





- G. Preliminary Experiment Data Analysis
- H. Analytical Derivation of Theoretical Model
- I. Computational/Numerical Solution of Theoretical Model
- J. Design of Main Experiment
- K. Construction of Main Experiment
- L. Calibration/Testing of Instrumentation
- M. Main Experiment Data Collection
- N. Development of Data Analysis Techniques (i.e. data processing algorithm and protocol)
- O. Main Experiment Data Analysis
- P. Presentation Slide Making
- Q. Graphs in Presentation
- R. Media and Animation in Presentation (e.g. photo/video editing, 3D rendering etc.)

All 18 Contribution Categories are weighted equally.

For each of the Contribution Categories, if there is one contributor, write his/her name.

If instead there are multiple contributors, please follow the following format:

Name 1 (70/100), Name 2 (20/100), Name 3 (10/100). Where (–/100) indicates the **Relative Contribution** of each contributor.

Students should reach a consensus with their collaborators regarding the Relative Contributions. Each student should keep a record of their Relative Contribution to each problem and should verify after the ranking breakdown is made public.

In case of a dispute, an investigation will be initiated by the CaYPT Committee. If a student is found to have intentionally misreported another student's Relative Contributions, disciplinary actions will be taken. Such an offence will result in one's disqualification from the current Individual Selection process and may result in one's permanent disqualification from future CaYPT competitions.

## 2.4. Academic Integrity

Academic integrity is an important matter and should be taken seriously. Possible academic integrity offences include plagiarism and falsification.

**Plagiarism may include but is not limited to:**

- A. Inadequate citations
- B. Submitting reports made in whole or in part by someone else as your own
- C. Buying or selling any part of the report

**Falsification may include but is not limited to:**

- A. Fabricating data
- B. Altering data to match expectations

**Sanctions for committing an academic integrity offence may include one or multiple of the following:**

- A. Disqualification from the current Individual Selection process
- B. Limited disqualification from future CaYPT competitions
- C. Permanent disqualification from future CaYPT competitions
- D. Letter to team leader about the incident
- E. Letter to school about the incident

All sanctions related to academic integrity will be determined by a disciplinary committee consisting of four CaYPT Committee members and one independent advisor with a degree in physics.

### 3. Ranking Calculation

#### 3.1. Definition of Parameters

**Unnormalized Report Score (urs):** The raw score given to a report submission based on IYPT report standard.  $[0,10]$

**Number of Submitted Report ( $N_i$ ):** The number of report submissions received for the particular problem  $i$ .

**Minimum Unnormalized Score Cutoff (MUSC):** The minimum Report Score (rs) a problem need to received to be considered for subsequent calculations. This parameter is different for CaYPT and IYPT Only problems.  $[0,10]$

**Report Score (rs):** Best report on a problem gets 10. Other reports graded relative to the best report. This is referred to as normalization. One Report Score given per report submitted.  $[0,10]$

**Relative Contribution (rc):** Contribution of a student in a Contribution Category for one CaYPT problem.  $[0,100]$

**Contribution Coefficient (c):** Sum of a student's Relative Contributions (rc) for one CaYPT Problem normalized.  $[0,1]$

**Student Score (s):** Product of Contribution Coefficient and Report Score for each CaYPT Problem summed overall problems.  $[0,100]$

#### 3.2. Formulae

**Minimum Unnormalized Score Cutoff (MUSC):**

For CaYPT Problems the MUSC is a constant of 2. This means that if a report receives a raw score less than 2, it will not be considered for subsequent calculations.

For IYPT Only Problems the MUSC is a function of the number of reports submitted for the particular problem. The formula is given by

$$MUSC_i = 5 - 0.5N_i \quad (1)$$

**Contribution Coefficient(c)**

$$c = \frac{1}{1800} \sum_{n=1}^{18} rc_n \quad (2)$$

where  $rc_n$  represents the Relative Contribution (rc) of a student in the  $n = 18$  Contribution Categories.

