

JUNK DRAWER RACES

GRAVITY POWERED ROBOT RACE

Grade 2 - 3

Competition Guideline and Overview 2021-22

Last Updated: September 2021

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If you require assistance or have any questions about the contest, please consult the **Junk Drawer Races Frequently Asked Questions** located on our website at www.skillsontario.com/junk-drawer-races or you may contact the Competition Coordinator at junkraces@skillsontario.com.

PROGRAM OVERVIEW

Introducing the first-ever Skills Ontario's Junk Drawer Races! The contests under this program are open to students from Grades 2 - 12 within Ontario. Last year we launched Paper Glider Competition for grades 7-12 and this year we are announcing new competitions for different grades. Please refer to table below for these competitions.

| Competition | Grades | Related Topics from Curriculum |
|-----------------------------------|--------|---|
| Gravity Powered Robot Walker Race | 2-3 | Simple Machines Movement Strong and Stable Structures Forces Causing Movement |
| Cardboard Car Race | 4-5 | Wheels Forces Acting on Structures and Mechanisms |
| Paper Glider Competition | 6-7 | Flight Technology Designing Building Testing Centre of Gravity |
| Hydraulic Crane Challenge | 8 | Hydraulics Fluids Systems in Action |
| Cardboard Hovercraft Race | 9-12 | Manufacturing Technology Technological Design Transportation Technology |

Number of Teams and its size:

One team of up to four (4) students can participate from every school for every contest. To ensure fairness and access to programs across the province, each school board is entitled to spaces at Elementary, Sr. Elementary and Secondary levels for both their online and in-person learning streams.

Virtual schools/hubs can register one team per contest just like in-person schools. Virtual class/es of a school that also has in-person classes can only register one team per contest which can be either from an in-person class, virtual class, or a collaboration of both. This competition is also open to private schools.

If you have any questions or concerns about registration spaces for your school board, please contact the Competitions Coordinator at junkraces@skillsontario.com.

Teams can register by visiting www.skillsontario.com/junk-drawer-races. A registration confirmation email will be sent to the registering email address within five business days.

PROGRAM REGISTRATION INFORMATION

Registration for all contests open on Tuesday, October 12th at 9:00 am! Please visit www.skillsontario.com/junk-drawer-races to begin the registration process.

Every school must register for all the contests separately by selecting the correct drop down from the registration form. If schools have more teams wishing to compete for a contest, they are encouraged to host a competition at school level to decide the team that represents the school. This competition could be held within a Gymnasium if permitted.

Teachers can email junkraces@skillsontario.com regarding any questions to hosting an internal school competition.

Registration Confirmation Email

A confirmation email will be sent to the registering email address. This confirmation email will be sent within 5 business days of registering. A team is not registered for the program until a confirmation email is sent. If the confirmation email is not received within 5 business days, please contact Skills Ontario at junkraces@skillsontario.com. Please be sure to check spam folders. It is important that all teachers at the school coordinate which team will represent the school. If a school has a second team who registered, Skills Ontario will notify both registered teams and advise them that they must select only one team to participate.

Registration closes Tuesday, November 16th at 4:00 PM. No exceptions.

REGIONAL DIVISIONS

For the purpose of this competition, Skills Ontario has divided the 76 public school boards across Ontario into regional divisions as per their geographic location. Similar to the regional divisions of the Qualifying Competition that leads to the Skills Ontario Provincial Competition. There are 7 regional divisions.

A team must place within the top 3 of their regional division during the Regional Competition that concludes on January 12th to be eligible for the Provincial Championships.

Refer to the table below to review which Regional Division your School Board belongs to. This is the division in which your team will compete within during the Regional Competition.

