Quantum VICTORIA

A Centre of Excellence & Innovation in Science & Mathematics

PrintACar Challenge

Field Guide

2026

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Quantum Victoria PrintACar Challenge

The Quantum Victoria PrintACar Challenge is a statewide competition providing primary and secondary students with an authentic STEM project. It combines design thinking, teamwork, 3D printing technologies, and friendly competition to foster creativity, critical thinking, and a passion for STEM education.

Students race their 3D printed cars against those of other teams. This aspect encourages students to refine their designs, optimise performance, and apply principles of physics and engineering to achieve the best results.

This field guide outlines all requirements for entry into the 2026 PrintACar Challenge. If you have any questions regarding the contents of this field guide, please contact admin@quantumvictoria.vic.edu.au.

Objective

The Quantum Victoria PrintACar Challenge aims to provide an authentic application of a design process and engage students in the processes of 3D modelling and printing.

Teams & Eligibility

A team for the 2026 PrintACar challenge may be comprised of up to four (4) students from either primary year levels (3-6) or secondary year levels (7-12).

A school may enter a maximum of two teams. If a school has multiple campuses or combines primary and secondary levels, a school may enter additional teams comprised of students from separate campuses, up to a maximum of two teams per campus.

Teams must be available to attend the Finals Day onsite at Quantum Victoria.

Individual students may compete in no more than two years of PrintACar in primary year levels and two years in secondary year levels.

Prizes

Prizes for the 2026 challenge will be announced prior to the Qualifiers Day.

Prizes are awarded to the school of the team that is awarded the Overall Winner in each category (Primary and Secondary). A school **cannot** be awarded an Overall Winner prize two years in a row. Quantum Victoria retains full authority to determine the winner, and all decisions are final.

2026 Key Dates

Registrations & Information		
Term 1	Week 5 ***Thursday 26th February***	Field Guide Published Team Registrations Open
	Week 8 ***Thursday 26th March***	PrintACar Webinar 3:30pm
Term 2	Week 10 ***Friday 26th June***	Team Registrations Close
Qualifiers		
Term 3	Week 2 ***Friday 24th July***	Last Day for Optional Car Feedback
	Week 5 ***Friday 14th August***	**Qualifiers Deliverables DUE:** • Portfolio • 3D Printed Car/s *(Qualifiers Cars must arrive at Quantum Victoria on or before this date)* • Self-Assessment/s • Model Files
	Week 7 ***Thursday 27th August*** ***Friday 28th August***	**Qualifiers Race Days**
Finals		
Term 4	Week 6 ***Friday 13th November***	**Pre-Racing Deliverables DUE:** • Portfolio • Model Files
	Week 8 ***Friday 27th November***	**Finals Race Day** **Finals Deliverables DUE:** • Final 3D Printed Car • Poster/Visual Display • Self-Assessment

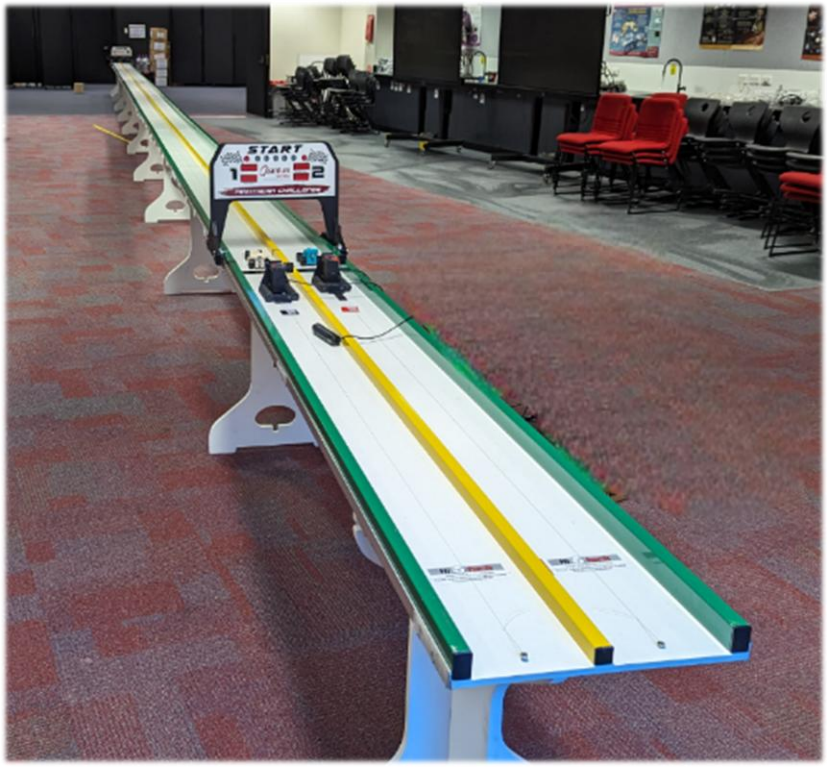
PrintACar Racing

A key component of the PrintACar Challenge is the Car Racing. All teams will have the opportunity for their cars to be raced as part of the Qualifiers Race Days.

The Track

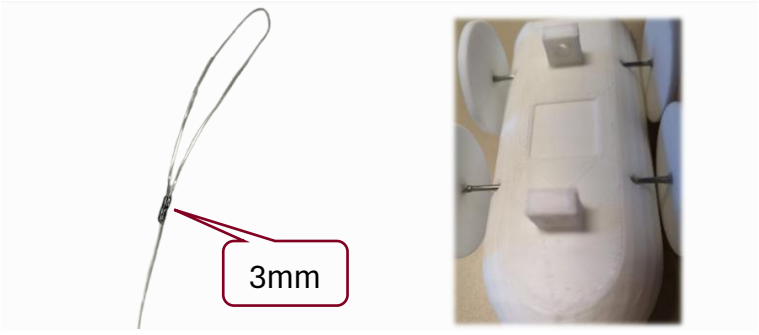
Cars are raced down a 20m track and are tethered using fishing line which runs the full length of the track.

The track uses a sensor at the finish gate to calculate the time taken for a car to reach the end.



Guide Wire

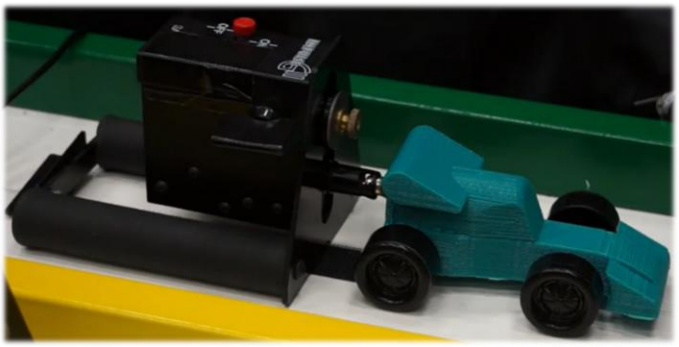
The fishing line used to tether cars to the track is referred to as a guide wire. This guide wire is threaded through two eyelets on each car and secured to each end of the track with a loop. The loop is secured using a crimp with a diameter of 3mm, so eyelets need to be big enough to allow this to pass through.



Propellant

Cars are propelled down the track using CO_2 canisters that are pierced with launching devices at the start gate.

