



STEAM AHEAD 2021

IJMO, VANDA Science, and DrCT Global Finals

INTERNATIONAL



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Overview



STEAM stands for Science, Technology, Engineering, 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 is the first to combine 3 international academic competitions in one location and offer multiple opportunities for students to win awards. (details on page)

2021 marks the third year of running STEAM AHEAD, with over 2200 students from 21 countries having participated.

The following are the awards participants can stand to win:

- 1. IJMO Math Olympiad Individual Award
- 2. VANDA Science Individual Award
- 3. VANDA Science Team Award
- 4. DrCT Individual Award
- 5. IJMO Overall Champion, Runner-up, 2nd Runner-Up in each grade level
- 6. VANDA Science Overall Champion, Runner-up, 2nd Runner-Up in each grade level
- 7. DrCT Overall Champion, Runner-up, 2nd Runner-Up in each grade level
- 8. President's Award for Excellence in STEAM (PAExS) winners in IJMO, VANDA Science Individual & DrCT Individual

IJMO, VANDA and DrCT

The top performing contestants who win all 3 Individual Gold Awards in VANDA Science Global Finals, DrCT Global Finals and IJMO will be honored with the President's Award for Excellence in STEAM (PAExS).

These contestants will be awarded a PAExS Platinum medal and certificate plus get inducted into the International Junior Honor Society (IJHS) and win a full scholarship to attend the Young Achievers Leadership Academy (YALA) 2021 online on December 11 - 12, 2021.

STEAM AHEAD 2021 is brought to you by SIMCC in collaboration with Scholastic Trust Singapore Limited and our global partners in over 35 countries and territories.

At each STEAM AHEAD event, we will start to promote linkages across the subjects so that it will upskill students and boast their interest in STEAM.

Our goal is to help our students get into professional paths that are future proof. Our society's demand for technically driven roles is rising and therefore it is crucial that students are encouraged to get qualifications in Science, Technology, and related fields. By getting qualifications that will allow students to work in innovative fields, they are guaranteed to have fulfilling and well-paid professions.





The International Junior Math Olympiad (IJMO) is an international mathematics competition which is held annually in different countries across Asia. IJMO is organised by SIMCC in collaboration with the National Math Societies in Asian countries to identify and encourage potential young math talents in every SIMCC participating country.

Objectives

IJMO aims to provide a global platform for students to interact and compete against their worthy opponents. IJMO is the ideal platform to showcase every student's potential and talent in math in the international math competitions arena!

IJMO empowers students with deep conceptual understanding and logical thinking skills beyond Grade-level. This effectively stretches every student's potential beyond Grade-level, allowing them to better apply much higher level logical and analytical skills to solve challenging Math Olympiad problems. Questions in IJMO are carefully designed to develop every student's higher level of conceptual understanding and logical thinking skills.

Pre-Requisite for the Competition

Candidate needs to obtain the following award before qualifying for IJMO:

• Gold or Silver award winners for AMO 2020, SMKC 2021, and SASMO 2021 from each country are selected annually to represent their country.



Duration: 90 minutes

Contestant starts with 20 bonus points at the start. Competition papers for each level contains 30 questions. IJMO will be hosted on our Online Contest System (OCS) (https://simccocs.org/#!/home)



Questions 11 to 20 Correct = 3, No Answer = 0, Wrong = -1 Total score: 30 points

Section C

Questions 21 to 30 Correct = 5, No Answer = 0, Wrong = 0 Total score: 50 points

Total Score: 120 points



Syllabus

IJMO reserves the rights to change the syllabus without any prior notice.