| Central Ontario | Far Northern Ontario |
|---|--|
| Durham Catholic District School Board | Conseil scolaire de district catholique des Aurores boréales |
| Durham District School Board | Keewatin-Patricia District School Board |
| Dufferin-Peel Catholic District School Board | Kenora Catholic District School Board |
| Peel District School Board | Lakehead Public Schools |
| Toronto Catholic District School Board | Northwest Catholic District School Board |
| Toronto District School Board (All Quadrants) | Rainy River District School Board |
| York Catholic District School Board | Superior North Catholic District School Board |

| | |
|---|--|
| York Region District School Board | Superior-Greenstone District School Board |
| | Thunder Bay Catholic District School Board |
| Eastern Ontario | |
| Algonquin and Lakeshore Catholic District School Board | Northern Ontario |
| Catholic District School Board of Eastern Ontario | Algoma District School Board |
| Conseil des écoles catholiques du Centre-Est | Conseil scolaire catholique du Nouvel-Ontario |
| Conseil scolaire de district catholique de l'Est ontarien | Conseil scolaire catholique de district des Grand Rivières |
| Conseil des écoles publiques de l'Est de l'Ontario | Conseil scolaire de district catholique Franco-Nord |
| Hastings and Prince Edward District School Board | Conseil scolaire public du Grand Nord de l'Ontario |
| Limestone District School Board | Conseil scolaire public du Nord-Est de l'Ontario |
| Ottawa Catholic School Board | District School Board of Ontario North East |
| Ottawa-Carleton District School Board | Huron-Superior Catholic District School Board |
| Renfrew County Catholic District School Board | Near North District School Board |
| Renfrew County District School Board | Nipissing-Parry Sound Catholic District School Board |
| Upper Canada District School Board | Northeastern Catholic District School Board |
| | Rainbow District School Board |
| Southern Ontario | Sudbury Catholic District School Board |
| Brant Haldimand-Norfolk Catholic District School Board | |
| Conseil scolaire catholique MonAvenir | Near Northern Ontario |
| Conseil scolaire Viamonde | Bluewater District School Board |
| District School Board of Niagara | Bruce-Grey Catholic District School Board |
| Grand Erie District School Board | Kawartha Pine Ridge District School Board |
| Halton Catholic District School Board | Peterborough Victoria Northumberland and Clarington Catholic District School Board |
| Halton District School Board | Simcoe County District School Board |
| Hamilton-Wentworth Catholic District School Board | Simcoe Muskoka Catholic District School Board |
| Hamilton-Wentworth District School Board | Trillium Lakelands District School Board |
| Niagara Catholic District School Board | Upper Grand District School Board |
| | Wellington Catholic District School Board |
| Western Ontario | |
| Avon Maitland District School Board | |
| Conseil scolaire catholique Providence | |
| Greater Essex Country District School Board | |
| London District Catholic School Board | |
| Lambton Kent District School Board | |
| St. Clair Catholic District School Board | |
| Thames Valley District School Board | |
| Waterloo Catholic District School Board | |

| | |
|--|--|
| Waterloo Region District School Board | |
| Windsor-Essex Catholic District School Board | |

If your school board is not listed, or if you notice an error, please contact the Competitions Coordinator at junkraces@skillsontario.com

CONTEST OVERVIEW

Teams of up to four (4) students from grades 2-3 are to design and build a **Gravity Powered** robot walker made from paper products, plastic or wooden beads and toothpicks or wood skewer sticks or dowels. Once the Robot Walkers is built, the teams are to then test their capabilities by letting the Robot complete a distance of 50 centimeters (cm) on a ramp from a stationary position to determine the time the robot would take to complete that distance. Teams are required to video record their robot's walk attempts.

CHALLENGE OVERVIEW AND JUDGING REQUIREMENTS

Below you will find the description and judging requirements for each section of the Gravity Powered Robot Race.

PART 1: PLANNING & DESIGN

There are three components to the Students' Planning and Design. All three components must be handed in to receive full marks. Submissions will **not be accepted** if students do not include their Mandatory Safety Checklist. All students **MUST** complete the Mandatory Safety Checklist **PRIOR** to beginning their Gravity Powered Robot project, however the checklist only needs to be submitted with the rest of the project files.

Mandatory Safety Checklist

Teams must complete the Mandatory Safety Checklist, which is a full project safety checklist that all entries must submit in order to be eligible to compete. Visit the Resources section of the Junk Drawer Races webpage to download the Mandatory Safety Checklist in .PDF format, located here: www.skillsontario.com/junk-drawer-races

Design Plan

In teams, students are to create a Design Plan of their Gravity Powered Robot Walker and submit their designs within their submission package. Design Plan should be neat, easy-to-read, and should clearly show the design of Robot. Teams are welcome to create their designs by hand or by computer. Teams will be marked on their abilities to build according to their design plans.