**Student Score (s)**

$$s = \sum_i \max\{(rs_i)(c_i)\} \quad (3)$$

If a student contributed to multiple submission of the same report the maximum of the product of the  $rs$  and  $c$  for the report is used in the calculation. This means that a student can only receive credit once for one problem. The summation over the index  $i$  indicates summation over all the problems that the student contributed to.

In case of a tie, the student who contributed to more rarer problems is ranked on top. The Rariness of a problem is determined by the number of report submissions received ( $N_i$ ). To compute the Rariness of a student's set of problems, the Rariness of a student's contributed problems is averaged.

### 3.3. Calculated Example

Jim is a student of CaYPT 202X. He did CaYPT 202X Problem A and J. In addition, he did IYPT Only problem by himself. He is in a school with two teams team Alpha and team Beta. He is part of team Alpha and he helped team Beta with their version of the Problem A report.

The relative contributions are as follows:

Problem A (Team Alpha):

$$c_{A_\alpha} = \frac{1}{1800} \sum_{n=1}^{18} rc_n = \frac{1200}{1800} \quad (4)$$

Problem A (Team Beta):

$$c_{A_\beta} = \frac{1}{1800} \sum_{n=1}^{18} rc_n = \frac{900}{1800} \quad (5)$$

Problem J (Team Alpha):

$$c_J = \frac{1}{1800} \sum_{n=1}^{18} rc_n = \frac{1500}{1800} \quad (6)$$

Problem 8 (IYPT) (Team Alpha):

$$c_8 = \frac{1}{1800} \sum_{n=1}^{18} rc_n = \frac{1800}{1800} \quad (7)$$

After all the reports are collected, the CaYPT committee found that there are 3 additional submissions for IYPT Only Problem 8. (So in total 4 submissions). According to the MUSC formula the MUSC for IYPT Only Problem 8 is:

$$\text{MUSC}_8 = 5 - 0.5(N_8) = 5 - 0.5(4) = 3$$

After the reports are graded. The Team Alpha version of Problem A received a (unnormalized) score of 4. The Team Beta version of Problem A received a (unnormalized) score of 2.5. The best Problem A report received an unnormalized score of 5.

Problem J received an unnormalized score of 4. The best Problem J report received an unnormalized score of 7.

IYPT Only Problem 8 received an (unnormalized score) of 2.5.

First let's perform the normalization process:

Jim's Team Alpha version of Problem A gets a normalized score of  $(4)\frac{10}{6} = 6.6667$ .

Jim's Team Beta Version of Problem B gets a normalized score of  $(2.5)\frac{10}{6} = 4.1667$ .

Jim's Problem J gets a normalized score of  $(4)\frac{10}{7} = 5.7143$ .

Jim's submission of IYPT Only Problem 8 is not factored into the calculation since his report of this problem received an unnormalized score of 2. This is less than the MUSC of this problem.

Now we compute Jim's Student Score (s). There are two version of Problem A. We compute the product of the  $rs$  and  $c$  and take the max.

The Team Alpha version is  $\frac{1200}{1800}(6.6667) = 4.4445$

The Team Beta version is  $\frac{900}{1800}(4.1667) = 2.0834$

So we take the Team Alpha version for future calculations.

For problem J, we get that  $\frac{1500}{1800}(5.7143) = 4.7619$

Thus computing Jim's Student Score (s) we get that

$$s = 4.4445 + 4.7619 = 9.2064 \tag{8}$$

All calculations are exact. Rounding made for display purposes only.

## 4. National Camp

### 4.1. Date and Location

The National Camp will run from the beginning of May to the end of June. The exact date will vary from year to year. Students will work in a student-run lab space of one of our generous sponsors. The lab is located in the Greater Toronto Area.

Students from outside of the GTA will work remotely under the supervision of the CaYPT National Camp

supervisor and local supervisors. Tasks will focus on theoretical and computational investigation of the problems. If the student wishes to perform experiments, he/she must own local supervisor before participating in the National Camp training. The CaYPT committee could offer additional financial support for experimental projects by non GTA-based students.