GRADES 1-4 (PRIMARY 1-4)

Arithmetic and Statistics Geometry and Mensuration Solving word problems using model method (or any other non-algebraic methods) Non-routine problem solving (including number patterns, divisibility tests, spatial visualisation, logic problems and simple cryptarithms)

GRADES 5-6 (PRIMARY 5-6)

Arithmetic and Statistics Geometry and Mensuration Solving word problems using model method (or any other methods including algebra) Non-routine problem solving (including number patterns, divisibility tests, spatial visualisation, logic problems and cryptarithms)

GRADE 7 (SECONDARY 1)

Arithmetic and Algebra Geometry, Graphs and Mensuration Statistics Non-routine problem solving (including number patterns, divisibility tests, spatial visualisation, logic problems and cryptarithms)

GRADE 8 (SECONDARY 2)

Arithmetic and Algebra Geometry, Graphs and Mensuration Pythagoras' Theorem Statistics Non-routine problem solving (including number patterns, divisibility tests, spatial visualisation, logic problems and cryptarithms)

GRADES 9-12 (SECONDARY 3-4)

Arithmetic and Algebra Geometry, Graphs and Mensuration Pythagoras' Theorem and Trigonometry Statistics and Probability Non-routine problem solving (including number patterns, divisibility tests, spatial visualisation, logic problems and cryptarithms)

Awards

IJMO Awards

Individual Awards



IJMO Overall Championship Awards

IJMO Overall Championship awards are given to the top 3 winners per grade level from grades 1 to 10/11 based on the Math Olympiad Individual Score. They will be announced during the award ceremony.

Awards (Cash)	
Overall Champion	SGD250
Overall Runner-up	SGD150
Overall 2 nd Runner-up	SGD100

In the event of any ties, we will give the winners the same position. For example, if two contestants score 90 points and the third contestant scores 87 points, we will grant 2 overall champions (with the prize money split between them, giving each S\$200) and an overall 2nd runner-up.

About VANDA Science Global Finals



Vanda is an International Science Competition held annually around the globe. It focuses on the student's ability to think critically and creatively to pick out hidden information to aid them in solving the question.

Vanda is for students from primary 3 to secondary 4 (Grade 3 to Grade 11). It follows closely with the Singapore School Science Syllabus and tests students based on their level of content that they have learned. This allows participants to do better compared to pure-Olympiad papers since they are familiar with some of the questions.

Vanda has very strong teamwork component in the competition, and the Gold-winning group will demonstrate high levels of collaboration and mutual support. These skills are highly valued and a number of our winners have gained admission into top schools by sharing their experience gained through VANDA Science Global Finals during admission interviews. Questions in the competition have a strong foundation in scientific knowledge and methodology which include the development of reasoning and analytical skills, decision and problem solving skills, flexible to respond to different context and possessing an open and inquiring mind that is willing to explore new territories and learn new things which are aligned to the desired 21st century competencies.

Objectives

IGNITE YOUR PASSION

Vanda ignites students' hidden passion for science! Vanda provides a range of interesting content in questions to spark their curiosity and encourages them to venture deeper into the world of science.

AN OPPORTUNITY FOR ALL

Vanda exposes students to a Science Olympiad Competition that follows closely to their syllabus and their level of content learned. This gives them the confidence to take part in more challenging science competitions and start scoring A* in Science.

REACHING GREATER HEIGHTS

Vanda helps students to be comfortable with various science olympiad papers in the right environment. Vanda wants students to utilize this experience to continue to take part in more challenging Science Olympiad Competitions in the future.

Pre-Requisite for the Competition

Candidate needs to obtain the following award before qualifying for VANDA Global Finals:

• Gold, Silver or Bronze award winners for VANDA International Science Competition 2021 from each country are selected annually to represent their country.

Website: https://vanda.sg/

Format

Round 1 - Written Paper (Individual)

Duration: 90 minutes Scoring: Starting Bonus = 5 points Section A = 10 points Section B = 30 points Section C = 40 points Total Score = 85 points

Round 1 will be hosted on our Online Contest System (OCS) (https://simccocs.org/#!/home)

Section A	Section B	Section C
Questions 1 to 5 2 points each 0 points for unanswered question Deduct 1 point for wrong answer	Questions 6 to 15 3 points each 0 points deducted for wrong answers and unanswered questions	Questions 16 to 25 4 points each 0 points deducted for wrong answers and unanswered questions

Total number of questions for each paper is 25.

80% of the questions are from the syllabus, with a focus on improving higher order thinking skills, development of reasoning and analytical skills, decision and problem-solving skills.

In addition to it, the competition strongly encourages possessing an open and inquiring mind that is willing to explore new territories and flexible to respond to different context to learn new things which are aligned to the desired 21st century competencies. Therefore, the remaining 20% of the questions are from out of syllabus.

