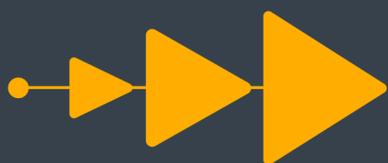




SCIENCEONTOURNE.COM

Science on tour<sup>o</sup>!



28<sup>th</sup>

INTERCOLLEGIATE SCIENTIFIC COMPETITION

# DOUBLE SENS



PRESENTED BY



CENTRE DE DÉMONSTRATION EN SCIENCES PHYSIQUES

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## YOUR CHALLENGE

Build a device capable of performing a round trip using exclusively potential gravitational energy



## HOW CAN I PARTICIPATE?

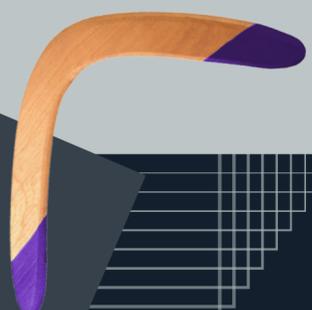
- Form your team (three participants maximum) within your college.
- All members of the team must be registered at the same college, as that is the institution they will represent should they qualify for the national final. A student can neither be part of more than one team nor present more than one device. Team members cannot be substituted from the local final to the national final.
- Direct yourself to Student Services at your college for the name of the person responsible for acquiring more information about the competition. This person will be available to give you further guidance, from who to see within the college as to when the local final will take place.
- Participating teams must assign an original name to their device. This name cannot be changed between the local final and the national final. Trademarks are prohibited.

### PROFESSIONAL CATEGORY

This category is intended for all students of public and private colleges of Quebec, registered full-time or part-time in regular or continuing education in any recognized program.

### AMATEUR CATEGORY

This category is intended for all support staff, technicians, or faculty members of public and private colleges in Quebec.



# LOCAL FINALS

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**JANUARY 15 TO APRIL 10, 2020**

Each college will organize its own local final during which the teams will compete against each other in their respective category. For the local final, the colleges are responsible for the assessment of the performance of the teams.

The nature of the prizes awarded to the winners of the local finals remains at the discretion of the colleges. The winning team from each establishment is invited to the national final (only one team per college for each of the categories).

## THE NATIONAL FINAL

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**MAY 1 - 2, 2020 AT CÉGEP LIMOILLOU, QUEBEC CITY**

The national final brings together the winning teams from each college in the Professional and Amateur categories.

The public is invited to attend.



**MORE THAN  
\$25,000  
IN PRIZES  
TO WIN!**



## 1 › THE CHALLENGE

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Build a device capable of performing a round trip using exclusively potential gravitational energy.

## 2 › SCORING

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$$P = \frac{D_{go} + (D_{return})^2}{t_{go}} + 1$$

- 2.1.  $D_{go}$  corresponds to the distance between the starting line and the transition line measured in centimeters. The transition line must be placed at a minimum distance of 50 cm and at a maximum distance of 300 cm from the starting line.
- 2.2.  $D_{return}$  corresponds to the shortest distance between the transition line and the position of the device upon its return. It is measured in centimeters perpendicular to the transition line and is at most equivalent to  $D_{go}$ . For a value to be assigned to  $D_{return}$ , the device must completely cross the transition line.
- 2.3.  $t_{go}$  corresponds to the time taken by the device to cover the distance between the start line and the transition line to go. It is measured in seconds with an accuracy of 0.1 seconds.
- 2.4. If the apparatus crosses the entire start line but does not completely cross the transition line, the score ( $P$ ) will be 1.
- 2.5. If the apparatus does not cross the entire start line on the outward journey, the score ( $P$ ) will be zero.
- 2.6. In the event of a tie, the device with the lowest mass will be favored in the standings.

## SECURITY

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Wearing protective equipment such as glasses and gloves is strongly recommended during the construction and operation of your device during both the local and national finals.