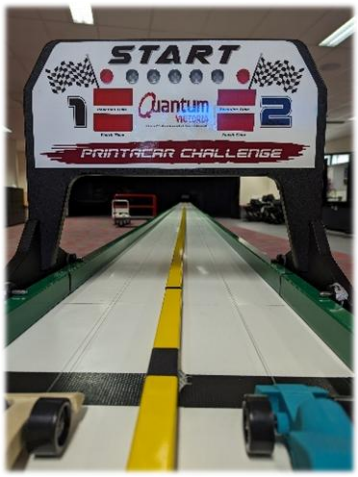
The canister contains compressed CO_2 that, when pierced with a launching device, accelerates the car down the track.

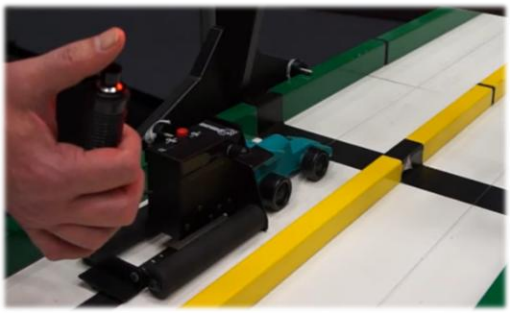


To safely launch the cars, each car design has a cylinder-shaped hole to hold the canister.

Launching

The launching device at the start gate is controlled by pushing a trigger when the race starts.





Students will have the opportunity to launch their own cars.

Race Days

Qualifiers Race Days

The Qualifiers will be held at Quantum Victoria on the following dates, with two sessions on each day:

- Thursday 27th August
    - morning 9:30am – 11:30am
    - afternoon 1:00pm – 3:00pm
- Friday 28th August
    - morning 9:30am – 11:30am
    - afternoon 1:00pm – 3:00pm

Teachers will be asked to nominate their session preference. Schools will be advised of session allocation at least two weeks in advance.

We encourage teams to attend onsite. If this is not possible, you have the option of watching a livestream.

Finals Race Day

Finals Race Day will be held at Quantum Victoria on the following day:

- Friday 27th November 2026
    - 9:00am to 2:15pm

Teams are required to attend the Finals in person.

Racing Safety

Quantum Victoria retains the right to refuse the racing of any car.

Cars that are judged by the Quantum Victoria (QV) team to be unsafe to race or likely to cause damage to the track will not be raced. This includes the situation where a car becomes unsafe during racing.

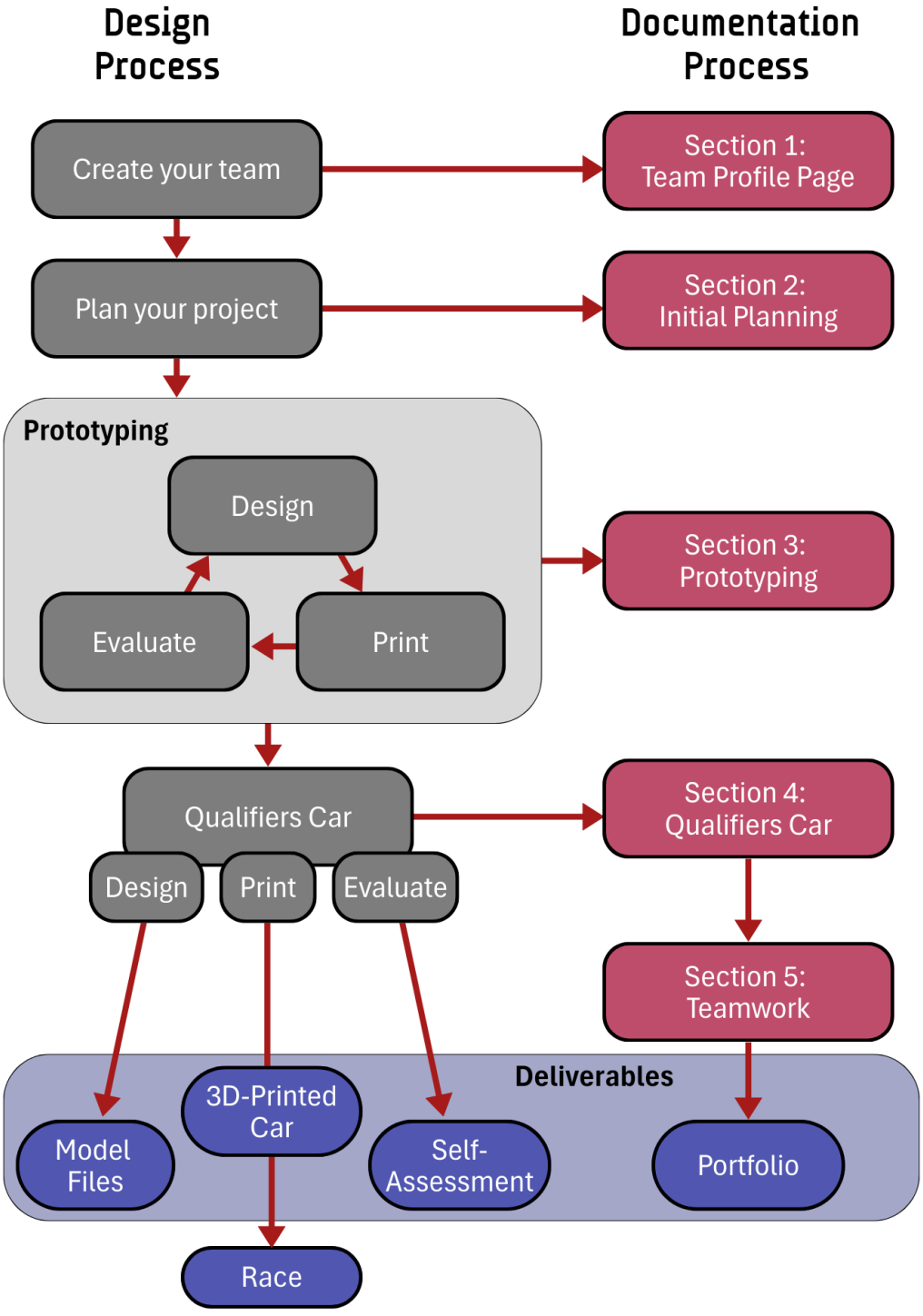
PrintACar Design Challenge

Your Challenge

Design a car using 3D modelling software, 3D print it, race it on the track, and document the journey from start to finish.
Teams can submit up to two cars of different designs at Qualifiers, but only one for Finals.

Challenge Process

This flowchart describes the process that we recommend you follow to complete the PrintACar Challenge.



Deliverables & Submission

Teams should produce the following deliverables as part of the design process. These should be completed and submitted as per the details below.

The items will be assessed according to the assessment criteria outlined in the rubrics in Appendices.

All deliverables for the Qualifiers are due on Friday 14th August.

Deliverable	Format	Submission Location
3D Printed Car/s	Fully assembled car, ready to race	Delivered to Quantum Victoria
Model Files	.stl or .obj file	Uploaded to Google Drive Folder
Self-Assessment	.pdf file	Uploaded to Google Drive Folder
Portfolio	.pdf file	Uploaded to Google Drive Folder

Please note:

- File types not specified may not be accepted or judged.
- Deliverables that are received after the specified submission date may not be accepted or judged.