Round 2 - Team Challenge

Duration: 2 hours and 30 minutes



Section A - Problem-solving questions

The team will answer free response questions based on the experiment they are presented with.

Section B - Modification questions

The team will answer questions on what modifications they will make to the experiment based on the scenario(s) given.

Section C - Design and explain

The team will design their modified experiment based on Section B and explain their modifications.

Students will be separated into teams based on their grade. The team divisions will be as follows:

Middle Primary	Upper Primary	Lower Secondary	Upper Secondary
Primary 3-4/Grades 3-4	Primary 5-6/Grades 5-6	Secondary 1-2/Grades 7-8	Secondary 3-4/ Grades 9-10/11

Within their own teams, participants will answer one paper and perform an online experiment provided to them. Participants are strongly encouraged to discuss with their team members during this component. All answers will be entered and saved on a Google Document that will be given to the team on the day of the competition. Diagrams and drawings are to be drawn in the Google Drawing links provided in their paper.

Syllabus

VANDA reserves the rights to change the syllabus without any prior notice.

GRADES 3-4 (PRIMARY 3-4)

Themes	Topics
Diversity	1. Diversity of living and non-living things (General characteristics and classification)
	2. Diversity of materials
Cycles	3. Cycles in plants and animals (Life cycles)
	4. Cycles in matter and water (Matter)
Systems	5. Plant system (Plant parts and functions)
	6. Human system
Interactions	7. Interaction of forces (Magnets)
Energy	8. Energy forms and uses (Light and heat)

GRADES 5-6 (PRIMARY 5-6)

Themes	Topics
Cycles	1. Cycles in plants and animals (Reproduction)
	2. Cycles in matter and water (matter and water)
Systems	3. Plant system
	4. Human system
	5. Cell system
	6. Electrical system
Interactions	7. Interaction of forces (Frictional force, gravitational force, force in springs)
	8. Interaction within the environment
Energy	9. Energy forms and uses (Photosynthesis)
	10. Energy conversion

GRADE 7-8 (SECONDARY 1-2)

Themes	Topics
The Scientific Endeavour	1. The Scientific Endeavour
Diversity	2. Exploring Diversity of Matter by its Physical Properties
	3. Exploring Diversity of Matter by its Chemical Composition
	4. Exploring Diversity of Matter using Separation Techniques
Models	5. Ray Model of Light
	6. Model of Cells - the Basic Unit of Life
	7. Model of Matter - The Particulate Nature of Matter
	8. Model of Matter - Atoms and Molecules
Interactions	9. Application of Forces and Transfer of Energy
	10. Transfer of Heat Energy and its Effects
	11. Chemical Changes
	12. Interactions within Ecosystems
Systems	13. Electrical Systems
	14. Human Digestive System
	15. Transport Systems in Living Things
	16. Human Sexual Reproductive System

GRADE 9 (SECONDARY 3)

Themes	Topics
Physics	I. MEASUREMENT
	1. Physical Quantities, Units and Measurement
	II. NEWTONIAN MECHANICS
	2. Kinematics
	3. Dynamics
	4. Mass, Weight and Density
	6. Pressure
	7. Energy, Work and Power
	III. THERMAL PHYSICS
	8. Kinetic Model of Matter
	9. Iransfer of Thermal Energy
Chemistry	
Chemistry	1 Experimental Chemistry
	1. Experimental chemistry
	II.ATOMIC STRUCTURE AND STOICHIOMETRY
	2. The Particulate Nature of Matter
	3. Formulae, Stoichiometry and the Mole Concept
	4. Energy Changes
	5. Electrolysis
Dialama	
BIOIOGY	1. PRINCIPLES OF BIOLOGY
	1. Cell Structure and Organisation
	2. Movement of Substances
	3. Biological Molecules
	II. MAINTENANCE AND REGULATION OF LIFE PROCESSES
	4. Nutrition in Humans
	5. Nutrition in Plants
	6. Transport in Flowering Plants
	7. Transport in Humans
	8. Respiration in Humans

GRADES 10-11 (SECONDARY 4)