Materials List

Teams must include, on a separate piece of paper, a full list of the materials used. This document can be created and formatted however the Team wishes. Teams will be marked on their ability to

include all materials used to create their Robot. They must also provide quantity of materials used and will be marked on the legibility and professionalism of this document.

Your Planning & Design Package should include the following three (3) documents:

- Design Plan – Should include all necessary dimensions are labeled (arms, feet, weight, length). It should also include a legend if necessary
- Mandatory Safety Checklist (Can be found in Junk Drawer Races Resource webpage)
- Materials List - Full list of materials used

Teams will be marked on:

- Materials List– Is it legible? Are all materials used listed? Did they use all approved materials? (Up to 5 marks)
- Design Plan – Does the design plan look neat and organized? Was a straight-edge ruler used? Is it legible? Are all measurements to scale? Does the design reflect the build? (Up to 5 marks)
- Accuracy – Are all measurements to scale? (5 marks)

All components of the Planning & Design section must be included with final submission in Dropbox in order to receive marks.

PART 2: CONSTRUCTION CHALLENGE

Once the Students have completed their mandatory safety checklist, materials list and design plan, they are then to begin constructing their projects according to their design plans. Students will be marked on: their ability to follow their design plans, the quality of the construction and the images provided.

Dimensions –

- Total arm lengths cannot exceed **30 cm**
- Total height cannot exceed **20 cm**

Approved Materials:

Approved Paper Products

- Printer paper
- Wrapping paper
- Newspaper
- Tissue Paper
- Toilet Paper or Paper Towel

- Cardboard and other Corrugated materials
- Stiff cardstock
- Any other paper product available – **MUST be a product primarily made of paper**

Approved Sticks and Beads

- Bamboo/wood Skewer Sticks or dowels, max 30cm (12 inch)
- Popsicle sticks
- Plastic or wooden beads
- The use of other materials, such as plastic or wire will **not be permitted**.

All items listed above can be found at most grocery stores, Dollar Stores, Stationary Stores, Walmart, Canadian Tire or Home Hardware stores across Ontario. If you are having difficulty finding these items, please contact junkraces@skillsontario.com.

If you are unsure if a material is approved, feel free to reach out to us at junkraces@skillsontario.com.

Approved Adhesives & Connectors

Students **may use ANY type of adhesive for their robot** but should take into account the type of materials they are using and if it will restrict walk.

Recommended adhesive/connector products:

- 3M scotch tape
- 3M masking tape
- Painters tape
- Duct tape
- Glue stick
- Glue gun
- White glue or carpenter's glue
- Zip Ties

Construction Images for Final Project Submission

Team's construction will be marked upon images submitted and proper materials used.

Three (3) pictures of the Robot from different angles is to be included with the project submission. Those picture angles are to be taken of the:

1. front

2. side (either side)
3. Top

Teams will be deducted marks if three images showing three separate views are not included with their submission package.

Teams will be marked on:

- Build Accuracy – Did the student competitors follow their design plans? Are all features in the designs present on the product? (Up to 5 marks)
- Picture Quality – Did the team include 3 images with the required views? Do the pictures clearly show the Robot? (Up to 5 marks)
- Quality of Construction – Does the Robot look like it will walk? Is it well built? Is it a creative design? (Up to 5 marks)

SAFETY NOTE:

If using a device that requires an electrical source such as a Hot Glue Gun, please ensure a teacher, parent or guardian is supervising at all times.

PART 3: WALK TESTS – FASTEST WALK

Once the Student Competitors have completed constructing their Robots and have taken photographs for their submission entries, students are to now let their robots walk on a ramp. The height of the starting point of the ramp should not be more than 6 inches at regional level.

The Student Competitors are to “nudge” their Robots by hand from a stationary position/starting point on the ramp. A long enough cardboard/sheet or a wooden plank can be used as a ramp by the students. If it is determined by the judges that the height of ramp is more than 6 inches, 5 marks may be deducted. They are to perform 3 walk tests, with the goal of fastest walk. The students are to video record their walk tests. Points will be awarded based on the time taken to complete the distance of 50 cm. Tiebreakers will be determined to the nearest tenth of a second.