Delivery Information

Schools are welcome to deliver their car/s in person to the below address between the hours of 8:30am and 4:30pm, Monday to Friday. Please email Sarah at admin@quantumvictoria.vic.edu.au beforehand so we know to expect you.

Schools may send the car via post/parcel service at their own expense.
Address/recipient for delivery of cars:

Sarah Gerardson
Quantum Victoria
235 Kingsbury Drive
Macleod VIC 3085

Please provide tracking details to Quantum Victoria within one day of dispatch to ensure safe receipt of the car.

Optional Car Feedback

Quantum Victoria offers a window for optional feedback about car requirements. Teams are welcome to deliver their cars the above address prior to the Feedback Closing Date (Friday 24th July).

Cars will be checked against the design requirements and checked for race safety. Cars will be returned along with a copy of the assessment for teams to make changes before the submission date.

Judging

Entries in the PrintACar competition are evaluated using a set of defined judging criteria. These criteria consider design quality, racing performance, and evidence of learning throughout the challenge. The sections below explain how teams are assessed.

Weighting

Judging of the Qualifiers stage is based on the assessment of a portfolio, the racing results, the car construction, and a self-assessment. Points for each of these sections contribute to the Overall Score of the team. These scores are used to rank teams and determine entry into the Finals competition. Judging is on the team as a whole.

Qualifiers Assessment Components	Point Distribution
Portfolio	50%
Racing Points	35%
Car Construction	10%
Self-Assessment	5%

The sections below specify how to prepare each component for judging.

Portfolio

Each team must produce a portfolio that documents the design process as it is being undertaken. The portfolio should demonstrate the development of the 3D printed car, from concept to racing.

The following outlines what should be included, along with key points for each area.
For detail about how each item is assessed, please refer to the marking rubric (Appendix D).

Should your team qualify for the Finals, the sections below (1-5) will **not** be remarked. The mark you receive at the Qualifiers stage will contribute a significant proportion to your Finals portfolio mark. It is important to complete your portfolio to a high standard if you wish to do well in Finals.

Section 1	Team Profile Page	5 points
Team Name		
School Name		
Team Logo	Create a logo that represents your team.	
Team Photo	A group photo of the team OR Individual photos of each team member	
Team Members	Include your names, year levels and roles in the team.	

Section 2	Initial Planning	10 points
Brainstorming	What initial ideas do you have for your design? Where will you start?	
Concept Sketch	Sketch your first car design; what do you want it to look like? Label some key features of your design.	
Inspiration	Describe what inspired your design. You might include pictures, photos, sketches, or a mood board.	
Research	Include a summary of information you learned or looked up to help you create the best possible design.	
Timeline	What timeline do you plan to stick to?	
Field Guide	Go through the Field Guide. What key information are you going to focus on?	
3D Printing	What 3D Printer do you have access to? What software are you planning to use?	

Section 3	Prototyping	20 points
First Design		
3D Modelling	How did you start designing your car in 3D? What software did you use? Did you have to skill-up to use your 3D software?	
Screenshots	Add a screenshot of your first design.	
Changes	What do you want to change about your first design?	
First Print		
Photo of 3D Print	Add a photo of your first 3D print.	
Design	What was successful about your design? What design features do you want to change?	
Printing	What was successful about your print? What print settings or options do you want to change?	
Next Designs		
More Designs	What other designs did you go through? Describe features that you wanted to change and how you changed them.	
More Screenshots	Add screenshots of your designs.	
Next Prints		
More Versions	What other printed versions of your car did you make? Describe print settings that you used and how these affected your print.	
More Photos	Add photos of each version of your 3D printed car.	
Prototyping Summary		
Successes	What successes did you have in prototyping?	
Challenges	What challenges did you have in prototyping? (e.g. software challenges, physical challenges, timing restrictions, availability)	

Section 4	Qualifiers Car	10 points
Final Design		
Screenshots	Add at least three screenshots of your final car design, from different angles.	
Design Features	Label and describe at least three key features of your car.	
Wheels	Label and describe at least two key features of your wheels.	
Physics	Explain how you have taken relevant physics concepts account in your design. For example, you may want to discuss the aerodynamics of the shape of the car body or the design of your wheels to account for friction.	
Final Printed Car		
Unassembled Photos	Add at least one photo of your final car, before you assemble it (put the wheels and axle on).	
Assembled Photos	Add at least four photos of your final car, after you have assembled it, from the front, side, top, and bottom.	
Filament	What filament did you use? List the manufacturer, material type (e.g. PLA) and colour.	
Research	Identify at least two important properties of the material you used.	
Slicing Settings	What settings did you use when you sliced your model for printing? What software did you use? Did you slice it yourself, or did your teacher do it for you?	
Challenges	What challenges did you have in printing? (e.g. print fails, surface finish, supports) What challenges did you have in assembling your car? (e.g. glue, axles etc.)	

Section 5	Teamwork	5 points
Successes	What did you do that helped you to work as a team? What would you do again?	
Improvements	What made it hard for you to work well as a team? What would you do differently next time?	
Timelines	How well did your team stick to the timelines that you had?	

Racing Points

Each team is required to produce at least one 3D printed car to compete at the Qualifiers. Teams may also submit a second car, provided it is a different design. All cars must be designed by the participating team and must not have been submitted to PrintACar in previous years.

In Qualifiers, each car will race three times. Any time penalties incurred for breaches to car design specifications will be added to these race times. The average of the three times, including penalties, will be calculated and attributed to the car as its Average Race Time. Cars will be ranked based on their Average Race Time and points allocated accordingly, with the fastest car receiving the maximum number of points. Primary cars will be ranked against other primary cars, and secondary cars against other secondary cars.

Penalties & Race Suitability

Cars must meet the specifications outlined below. Where measurements are provided, a tolerance is given to allow for minor variations in 3D printing. Diagrams are provided to help explain how measurements are taken.

The QV team will assess each car against these specifications. If a car does not meet a specification, as determined by Quantum Victoria, the associated time penalty will be applied.

Safety and racing eligibility

- Cars that meet all specifications will be deemed safe to race.
- Cars that do not meet all specifications will be referred to a safety inspector to assess whether they are suitable to race.
- Cars deemed safe to race will compete with the applicable time penalties applied.
- Cars deemed unsafe to race will be disqualified and receive zero Racing Points.

Disqualified cars may be modified by the QV team so they can safely run on the track, but the car will remain disqualified and receive zero Racing Points.

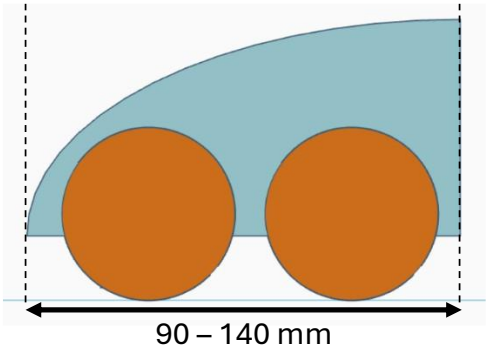
Any car that does not make it to the finish gate will be assigned a time of 10.00 seconds.

Quantum Victoria reserves the right to disqualify any car if one or more specifications fall outside the permitted tolerance, or if any part of the design poses a risk to the track or spectators.