Themes	Topics
Physics	I. WAVES 1. General Wave Properties 2. Light 3. Electromagnetic Spectrum 4. Sound
	 II. ELECTRICITY AND MAGNETISM 5. Static Electricity 6. Current of Electricity 7. D.C. Circuits 8. Practical Electricity 9. Magnetism and Electromagnetism
Chemistry	I.CHEMISTRY OF REACTIONS 1. Acids, Bases and Salts
	II.PERIODICITY
	2. The Periodic Table
	3. Metals
	III.ATMOSPHERE
	4. Air
	IV.ORGANIC CHEMISTRY
	5. Organic Chemistry
Biology	I. MAINTENANCE AND REGULATION OF LIFE PROCESSES
	1. Excretion in Humans
	2. Homeostasis
	II. CONTINUITY OF LIFE
	4. Reproduction
	5. Molecular Genetics
	6. Inheritance
	III. MAN AND HIS ENVIRONMENT
	7. Organisms and their Environment

VANDA Global Finals Awards

Individual Awards - Round 1 (Written Paper)



Team Awards - Round 2 (Team Challenge)

Award	
Gold award	Тор 10%
Silver award	Next 15%
Bronze award	Next 25%

VANDA Overall Championship Awards

Vanda Overall Championship awards are given to the top 3 winners per grade level from grades 3 to 10/11 based on the VANDA Individual Score (must be Gold award) and team score. They will be announced during the award ceremony.

Awards (Cash)	
Overall Champion	SGD250
Overall Runner-up	SGD150
Overall 2 nd Runner-up	SGD100

In the event of any ties, we will give the winners the same position. For example, if two contestants score 90 points and the third contestant scores 87 points, we will grant 2 overall champions (with the prize money split between them, giving each S\$200) and an overall 2nd runner-up.

About DrCT Global Final (DESIGN THINKING with robotics and COMPUTATIONAL THINKING GLOBAL FINAL)



We are delighted to bring you, Design Thinking with robotics and Computational Thinking Global Finals (DrCT). We are the team that brought BEBRAS Computational Thinking to Singapore and now offer BEBRAS as a free training platform for all students in Singapore joining DrCT. BEBRAS is the world's leading community which develops CT questions for schools.

We invite you to sign up for DrCT and open the doors to free CT training using our internationally acclaimed BEBRAS tasks and breaking down problems solving, analysing the validity of solutions and spotting patterns in data - all essential skills for the workplace.

We hope to create a platform that can allow the neighbourhood schools' students to have an opportunity to learn about informatics in a more creative way and compete with the rest of the world. Using Computational Thinking also allows the students to have a systematic approach to learn programming and our methodology of combining design thinking and robotics will provide an intuitive first introduction to programming, as well as infinite opportunities for gradually building more advanced projects using an electronics platform fulfilling a standard loved and tested by millions of people who use informatics for real-world application projects across the globe.

DrCT will get students to improve in Coding and Programming and help them to prepare for the National Olympiad in Informatics (NOI), the highest national contest for Informatics in all countries before the best 4 students are selected to represent their country for the International Olympiad in Informatics (IOI).

Objectives

To cultivate students' creativity, logical reasoning ability, algorithmic and computational thinking skills. By solving our contest tasks and using design thinking methodology to develop solutions for a problem statement, we will facilitate a deeper understanding of the world around the learner and enable them to solve everyday problems by leveraging the power of computers and information technology. Students will pick up the finer points of programming, solution focus and be action oriented which is not merely writing a piece of code but involves useful algorithmic techniques and problem-solving skills.

Pre-Requisite for the Competition

Candidate needs to obtain the following award before qualifying for DrCT Global Finals:

• Gold, Silver or Bronze award winners for DrCT International Local 2021 from each country are selected annually to represent their country.