The Walk Tests consists of three (3) consecutive tests. In order to ensure that Students are using three consecutive tests, the Walk test video must be shot in **ONE CONTINUOUS VIDEO – NO EDITING!**

The video must capture the entire walk of the Robot at all times. At no point in the video can the Robot escape the frame of the video. Teams must plan their walk tests and video shot carefully in order to ensure the Robot does not leave the video frame. Students *must mark the start and end point on the ramp* and the distance between the two must be 50 cm. Once in the video, the teams must use a measuring tape to show the judges, the distance between start and end point. The fastest walk attempt out of the three attempts will be considered as a final race submission.

Teams will be marked on:

- Video – has it met all criteria? (Submitted on time and titled in proper format, robot does not leave frame; start and end points are within the entire frame during walk)
- Time taken by the robot to complete the 50 cm distance

SAFETY NOTE:

Students should use a safe indoor area, such as a classroom, school gymnasium or an activity room to perform a walk test.

PART 4: SKILLED TRADES TEST

Teams are to include with their robot walker submission, answers to the Junk Drawer Races Skilled Trades Test, which can be downloaded from www.skillsontario.com/junk-drawer-races.

The Junk Drawer Races Skilled Trades Test requires the students to find the answers to 10 multiple choice questions that are based upon the Skills Ontario website, OYAP program website and Skilled Trades within Ontario.

BONUS: VISUAL APPEAL

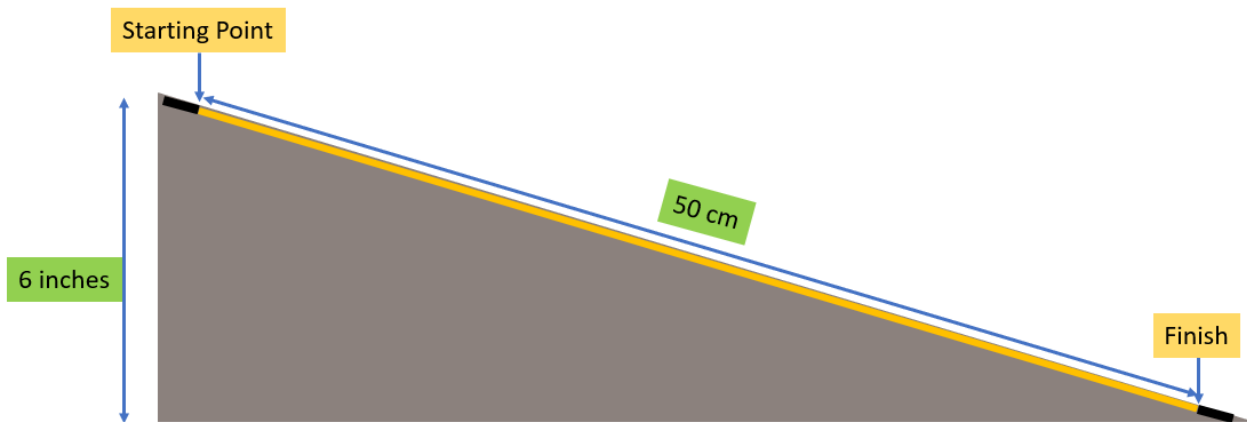
Teams have the option to decorate their Gravity Powered Robot projects but must do so using specific materials that do not provide a structural advantage. Students may only use decorations such as colourful construction paper, markers, crayons, paint, glitter, etc.

Some examples of decorations that could provide an unfair advantage are:

- Wire
- Pipe Cleaners
- Non-Paper materials, such as aluminum foil, saran wrap or plastic

Any decorations that appear to be aiding in the structural integrity of the Robot will result in a 5-point penalty. If a team is unsure if a certain decoration material is allowed to be used, they may email the Competitions Coordinator at junkraces@skillsontario.com.