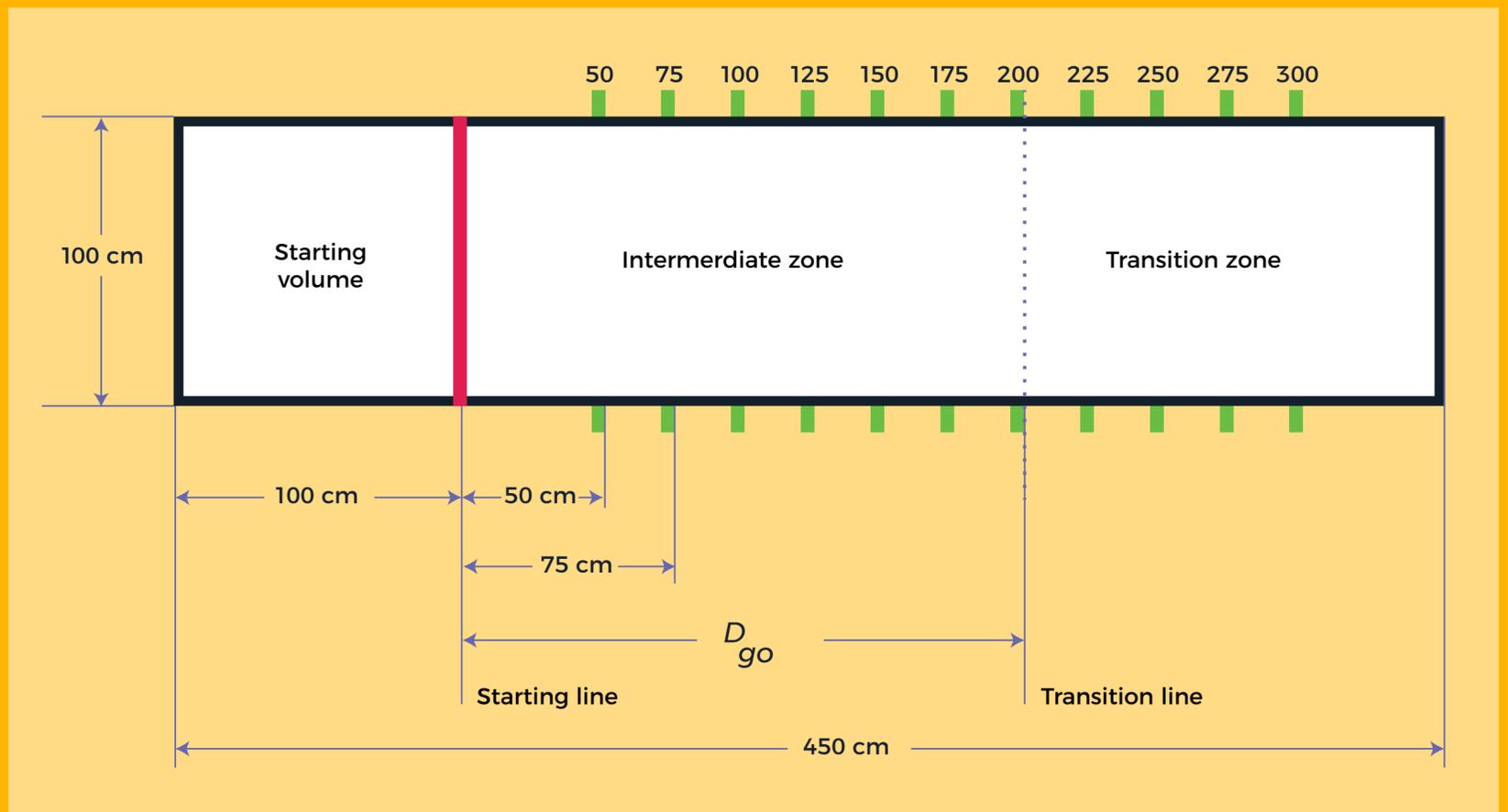
## QUESTIONS

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The responses published in the “Frequently Asked Questions” section of our website provide additional information regarding the compliance of a device. If any questions remain after reading this section, please ask them via the [scienceontourne.com](https://www.scienceontourne.com) website.