Format

DrCT Global Finals (Individual Round)

DrCT Global Finals (Individual Round) will be hosted on our Online Contest System (OCS) (https://-simccocs.org/#!/home)

Lower Primary Division - Primary 1-2/Grades 1-2

18 Questions (Total: 57 marks, base point of 5 marks)

Section A	Section B	Section C
5 CT Questions	10 Block Programming Questions	3 NOI Questions
2 marks each	3 marks each	4 marks each
0 points for unanswered questions	0 points for unanswered questions	0 points for unanswered questions
-1 point for wrong answers	and wrong answers	and wrong answers

Middle Primary Division - Primary 3-4/Grades 3-4

20 Questions (Total: 64 marks, base point of 6 marks)

Section A	Section B	Section C
6 CT Questions	10 Block Programming Questions	4 NOI Questions
2 marks each	3 marks each	4 marks each
0 points for unanswered questions	0 points for unanswered questions	0 points for unanswered questions
-1 point for wrong answers	and wrong answers	and wrong answers

Upper Primary Division - Primary 5-6/Grades 5-6

24 Questions (Total: 77 marks, base point of 7 marks)

Section A	Section B	Section C
7 CT Questions	12 Block Programming Questions	5 NOI Questions
2 marks each	3 marks each	4 marks each
0 points for unanswered questions	0 points for unanswered questions	0 points for unanswered questions
-1 point for wrong answers	and wrong answers	and wrong answers

Sample CT Question: https://simccocs.org/#!/training/5FBE09CC-89B0-FD22-9429-52FC1CBA0102/DrCTFinal

Lower Secondary Division - Secondary 1-2/Grades 7-8

24 Questions (Total: 78 marks, base point of 6 marks)

Section A	Section B	Section C
6 CT Questions	12 Block Programming Questions	6 NOI Questions
2 marks each	3 marks each	4 marks each
0 points for unanswered questions	0 points for unanswered questions	0 points for unanswered questions
-1 point for wrong answers	and wrong answers	and wrong answers

Upper Secondary Division - Secondary 3-4/Grades 9-10

24 Questions (Total: 79 marks, base point of 3 marks)

Section A	Section B	Section C

3 CT Questions 2 marks each 0 points for unanswered questions -1 point for wrong answers

14 Block Programming Questions 3 marks each 0 points for unanswered questions and wrong answers

7 NOI Questions 4 marks each 0 points for unanswered questions and wrong answers

Sample CT Question: https://simccocs.org/#!/training/5FBE09CC-89B0-FD22-9429-52FC1CBA0102/DrCTFinal

Syllabus

DrCT reserves the rights to change the syllabus without any prior notice.

The syllabus for all grades will include all topics from previous grades. (e.g. Primary 5-6/Grades 5-6 syllabus includes topics from Primary 1-2/Grades 1-2 and Primary 3-4/Grades 3-4.)

PRIMARY 1-2/GRADES 1-2 (PREPARATORY COMPUTATIONAL THINKING)

- Pattern recognition
- Sequencing
- Loops
- Binary representation of numbers
- Representation of text and images

PRIMARY 3-4/GRADES 3-4 (COMPUTATIONAL THINKING 1)

- Debugging
- Conditionals
- Variables
- Functions

PRIMARY 5-6/GRADES 5-6 (COMPUTATIONAL THINKING 2)

- For Loops
- While Loops
- Nesting code
- Sorting
- Searching

SECONDARY 1-2/GRADES 7-8 (PROGRAMMING 1)

- Introduction to input and output, lists, Strings, and iteration
- Creating and accessing variables for storing and manipulating data
- Making simple decisions with conditions like if-then-else statements
- Repeating instructions through loops like the while statements
- Using simple functions
- Principle of Algorithms and Abstraction

SECONDARY 3 - JC 2/GRADES 9/10/11/12 (PROGRAMMING 2)

- Data structure
- Modularity
- Analysis
- Divide and conquer: Search
- Divide and conquer: Sorting
- Principle of Decomposition and Patterns

DrCT Global Finals Awards

Individual Awards - Written Paper



DrCT Overall Championship Awards

DrCT Overall Championship awards are given to the top 3 winners per grade level from grades 2 to 10/11 based on the DrCT Individual Score (must be Gold award) and team score. They will be announced during the award ceremony.

Awards (Cash) *Lower cash prizes due to low number of contestants in DrCT local and global round in 2021		
Overall Champion	SGD100	
Overall Runner-up	SGD50	
Overall 2 nd Runner-up	SGD25	

In the event of any ties, we will give the winners the same position. For example, if two contestants score 90 points and the third contestant scores 87 points, we will grant 2 overall champions (with the prize money split between them, giving each S\$75) and an overall 2nd runner-up.