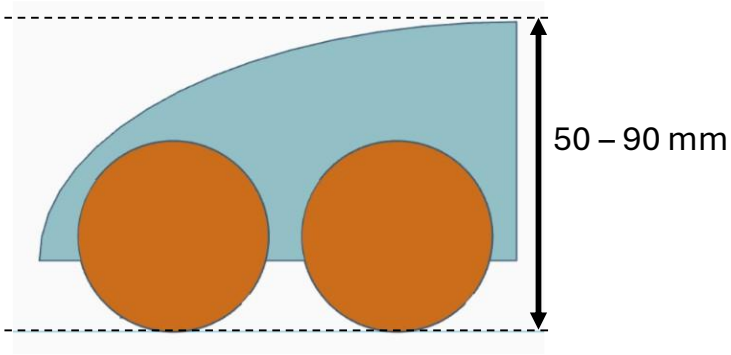
Car Design Specifications

Manufacturing & Assembly		Tolerance	Penalty
1. Manufacturing	All components of the car must be manufactured using 3D Fused Deposition Modelling (FDM) printing technology with ABS or PLA filaments. Exceptions: axles, adhesives, and decorations.	N/A	DQ
2. Assembly	Car must be fully assembled, including wheels and axles. All components must be securely attached.	N/A	+0.5 s

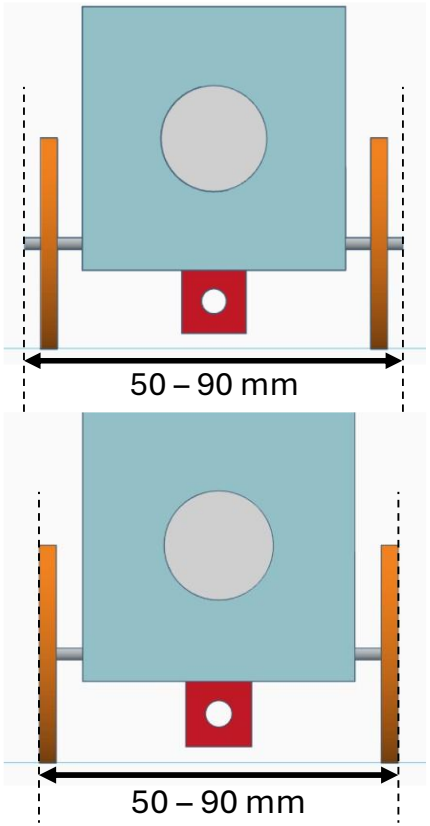
Overall Dimensions		Tolerance	Penalty
3. Weight	Car must have a mass of **90g or more.**	-1.0 g	+0.2 s / +1.0 s
4. Length	Car must have a length of **90 - 140mm.**	±1.0 mm	+0.1 s
5. Height	Car must have a height of **50 - 90mm.**	±1.0 mm	+0.1 s
6. Width	Car must have a width of **50 - 90mm.**	±1.0 mm	+0.1 s



5. Length

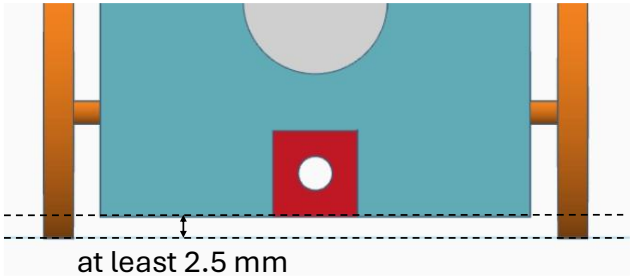


6. Height



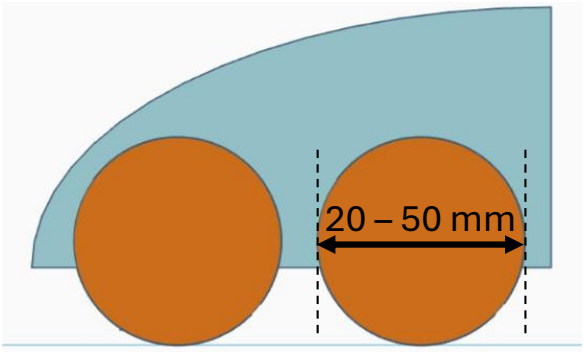
7. Width

Clearance		Tolerance	Penalty
7. Minimum Clearance	There must be **at least a 2.5 mm** clearance between the lowest part of the car body/eyelets and the ground.	-0.5 mm	+0.5 s



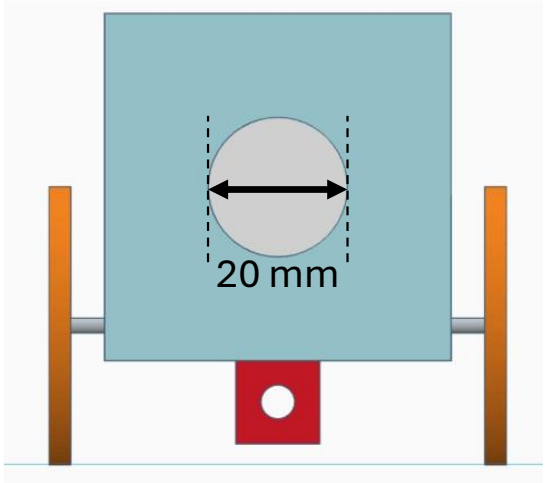
8. Minimum Clearance

Wheels		Tolerance	Penalty
8. Rotation	Wheels must rotate freely.	N/A	+0.1 s
9. Diameter	Wheels must have a diameter of **20 - 50mm.**	±1.0 mm	+0.1 s
10. Alignment	Wheels must be vertical, not leaning or tilted. Wheels must be set in parallel to each other.	N/A	+0.05 s