Ramp Structure For Robotic Walker



SCORING

| Category | Maximum Points | | | | | | | | | | | | |
|---|--|-----------|--------|---------------------|-----------|------------------|-----------|------------------|-----------|-------------------|-----------|----------------------|----------|
| Part 1: Planning & Design package | | | | | | | | | | | | | |
| Materials List- Is it legible? Are all materials used listed? Did they use all approved materials? | 5 | | | | | | | | | | | | |
| Professionalism – Does the Design Plan look neat and organized? Was a straight-edge ruler used? Is it legible? | 5 | | | | | | | | | | | | |
| Accuracy – Are all measurements to scale? | 5 | | | | | | | | | | | | |
| Mandatory Safety Checklist - submitting this is an automatic 5 points. If an entry does not include a Safety Checklist, the entry will be disqualified | 5 | | | | | | | | | | | | |
| Total Planning and Design | 20 points | | | | | | | | | | | | |
| Part 2: Construction | | | | | | | | | | | | | |
| Build Accuracy – Did the Student Competitors follow their design plans? Are all features in the designs present on the product? | 5 | | | | | | | | | | | | |
| Picture Quality – Did the team include 3 images with the required views? Do the pictures clearly show the Robot? | 5 | | | | | | | | | | | | |
| Quality of Construction – Does the Robot look like it will walk? Is it well built? Is it a creative design? | 5 | | | | | | | | | | | | |
| Total Construction | 15 | | | | | | | | | | | | |
| Part 3: Walk Test | | | | | | | | | | | | | |
| 3 attempts – | Time of the fastest attempt will be considered | | | | | | | | | | | | |
| Points Breakdown | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th>Time</th> <th>Points</th> </tr> </thead> <tbody> <tr> <td>Less than 5 seconds</td> <td>20 points</td> </tr> <tr> <td>5 – 6.99 seconds</td> <td>18 points</td> </tr> <tr> <td>7 – 8.99 seconds</td> <td>15 points</td> </tr> <tr> <td>9 – 11.99 seconds</td> <td>10 points</td> </tr> <tr> <td>12 seconds and above</td> <td>5 points</td> </tr> </tbody> </table> | | Time | Points | Less than 5 seconds | 20 points | 5 – 6.99 seconds | 18 points | 7 – 8.99 seconds | 15 points | 9 – 11.99 seconds | 10 points | 12 seconds and above | 5 points |
| Time | | Points | | | | | | | | | | | |
| Less than 5 seconds | | 20 points | | | | | | | | | | | |
| 5 – 6.99 seconds | | 18 points | | | | | | | | | | | |
| 7 – 8.99 seconds | | 15 points | | | | | | | | | | | |
| 9 – 11.99 seconds | 10 points | | | | | | | | | | | | |
| 12 seconds and above | 5 points | | | | | | | | | | | | |
| Quality of Video | 10 | | | | | | | | | | | | |
| <ul style="list-style-type: none"> Was the Robot within the frame at all times? Was always the start and end points in the frames? Was it clear in the video , the distance covered, and did the student measured the distance accurately? | | | | | | | | | | | | | |
| Any Penalties | () | | | | | | | | | | | | |
| Total Walk Test Challenge | | | | | | | | | | | | | |
| Part 4: Skilled Trades Knowledge | | | | | | | | | | | | | |

| | |
|---|-----------|
| Questions 1 – 10 | 10 |
| Bonus Question | 5 |
| Total Skilled Trades Knowledge | 15 |
| VISUAL APPEAL BONUS MARKS <ul style="list-style-type: none"> • Did the team use approved decoration materials? Is the decoration appropriate? | 5 |
| TOTAL MARKS | |

Important Points:

1. All judging is final. Individual final scores will not be shared with teams.
2. Students are encouraged to work in a team and every student must have a different responsibility (keeping the time, measuring the distance, nudging the robot)
3. If the robot stops before the finish line, a student can nudge it from the same point, 1 point will be deducted for every push.

Tiebreaker

In the event of a tie between two or more teams, ties will be broken by using the score from the Walk Test.

SUBMISSION PACKAGE

Team’s submissions for the Regional Robot Race round are to include the following media in the following formats:

Part 1 – Design Plan Package

- A copy of the Gravity Powered Robot Walker Design Plan is required to be submitted. These can be created and submitted in: .PDF, .JPEG, .DOCX (Word or Excel). Any other formats will not be accepted. Must be saved as “Design Plan”
- Material List is required to be created and submitted in: .docx, .xls or .pdf format (MS Word or Excel). Must be saved as “Materials List”
- Mandatory Safety Checklist to be downloaded, answered, and submitted in: .docx,.xls or .pdf format (MS Word or Excel). Must be saved as “Mandatory Safety Checklist – Completed”

Part 2 – Construction Photographs

- Three (3) pictures of the Robot are required to be submitted (Front, Side and Top). These can be received in: .PDF, .JPEG. Any other formats will not be accepted.