Overall Champion Awards - President's Award for Excellence in STEAM (PAExS) and Award Badges

PAExS awards are given to the top winner from each grade who has scored the highest across all individual competition categories (IJMO, Vanda Global Finals - Individual and DrCT - Individual).

For Grades 3 to 10/11 (1 winner per grade)



- Trophy
- Certificate
- IJHS induction
- YALA Platinum Scholarship (for grades 5 and above worth \$520)
- PAExS Medal with winner's name and grade

Schedule Overview

* All timings above are in Singapore time

There will be 2 sessions for Day 1:

Session 1: starts at 10.20am (Singapore time) Session 2: starts at 7.30pm (Singapore time)

Participants will only need to report for the competitions they are taking part in. For e.g., if a participant is only participating for IJMO, they do not need to stay for VANDA Global Finals. Similarly, if a participant is only participating in DrCT, they do not need to report for Day 1.

SIMCC will assign you a session to attend based on your timezone. Kindly take note that all timings in the schedule are according to Singapore timezone.

Session 1	Session 2
All participating countries not listed in Session 2	Azerbaijan Brazil Bulgaria Egypt Ghana Iran Mexico Turkey Canada Nigeria Tunisia USA

SIMCC reserves the rights to make changes to the schedule without prior notification.

Day 1 (IJMO and VANDA)

Session 1

Activity	Session 1	Duration (minutes)	
Registration for IJMO	10:20 AM	30	
Opening speech by Henry Ong and VIP	10:50 AM	10	
Speech by Dr Haksun Li			
Launch of High School Data Science Competition and Open Data Science	11:00 AM	15	
Competition in 2022 by NM Dev and SIMCC			
IJMO rules and instructions	11:15 AM	30	
Start of IJMO	11:45 AM	90	
End of IJMO	1:15 PM	135	
Registration for VANDA Round 1 (Individual)	3:30 PM	30	
Briefing for VANDA Round 1 (Individual)	4:00 PM	30	
Start of VANDA Round 1 (Individual)	4:30 PM	90	
End of VANDA Round 1 (Individual) / Break for dinner (Session 1)	6:00 PM	60	
Registration for VANDA Round 2 (Team) (Session 1)	7:00 PM	30	
Briefing for VANDA Round 2 (Team)	7:30 PM	30	
Start of VANDA Round 2 (Team)	8:00 PM	150	
End of VANDA Round 2 (Team)	10:30 PM	150	
End of Steam Ahead Day 1			

Session 2

Activity	Session 2	Duration (minutes)	
Registration for VANDA Round 2 (Team) (Session 2)	7:00 PM	30	
Briefing for VANDA Round 2 (Team)	7:30 PM	30	
Start of VANDA Round 2 (Team)	8:00 PM	150	
End of VANDA Round 2 (Team) / Break for Round 1	10:30 PM	45	
Registration for VANDA Round 1 (Individual)	11:15 PM	15	
Briefing for VANDA Round 1 (Individual)	11:30 PM	30	
Start of VANDA Round 1 (Individual)	12:00 AM	90	
End of VANDA / Break for IJMO	1:30 AM	60	
Registration for IJMO	2:30 AM	30	
Opening speech by Henry Ong and VIP	3:00 AM	10	
IJMO rules and instructions	3:10 AM	30	
Start of IJMO	3:40 AM	00	
End of IJMO	5:10 AM	90	
End of Steam Ahead Day 1			

Day 2 (DrCT)

Session 1

Activity	Session 1	Duration (minutes)
Registration for DrCT	7:30 PM	15
Briefing for DrCT	7:45 PM	30
Start of DrCT	8:15 PM	90
End of DrCT	9:45 PM	60
End of Steam Ahead Day 2		

Registration Information

Where to Register

Kindly check with your country partner for registration details.

Registration Fees

Kindly check with your country partner for information on fees and payment details.

About STEAM AHEAD training

Kindly check with your country partner for training information

Award Ceremony and Results Announcement

Results for all components will be announced during the STEAM AHEAD Award Ceremony on 19 December 2021, at 7.15pm Singapore Time.

Timeline