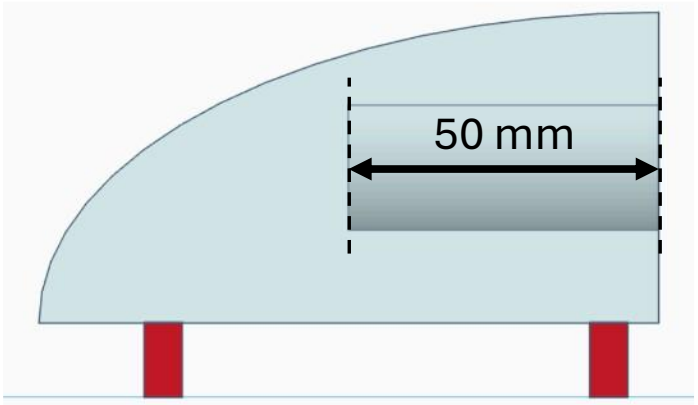


9. Diameter

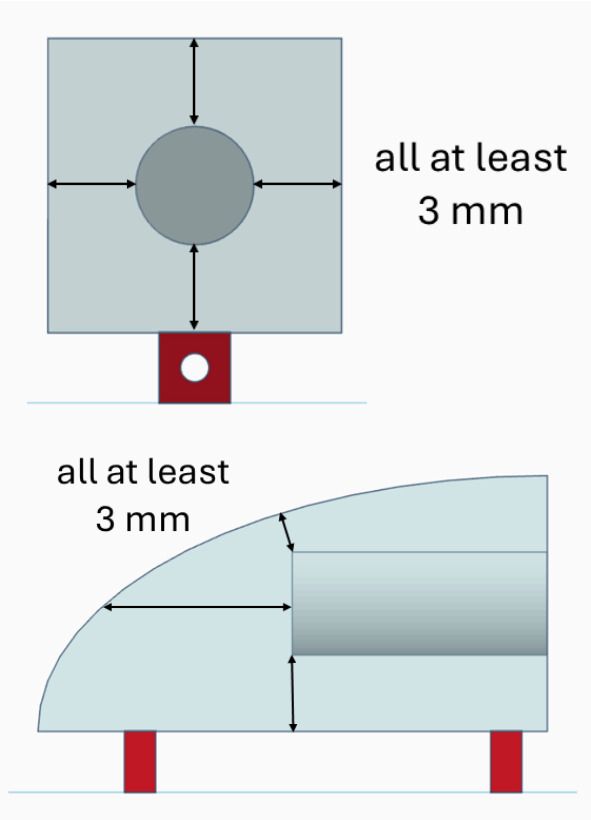
Canister Hole Dimensions		Tolerance	Penalty
11. Diameter & Shape	The hole must be a cylindrical shape with a circular diameter of **20mm.**	±1.0 mm	+0.1 s
12. Inner End & Depth	The inner end of the cylinder hole must be flat (not curved), with a depth of **50mm**.	±1.0 mm	+0.1 s
13. Wall Thickness	The wall of the cylinder hole must be **more than 3mm** in every direction around the hole. The only opening to the hole must be at the rear of the car.	-0.5 mm	+0.1 s



11. Diameter & Shape

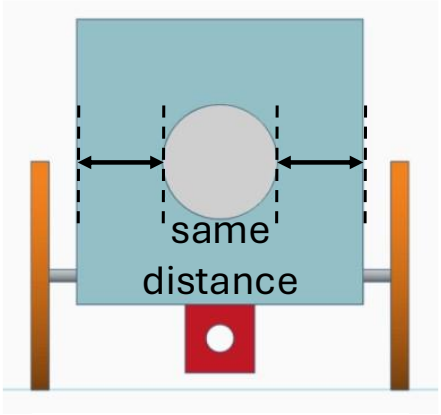


12. Inner End & Depth

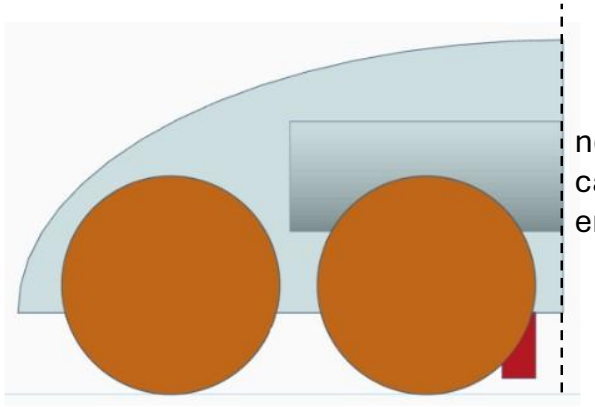


13. Wall Thickness

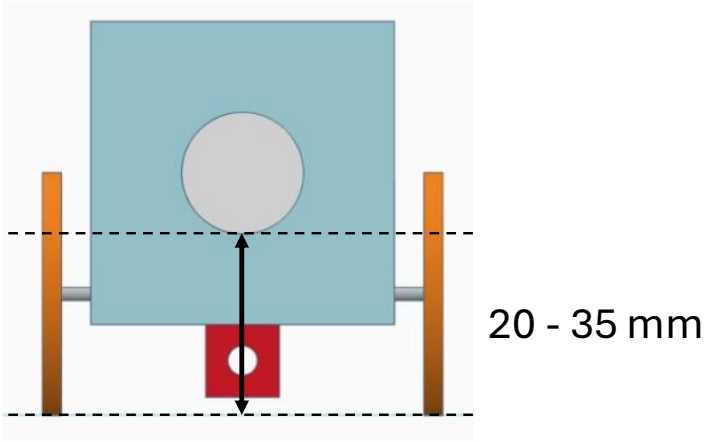
Canister Hole Location		Tolerance	Penalty
14. Alignment	The canister hole must be aligned to the centre of the car horizontally and the length should be parallel to the ground.	N/A	+0.1 s
15. Rearmost Point	The canister hole must be at the rearmost point of the car. No part of the car, including wheels, should stick out behind the canister hole.	N/A	+0.1 s
16. Lowest Point	The bottom of the canister hole must be **20 - 35mm** above the ground.	±1.0 mm	+0.1 s



