and** Perfect scorer, Gold, Silver and Bronze Medalists of DrCT national contest will be invited to join STEAM AHEAD to compete in the STEAM AHEAD 2024 – International Junior Informatics Olympiad (IJIO) for Grade 1 to Grade 7 and International Junior CyberSecurity Olympiad (IJCO) organized by National University of Singapore, School of Computing for Grade 8 onwards**, together with SIAT Global Finals, plus Overall Champion in each grade level for IJMO, VANDA and** IJIO/IJCO**, and Triple Gold Medal winners in IJMO, VANDA,** IJIO/IJCO **and SIAT will be awarded the President's Award for Excellence in STEAM STAR (PAExS STAR) - more than 6 awards can be won! Students winning 2 gold medals in any of the STEAM AHEAD Competitions will be awarded President's Award for Excellence in STEAM (PAExS)**

Please refer to the STEAM AHEAD info pack for more details or visit our website.

WEBSITE: **https://ijmo.asia/**



Scholastic Trust (Singapore) Limited (STS) and Young Achievers Leadership Academy (YALA)

STS is a non-profit foundation that set up the International Junior Honor Society (IJHS) to recognize outstanding primary to junior college students who have won Gold awards in English, Mathematics, Science, Computational Thinking, Informatics, Digital Technologies, Arts, Music, and Cultural Competitions.

Students are exclusively invited by STS and SIMCC to join this society to pursue excellence and IJHS provides a suite of services to help them succeed. Once inducted, STS supported by SIMCC will enhance their abilities in leadership, creativity, and character building through the Young Achievers Leadership Academy (YALA) and community service activities.

The Young Achievers Leadership Academy (YALA) is a 5 days 4 nights leadership and personal development workshop conducted by Scholastic Trust (Singapore) Limited (STS).

YALA is an academic motivational camp for primary 4 to junior college 2 (Grades 4 to 12) students specially designed to cater to top students in their pursuit to reach their highest academic goals, such as cracking the admission process to the top schools and universities with scholarships.

To get inducted into IJHS, students must have 4 scholarship points or more within the previous year in our competitions (SASMO, AMO, DrCT, VANDA, SMC, SIAT, or any Ivy league math Tournament managed by SIMCC.

YALA and other scholarships are awarded to students with the highest points - from international local SIMCC competitions based on Perfect Score and Gold awards and international Global SIMCC competitions based on Individual Perfect Score, Gold, Silver and Overall Champion Individual awards. University scholarships will also require students to meet the university entrance requirements as well as receive a Gold award and above for a specific competition, such as AMO Gold award and IJHS Lifetime membership is required in order to win the Southern Illinois University (SIU) 4-year STEM undergraduate scholarship.

Singapore International
Mastery Contests Center

Email: admin@simcc.org