## 3 › PLAYING AREA

The playing area consists of the starting volume, the intermediate zone and the transition zone.



- 3.1.** The play area is rectangular and measures 450 cm long x 100 cm wide. It is delimited by a white adhesive tape on the surface being used. During the national final, the surface will consist of laminate floating floors. It is part of the challenge to adapt to the type of surface used in the national final. Note that the space available outside the play area is not known.
- 3.2.** The starting volume for the device measures 100 cm long x 100 cm wide x 200 cm high and is indicated by an adhesive tape stuck to the surface being used. A red strip of tape will indicate the start line.
- 3.3.** The intermediate zone is delimited by the starting line and the outer edge of the transition line. The position of the transition line is chosen by the team from the following possibilities: the first transition line is located at a distance of 50 cm from the starting line and the subsequent lines are at regular intervals of 25 cm, and this, up to the maximum distance of 300 cm from the starting line. During the national final, strips of green adhesive tape identifying the possible transition lines will be stuck outside the playing area. A laser square aligned on the outside of the strips of green adhesive tape will mark on the ground the transition line chosen by the team.
- 3.4.** The transition zone has a variable length depending on the transition line chosen by the team. For example, when the transition line chosen is that located 300 cm from the starting line, the dimensions of the transition zone are 50 cm long x 100 cm wide.

## 4 › DEFINITIONS

**The device :** consists of everything in the starting volume at the start of an official test which leaves after the start-up action.

**The launching device :** consists of everything that remains in contact with the ground inside the starting volume for the entire duration of an official test.

## 5 › REGULATIONS

**A team may be disqualified, lose a try, or be at risk of being stopped by the referee for the current trial if it violates any of the following rules.**

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- 5.1.** Only the potential gravitational energy already present in the vehicle or in the launching device before the start-up action may be used for the movement of the vehicle. Thereafter, the gravitational potential energy can be converted into other forms of energy (mechanical, electrical, etc...).
- 5.2.** Other sources of energy may be used for functions other than that of moving the device.
- 5.3.** For safety reasons, combustion and lithium batteries are prohibited.
- 5.4.** The combined mass of the vehicle and the launching device must not exceed  $(4.50 \pm 0.01)$  kg.
- 5.5.** At the start of an official test, the vehicle, the launching device, and the start-up tool (if placed in the starting volume) must be entirely inside the starting volume and must be stationary.
- 5.6.** The starting of the device must be carried out with a single action and with one hand. The use of a tool is permitted for start-up.
- 5.7.** The energy supplied by the start-up action must not be used to move the device.
- 5.8.** Once the start-up action has been carried out, the device must be autonomous.
- 5.9.** Neither the device nor the launching device may separate into several pieces during the official tests.
- 5.10.** Outside the starting volume, the apparatus must, at all times, have at least one point of contact with the ground and all points of contact with the ground must remain entirely within the limits of the area demarked by the game course. In the event of that the device leaves the game zone, the official test will be stopped and the points accumulated before the end of the test will be counted according to the following rules :
  - 5.10.1.** If the apparatus crosses the entire transition line to go without going outside the limits of the playing area, a value will be assigned to  $D_{go}$  as well as  $t_{go}$ .
  - 5.10.2.** If the apparatus leaves the playing area or the team terminates the official test before the immobilization of the apparatus,  $D_{return}$  will take the value of zero.
- 5.11.** The operation of the apparatus must not present any danger or risk to damaging the game area and the competition premises.
- 5.12.** The device, the launching device, the tools and the rest of the technical equipment must be contained in one or two boxes such as those which can contain 5000 sheets of 8 ½ "x 11" format (21.6 cm x 27, 9 cm). Boxes should close to their original dimensions.
- 5.13.** The organizers of local finals may adapt the terms of the official competition. It is however recommended to follow as much as possible the rules as described herein as they will be applied during the national final. The Science coordinating committee, *Science on Tourne!* is not responsible for changes made by the organizers of the local finals.