14. Alignment

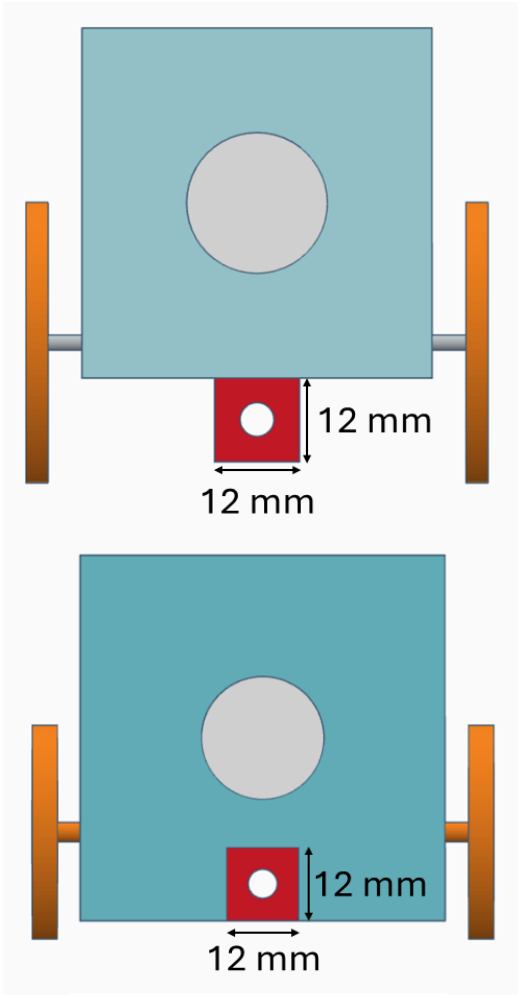


15. Rearmost Point

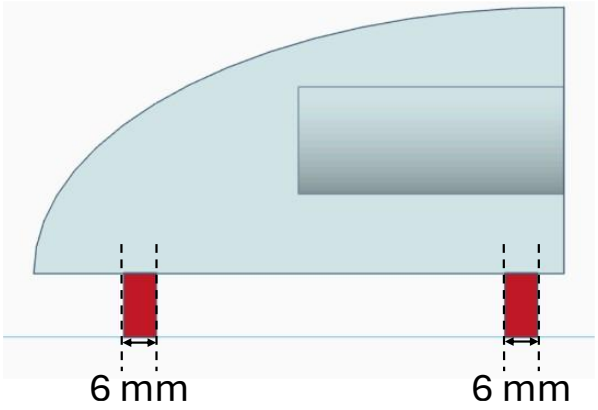


16. Lowest Point

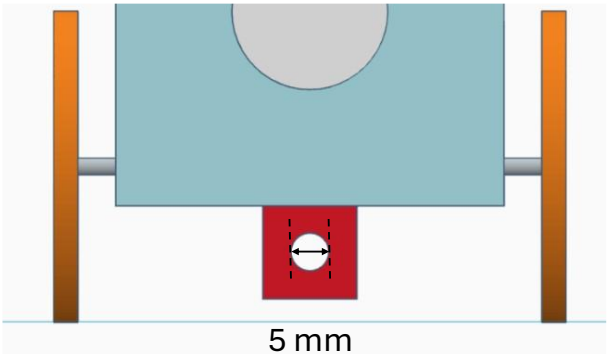
Eyelet Dimensions		Tolerance	Penalty
17. Number & Shape	The car must have exactly two eyelets, shaped as rectangular prisms, with a cylindrical hole running parallel to the ground.	N/A	+0.5 s
18. Width & Height	Each eyelet must have a width and height of **12mm.**	±0.5 mm	+0.05 s
19. Length	Each eyelet must have a length of **6mm**.	±1.0 mm	+0.1 s
20. Hole Diameter	Each eyelet must have a cylindrical hole with a diameter of **5mm.**	±0.5 mm	+0.05 s
21. Hole Alignment	The eyelet hole must be in line with the centre of the eyelet.	±0.5 mm	+0.05 s



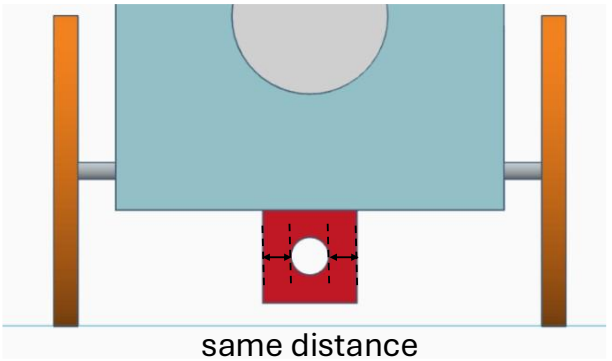
18. Width & Height



19. Length

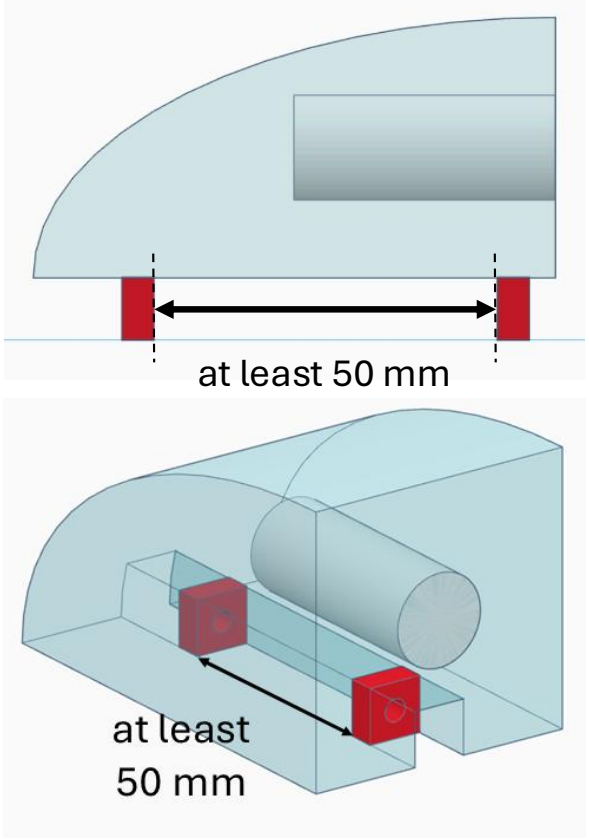


20. Hole Diameter

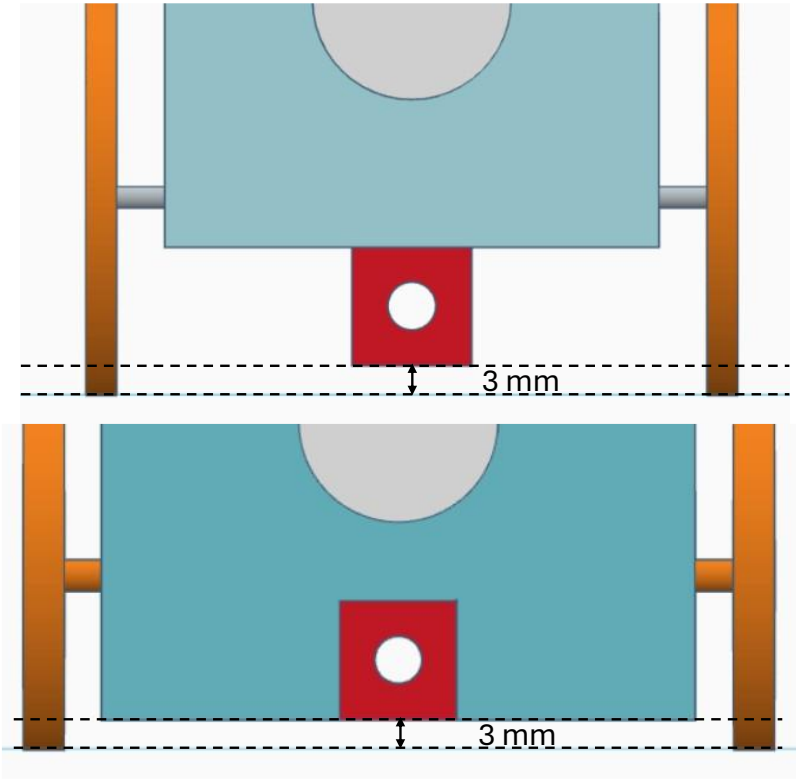


21. Hole Alignment

Eyelet Location		Tolerance	Penalty
22. Eyelet Gap	The eyelets must be **more than 50mm** apart.	-1.0 mm	+0.1 s
23. Alignment	The assembled car must have eyelets that are: - In line with the centre of the car - Parallel to the ground - Equal distance to the ground	N/A	+0.05 s
24. Clear Path	There must be a clear path from the front of the car to the back of the car through the eyelet holes. There must be **nothing** in the way of this path.	N/A	+0.1 s
25. Clearance	The clearance between the bottom of the eyelet and the ground must be **3mm.**	±1.0 mm	+0.5 s



22. Eyelet Gap



25. Clearance

Crucial Car Design Specifications

Please pay close attention to the following crucial specifications.

Weight – Specification 3

Adhering to the weight requirement is one of the most important parts of the challenge. This year we are introducing a categorised penalty for this requirement. Cars that are within a small degree of error under of the tolerance will incur a penalty of +0.2s, while cars that are further under the tolerance will incur a penalty of +1.0s. Cars that are excessively underweight will be subject to potential disqualification.

Measurements – Specifications 4-6

All measurements are taken when the car is fully assembled. This is especially important for things like measuring the width with the wheels and axles attached, as well as checking the canister hole is the rearmost point of the car after the wheels have been attached.

Canister Hole Wall Thickness – Specification 13

The wall of the canister hole must be at least 3mm in ALL directions. This includes the inner end of the hole, even though this can be difficult to see as it is often a mid-section part of the car.