## 4.2. Workload Expectations

Admitted students will work on 4-7 additional problems to prepare for the IYPT.

Students in the national camp will be coached by IYPT team leader/ juror and past IYPT participants during this final preparation stage. Students will also refine their completed problems to meet international standards.

Students will attend 2 weekly meetings each approximately 2 hours in length and spend a minimum of 12 hours per week doing lab work. They will also be given the opportunity to practice their presentation skills extensively.

Each CaYPT National Camp Member will be asked to keep a detailed record of their work. Near or after the end of the training, student will be asked to contribute to the CaYPT SOP Project.

## 4.3. Material Fee

Each student that participates in the CaYPT National Camp will pay a material fee of approximately \$970 to fund the completion of the IYPT problems and the operation of the camp. All camp supervisors are volunteers, The material fee will not go towards personnel costs. The material fee can be paid to STEM Fellowship as a charitable donation. A receipt will be provided on request and can be used for tax purposes.

The material fee is proposed by the supervisors of the National Camp and approved by the CaYPT Committee.

The material fee may be used for the following purposes:

- A. Purchasing materials needed to complete the IYPT problems
- B. Purchasing tools and equipment used in the National Camp
- C. Paying for software or subscription-based services need to complete the IYPT problems
- D. Paying for services offered by a third party. This may include but is not limited to:
  - (a) Engineering design
  - (b) Manufacturing
  - (c) Custom software development
- E. Purchasing books, scholarly articles or academic journal subscriptions
- F. Improving the information and computational infrastructure of the laboratory
- G. Improving the living and working condition of the laboratory

Usage of the material fee for additional purposes must be approved by the CaYPT Committee. A detailed financial record of the CaYPT National Camp will be kept and may be released by request.

## 4.4. Location Considerations

Qualified students who are not in the Greater Toronto Area are still required to pay the material fee. The student will be given an allowance to purchase material, equipment, services locally.

After the conclusion of CaYPT National Camp, the purchased equipment and material can be managed in one of two ways:

1. Equipment and material can be kept in the student's school with the permission of school administrators. A student from the school will be named a CaYPT School Coordinator He/she is responsible for managing the equipment assets and will coordinate future team preparation and participation.
2. Equipment and material can be shipped to Toronto. Shipping cost will be reimbursed by the CaYPT Committee.

## 5. National Team and Observers

### 5.1. IYPT Team Member

The 5 best performing students in the National Camp will form the Canadian Team. Student performance is determined by the combination of the following performance metrics:

1. National camp entrance theory exam (15%)  
A comprehensive open book exam covering topics in Math, Classical Mechanics, Electromagnetism, Thermodynamics, Fluid Dynamics, Optics, Electronics and Computational Methods
2. Attendance of meetings and lab work time (15%)
3. Final report (60%)
4. Mandatory SOP contribution (10%)
5. Training and additional SOP bonus (5%)

Exact grading scheme is subjected to change.

### 5.2. IYPT Observer

Up to 5 students will be invited to join the team as Observers. Observers do not actively compete, but they are free to watch any Physics Fights of the IYPT. This is an excellent learning opportunity for younger students.

## 6. IYPT Participation

Team members, observers, Team Leader and Team Leader Juror form the Canadian delegation for IYPT. Each participant is responsible for their own cost of travel and the cost of participation.



The decision for Canada to participate in a year's IYPT will be made in the month of May of that year. The National Camp runs with the assumption of IYPT participation. However, the CaYPT Committee reserves the right to make the final decision about IYPT participation.

If opportunities permit, camp participants who are not participating in the IYPT may be eligible to participate in an online version of an IYPT-styled tournament.

## 7. Status of the IYPT Team Canada Selection Process

The regulations are established by the COC and may be changed only by the COC.

*Accepted on Nov 13th, 2022*