## 6 › PROCEDURE

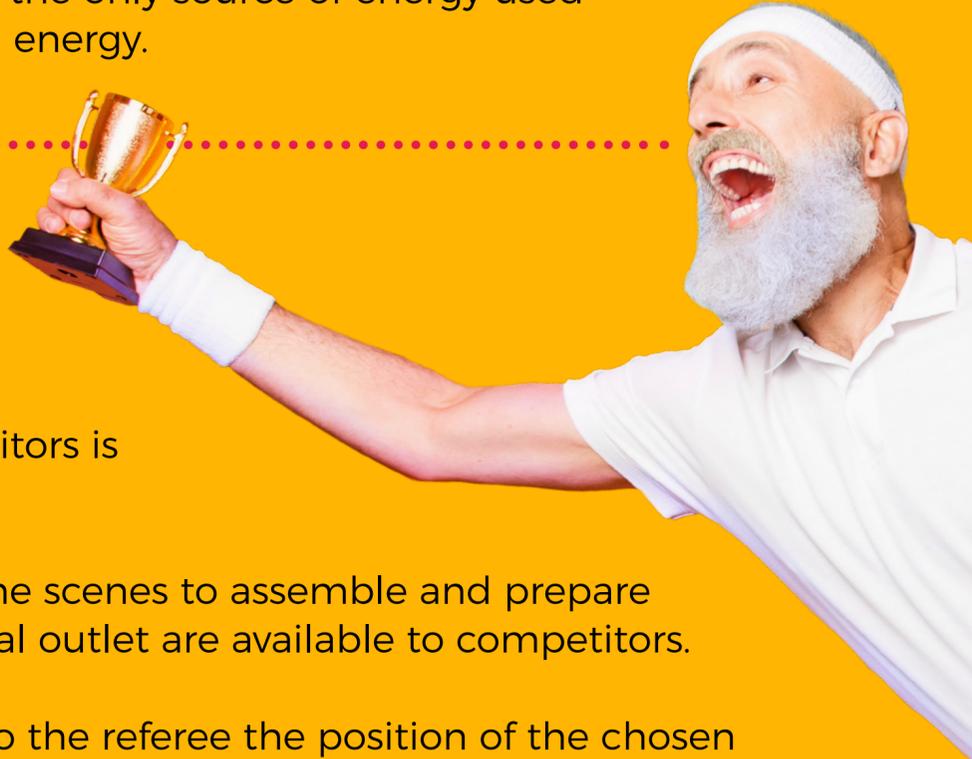
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### Before the competition

- 6.1. The day before the competition, each participating team, whether it belongs to the *Professional* or *Amateur* category, must have their device verified for conformity to the rules.
- 6.2. Each participating team must be prepared to explain how their device works and demonstrate that the only source of energy used to propel it is potential gravitational energy.

### During the qualification round

- 6.3. The order of passage of the competitors is determined at random.
- 6.4. Each team has 5 minutes behind the scenes to assemble and prepare their device. A table and an electrical outlet are available to competitors.
- 6.5. The team representative indicates to the referee the position of the chosen transition line.
- 6.6. At the invitation of the facilitator, the team deposits their materials in the presentation area and then has 2 minutes for their oral presentation.
- 6.7. The team then has 5-minutes to :
  - set up and prepare the device ;
  - conduct unofficial testing; and
  - perform a maximum of two official tests.
- 6.8. For each official test, the following steps will be carried out :
  - 6.8.1. The team representative informs the referee that the team is ready for an official test and the rest of the team leaves with any excess equipment. At this time only the device, the launching device and the start-up tool (if placed in the starting volume) must be stationary and entirely contained in the starting volume. The team must no longer interact with the material contained in the starting volume until the start-up.
  - 6.8.2. The referee ensures the conformity of the playing area and the apparatus.
  - 6.8.3. A whistle signals the start of an official test.
  - 6.8.4. The team representative can then perform the start-up action.
- 6.9. In the event that the start-up action does not allow the device to start moving, the test will not be counted as an official test, but the performance time will not be stopped. The team can then reposition the device for a new start-up action.
- 6.10. At any time after the apparatus is started, the team may end an official test by notifying the referee. The points accumulated before the end of the official test will then be counted as indicated in 5.10.
- 6.11. When the device stops or crosses the entire start line on return, the time is stopped in order to calculate the points for that official attempt.