Eyelets – Specifications 17-20

The eyelets are a functional structure and should not be a feature of design choice. As such, this year we have provided specific dimensions that are required for these, which should be strictly adhered to. To assist with this, we have also provided a downloadable model file of these structures that can be imported directly into your modelling software and added to your car model.

Car Construction

Each car will be assessed based on the quality of 3D printing, finishing, and assembly. The criteria are designed to encourage students to refine the quality of their 3D printed product using various techniques such as changing their slicing settings, understanding the material they are using and surface treatments such as sanding.

Cars are marked according to the specifications below and using the Car Construction Rubric (Appendix E).

Car Construction Specifications	10 points
Support Material	All support material should be removed.
Large Surface Finish *This applies to external surfaces such as the main body of the car, wheels and spoilers.*	Surfaces should be smooth to the touch without rough bits noticeable. This can be achieved through print settings and large-scale finishing techniques such as sanding. (Paint and fillers cannot be used for Qualifiers.)
Fine Detail Finish *This applies to smaller printed details and internal printed surfaces such as eyelet holes, cylinder holes, axle holes and spoiler under-hangs.*	The outermost printed layer should be intact and smooth. No little holes or voids should be present in the plastic around any holes (e.g. cylinder, eyelets). This can be achieved through advanced print settings or print orientation and small-scale finishing techniques such as the use of pliers, tweezers, drills, or files and rasps.
Car Assembly	All car parts are attached securely. Any glue used is set/dry.

Self-Assessment

Teams are required to complete a self-assessment of each of their cars. The goal of this is to allow students to assess their car in comparison to the requirements. The Self-Assessment form is included as Appendix C.

Self-Assessments are assessed to reflect completion and effort as per the rubric in the appendices.

Finals Competition

Finals Selection

Ten teams from each category (Primary and Secondary) will be selected to compete in the Finals of the PrintACar Challenge.

Teams will automatically proceed to the Finals if they have (in their category):

- the fastest penalty adjusted race time, or
- the best portfolio.

The remaining places will go to teams with the highest overall scores.

Teams will be notified of their selection for the Finals within five working days of the Qualifiers Race Day. Feedback will be provided on request.

Finals Deliverables & Submission

The table below details the deliverables for the Finals. Some items are expected to be uploaded to Google Drive prior to the Finals Day, while others must be brought with the team to Finals Day.

Teams are expected to improve their car design and re-print the car. The portfolio is to be expanded to include a description of the team's changes to their car for Finals.

Teams are also required to design and print a poster/visual display which will be allocated a space to be showcased on Finals Day.

Deliverable	Format	Submission Location
Portfolio	.pdf file	Uploaded to Google Drive Folder *Due Friday 13th Nov*
Model Files	.stl or .obj file	Uploaded to Google Drive Folder *Due Friday 13th Nov*
3D Printed Car	Fully assembled car, ready to race	Brought to Quantum Victoria on Finals Day
Self-Assessment	Printed A4	Brought to Quantum Victoria on Finals Day
Poster/Visual Display	Physical copy displayed on table or A2 paper	Brought to Quantum Victoria on Finals Day

Judging

Overall Winners

There will be one **Overall Winner (Primary)** and one **Overall Winner (Secondary)**. The winning teams will have the highest total scores based on the assessment and weighting described below and will receive a prize and trophy for their school.

A school cannot be awarded an Overall Winner prize two years in a row. If the same school does end up with the highest overall score, they will take home the trophy, but any monetary prizes will be awarded to second place.

Additional challenge awards to acknowledge aspects of the competition may be awarded on the day. Receipt of any additional award does not impact a team's eligibility for the Overall Winner award.

Quantum Victoria retains full authority to determine the winners, and all decisions are final.

Finals Weighting

Judging of the Finals is based on the assessment of a portfolio and a poster/visual display, the racing results, the car construction, and a self-assessment.

Finals Assessment Components	Point Distribution
Portfolio	40%
Poster/Visual Display	20%
Racing Points	30%
Car Construction	5%
Self-Assessment	5%

The sections below specify how to prepare each component for judging in the Finals.

Finals Portfolio Additions

Teams are required to document their continued design process from Qualifiers to the Finals. This will form Section 6 of the portfolio; requirements are outlined below.

For Finals, Quantum Victoria will only be marking section 6 of the portfolio. Teams' portfolio marks will consist of their existing portfolio mark from Qualifiers, plus their mark for section 6. For detail about how each item is assessed, please refer to the assessment rubric (Appendix D).

Section 6	Finals Preparation	25 points
Reflection & Planning		
Qualifiers Results	How did your team go in the Qualifiers?	
Improvements	What do you want to change or improve for Finals?	
Steps and Timeline	Outline your plan for making improvements and completing the additional sections for Finals (Poster, Flair).	
Final Car Design		
Screenshots	Add at least three screenshots of your final car design, from different angles.	
Design Features	Label and describe at least three key features of your car.	
Wheels	Label and describe at least two key features of your wheels.	
Challenges	What challenges did you have in designing your Finals car? (e.g. software challenges, physical challenges, availability)	
Flair & Finishing		
Team Branding & Decorations	What did you add to show your team colours/logo? Did you add any decorations?	
Finishing Techniques	Outline the finishing techniques that you used to refine the external surfaces of your printed car. (e.g. sanding, support removal, smoothing)	
Final Car Print		
Unassembled Photos	Add at least one photo of your final car, BEFORE you assemble it (put the wheels and axles on).	
Assembled Photos	Add at least four photos of your final car, AFTER you have assembled it, from the front, side, top, and bottom.	
Filament	What filament did you use? List the manufacturer, material type (e.g. PLA) and colour.	
Slicing Settings	What settings did you use when you sliced your model for printing? What software did you use? Did you slice it yourself, or did your teacher do it for you?	
Challenges	What challenges did you have in printing? (e.g. print fails, surface finish, supports) What challenges did you have in assembling your car? (e.g. glue, axles etc.)	

Poster/Visual Display

The purpose of your poster/visual display is to showcase your team and your car to other finalists. Suitable mediums for this section could be a poster, diorama, or similar. If a poster is chosen, then it should be A2 size.

Teams will be awarded marks for their poster/visual display based on the inclusion of the required information, the level of detail, the clarity of communication of information, and the visual appeal of the display. This will be assessed using the Assessment Rubric (Appendix G).

Poster/Visual Display	15 points
Team Profile	
Team Name	
School Name	Displayed in addition to logo.
Team Logo	
Team Photo	A group photo of the team OR Individual photos of each team member.
Team Members	Include your names, year levels and roles in the team.
Car Details	
Photos	At least one photo of your car.
Features	A brief summary of at least three key features of your car.
Explanation	Clear explanation of why the identified features are important.

Finals Racing Points

Each team must produce one 3D printed car to race at Finals Day. Each car must be designed by the participating team and should include minor improvements from one of their car designs that competed in the Qualifiers.

In Finals, each car will race four times. Any time penalties incurred for breaches to car design specifications will be added to these race times. The average of the three fastest times, including penalties, will be calculated and attributed to the car as its Average Race Time.

Cars will be ranked based on their Average Race Time and points allocated accordingly, with the fastest car receiving the maximum number of points. Primary cars will be ranked against other primary cars, and secondary cars against other secondary cars.