- The three (3) pictures must each be saved as: "robot_top", "robot_side", "robot_front".

Part 3 – Walk Test

- **Three (3) attempts within 1 continuous video** are required to be submitted. Video submission formats accepted are: .MP4 and .AVI.
- This file must be titled "Walk Test".

Part 4 – Skilled Trades Question Answers

- Answers to the three (3) Skilled Trades Questions are required to be submitted. Submission formats accepted are: .JPEG,.PDF and .DOCX (Word or Excel) and can be no larger than 1GB in size
- This document must be titled "Skilled Trade Test Answers".

The Gravity Powered Robot Walker Submission Package should contain the Team's design plan, materials list, three (3) photographs of the constructed Rubber band Powered Car, their written answers to the Skilled Trades Questions, as well as the video recording of their Drive test online.

Registered Teams will have until December 1st at 3:00 PM to submit their Submission Package to the Dropbox folder.

Submitting to Dropbox

Teams are to collect all parts of their submission within a folder and submit their final submission package within the Skills Ontario Junk Drawer Races webpage at www.skillsontario.com/junk-drawer-races by clicking the blue "Submit your Project" button.

Junk Drawer Races project submissions must be submitted in a specific naming format in order to receive marks. If a team does not name their submission package in the following naming convention, their submission may be disqualified from competition.

STUDENTS:

Be sure to have all 6 components of your project saved within a compressed .ZIP file folder. The .ZIP file **MUST** be titled using your school name and school board initials.

For example, if your school is St. Mary's Elementary School in Waterloo Catholic District School Board, your file must be titled: "stmarys.wcdsb.ZIP".

NOTE: Your full submission package should include a total of 6 documents that is a part of the 4 sections above.

IMPORTANT DATES

| Event | Date |
|---|---|
| Registration for Regional Competitions Opens | Oct. 12 th , 2021, at 9:00 AM |
| Registration for Regional Competitions Closes | Nov. 16 th , 2021, at 4:00 PM |
| Submissions for Regional Competitions Due | Dec. 1 st , 2021, at 3:00 PM |
| Regional Competitions Winners Announced | January 12 th , 2022, VIA Social Media |
| Championship Round Challenge Announced | January 12 th , 2022 |
| Championship Round Registration Opens | January 12 th , 2022 |
| Championship Round Submissions Due | February 16 th , 2022, at 3:00 PM |
| Championship Round Winners Announced | March 10 th , 2022, VIA Social Media |

*All important dates are subject to change.

PROVINCIAL CHAMPIONSHIPS

The Gravity Powered Robot Race Championship Round will consist of the top 3 teams from each regional division from the regional competition. The Provincial Championship Round will follow the same rules and guidelines as the regional competition, with the exception of the added Provincial Competition Challenge. **The Provincial Championship Challenge will be revealed when the advancing teams are announced on January 12th, 2022.**

Teams competing within the Provincial Championship round will have until February 16th to review their existing blueprints, potentially modify their designs to meet the provincial challenge and construction requirements while explaining their modifications and submit their new submissions via Dropbox. Provincial submissions follow the same guidelines as the regional competition, but with the addition of the Provincials Challenge. Entries are to be assembled and submitted similar to how they were submitted within the regional competition.

Provincial Submissions will be judged and evaluated by industry volunteers, and the top three teams will be awarded prizes by Skills Ontario. Winning teams will be notified no later than March 10th.

NOTE:

The above Provincial Championship guidelines and dates are subject to change at any time. An official Gravity Powered Robot Race Championship guideline will be released to advancing teams upon the conclusion of the Regional round.

RESOURCES

To learn how to build this activity and see how it functions, you can refer to the links below:

- <https://www.instructables.com/Gravity-Powered-Robot-Walker/>
- <https://www.youtube.com/watch?v=ITTCWrsI93s>

Note: The links are for reference only, you may learn from these, but your submission shouldn't be identical. If it is found to be identical by the judges, your submission may not be considered for marking.

QUESTIONS?

Should you have any questions regarding this competition, please don't hesitate in contacting the Competitions Coordinator at junkraces@skillsontario.com.

Thank you to our Sponsor. Merci à notre commanditaire.



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