**6.12.** The team may, if there is time remaining in the five (5) minutes allotted to them, make a second official attempt. The stages of the process are then repeated from 6.7, but the team only has the remaining performance time. The position of the transition line can be changed at this time,

**6.13.** The best result (*P*), of the two official tests, if any, is retained for classification.

**6.14.** The five teams with the best result qualify for the final round.

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## The Finals

**6.15.** The competitors' order of passage is determined in the reverse order of the classification of the qualifying round.

**6.16.** The stages of the process are repeated from 6.4.

**6.17.** The winning team is the one with the best result (*P*) exclusively obtained in the final round. In the event of a tie, article 2.6 applies



# THE PRIZES

*The prizes described below will be offered to the winners of the Professional category during the national final.*

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## **Challenge Prize**

**\$ 1,000** awarded to each team member with the highest score.  
**Offered by the ministère de l'Économie et de l'Innovation.**

Free registration for the **Forum international Sciences Société** offered to each member of the winning team as well as reimbursement (up to \$ 100) of travel expenses. **Offered by ACFAS.**

## **Ingenuity Award**

**\$ 1,000** given to the team who will have developed an original concept for their device in order to make the most of the rules. **Offered by the Order of Professional Technologists of Quebec (OTPQ).**

## **Design Award**

**\$ 1,000** given to the team that will have made a device that is both aesthetic and functional. **Offered by the Centre de démonstration en sciences physiques (CDSP).**

## **Eco Responsibility Award**

**\$ 1,000** given to the team that will have applied the principles of eco-design to manufacture their vehicle in order to minimize its environmental footprint. **Offered by Polytechnique Montréal.**

## **Communication Award**

**A mobility grant of \$ 1,500** to participate in a scientific stay in France during the *Fête de la science*, in October 2020. Available to each member of the team who has distinguished himself by the quality of their communication (written and oral), it makes it possible to pay, in whole or in part, the transport and subsistence costs. **Offered by LOJIQ - Les Offices jeunesse internationaux du Québec.**

## **Merite Award**

**\$ 1,000** given to the team that stands out in the following five categories: device performance, ingenuity, design, eco-responsibility and communication.  
**Offered by the Fédération des cégeps.**

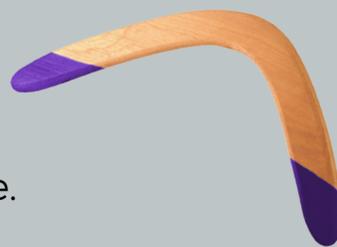
## **Jury Selection Prize**

**\$ 1,000** given to the winning team chosen by the jury. The evaluation criteria for this award are at the discretion of the members of the jury.

## **Audience Award**

**\$ 1,000** given to the winning team by public vote.  
**Offered by Cégep Limoilou.**

*Please consult our website should you require any further clarification for the criteria in the awarding of the various prizes.*



# SCHOLARSHIPS

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A scholarship worth **\$ 2,500** applicable on tuition fees **offered by l'Université du Québec à Trois-Rivières.**

A scholarship worth **\$ 1,500** applicable on tuition fees **offered by Polytechnique Montréal.**

A scholarship worth **\$ 1,500** applicable on the tuition fees **offered by the École de technologie supérieure (ÉTS).**

# PARTICIPATION AWARDS

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## **Participation prize for women**

**\$ 500** given to a student whose name is drawn from among all the participants in the local finals in the Professional category. **Offered by the ministère de l'Éducation et de l'Enseignement supérieur.**

## **Participation prize for men**

**\$ 500** given to a student whose name is drawn from among all the participants in the local finals in the Professional category. **Offered by the ministère de l'Éducation et de l'Enseignement supérieur.**

**A one-year subscription to *Quebec Science* magazine** is offered to all participants in the national final in the *Professionals* category.



**GOOD LUCK!**

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