Car design specifications, rules for penalties and determining race suitability remain unchanged for Finals and are outlined on pages 13 to 20.

Finals Car Construction

As at Qualifiers, each car will be assessed based on the quality of 3D printing, finishing, and assembly. The criteria are designed to encourage students to refine the quality of their 3D printed product using various techniques such as changing their slicing settings, understanding the material they are using and surface treatments such as sanding.

In Finals teams may also apply decorations to their car.

Car Construction Addition		3 points
Decoration	Decorations applied securely and/or filament choice improves the visual appeal of the car.	

The detailed marking rubric for Finals car construction can be found in Appendix E.

Self-Assessment

Self-assessments are left unchanged for Finals and can be found in Appendix C.

Final word

Whilst there is only a single Primary Overall Winner and a single Secondary Overall Winner, Quantum Victoria would like to acknowledge the students, teachers, support staff and schools for their effort and dedication which make this competition possible.

If you would like to contact Quantum Victoria please use the email below:
admin@quantumvictoria.vic.edu.au

Appendices

A – 2026 Updates

Every year Quantum Victoria makes changes to the specifications for the Challenge. This ensures originality of designs and allows students to compete more than one year. Teams should read through all requirements closely.

This year, the following changes have been made:

- Weight requirements have been reduced.
- The portfolio has been reorganised to better align with the design process.
- Wording in this Field Guide has been revised to improve clarity and consistency.
- Diagrams have been added to the car design specifications.
- Eyelet requirements have been clearly defined to emphasise their purely functional purpose.
- The process for allocating penalties and determining race eligibility has been clarified to improve transparency.

B – FAQs

Q. Do we have to use our school printer to print our car?

A. If you do not have access to a printer at your school or your school printer is unable to print anything of reasonable quality, check out local libraries, maker spaces, men's sheds, community centres, etc. If you cannot find a suitable printer to use, please contact us to discuss alternative options.

Q. Does it have to be printed with a specific type of 3D printer? If so, what type?

A. Students can use any 3D printer that uses filament. Note that only one of ABS or PLA filament can be used.

Q. Do the wheels need to be printed?

A. Yes, the wheels need to be printed. All parts of the car except for the axles need to be printed.

Q. How much teacher input is allowed, if any?

A. We want teachers to act as a guide to their teams. Teachers can discuss and clarify the requirements as listed in this field guide and also teach skills students need to complete the tasks required. However, students must design and create their cars, portfolio and poster/visual display themselves. You need to show evidence of this in your portfolio.

Q. What glue can I use to assemble my car?

A. You should research the best glue to use for the material you have chosen (this might be a good thing to add to your portfolio).
You must not use hot melt glue to attach eyelets to your car or wheels to the axles.
Below we have provided some suggestions.

Body of Car	• PVA • Super glue (Cyano acrylate) • UV curable resin
Wheels	• 5-minute epoxy resin e.g. araldite • UV curable resin

Q. Are we allowed to use lubricant on the axles?

A. No.

Q. Do I need to remove any 3D printed support material?

A. Yes, you need to remove all support material (including in the eyelet holes and the canister hole).

Q. If my car breaks during racing, can I fix it?

A. This will depend on how much the car breaking affects its safety. We will allow you (or a Quantum Victoria staff member) to repair your car if it is safe to do so. However, if the car breaks in the same way again, it will not be allowed to race further on that day. If the break is a result of something you have assembled coming loose (e.g. wheel/s falling off), then this will affect the mark you will receive for the Car Construction section.

Q. What are the tolerances for printed shapes?
A. Tolerance refers to the difference between the 3D model in the modelling software and the printed product. Tolerances will vary depending on your printer and materials used. Some trial and error might be needed. Judging will use the tolerances given in the Car Design Specifications.

Q. Does the portfolio and/or poster/visual display need to be printed, or can it be handwritten?
A: Teams can choose whether to handwrite or create their portfolio digitally. Regardless of the chosen medium, a digital copy of the portfolio must be uploaded to the Google Drive folder by the due date. A physical copy of the poster/visual display needs to be submitted on Finals Race Day. Again, these can be handwritten or created digitally.

Q. My school is in Melbourne close to Quantum Victoria. Do I have to send my car/s by courier or can I hand deliver it?
A. You can hand deliver your car as long as it is received by Quantum Victoria by Friday 24th July.

Q. How can we learn more about how to use 3D Design and Printing?
A. Teachers can book their classes into one of our 3D Modelling and Printing programs to upskill their students (subject to availability for onsite and synchronous programs). Visit https://www.quantumvictoria.vic.edu.au/programs?features%5B%5D=3d-modelling for more information on the primary and secondary 3D Printing programs.

Q. Can I use a pretty filament?
A. Yes, but not transparent or glow-in-the-dark filaments as these may not be picked up by the track sensors.

Q. Can I ask more questions?
A. Yes, please do! We will be running a webinar for teachers on Thursday 26th March at 3:30pm. You can also email admin@quantumvictoria.vic.edu.au at any time.

Q. I'm not sure if my car meets specs, can you check it?
A. Yes, you can submit it for early feedback. If you want to do this, get in contact with us and make sure we have received your car before Friday 24th July.

Q. My school won last year, can I enter this year?
A. Yes, but please be aware that you will not be eligible to receive the Overall Winner prize.

Q. Can I complete the Self-Assessment electronically?
A. Yes, there will be a fillable PDF available.

Q. Where is this Google Drive folder you speak of?
A. Your teacher will receive an email with a link shortly after team registrations close.

Q. How fast will my car go?
A. Over the last two years, the average time for cars to race down the track was just over 1.8 seconds.

C – Self-Assessment Form

Team: _____ **PRIMARY**

School: _____ **SECONDARY**

Read each specification and answer Yes (Y) or No (N). Include measurements where requested.
If you list a No for any specification, check the penalty applicable and, if possible, make changes.

	Manufacturing & Assembly	Measurement	Y/N
1	**Manufacturing:** All components of the car must be manufactured using 3D FDM with ABS or PLA filaments.		
2	**Assembly:** Car must be fully assembled.		
	Overall Dimensions		
3	**Weight:** Car must have a mass of **90g or more**.		
4	**Length:** Car must have a length of **90 – 140mm**.		
5	**Height:** Car must have a height of **50 – 90mm**.		
6	**Width:** Car must have a width of **50 – 90mm**.		
7	**Minimum Clearance:** Must be **at least 2.5mm** clearance between lowest part of car body/eyelets and ground.		
	Wheels		
8	**Rotation:** Wheels must rotate freely.		
9	**Diameter:** Wheels must have diameter of **20 – 50mm**.		
10	**Alignment:** Wheels must be vertical and set in parallel.		
	Canister Hole Dimensions		
11	**Diameter & Shape:** Hole must be cylindrical with **20mm** diameter.		
12	**Inner End & Depth:** Inner end of hole must be flat with **50mm** depth.		
13	**Wall Thickness:** Wall around hole must be **more than 3mm**.		
	Canister Hole Location		
14	**Alignment:** Hole must be centred and parallel to ground.		
15	**Rearmost Point:** Hole must be the rearmost point of the car.		
16	**Lowest Point:** Bottom of hole must be **20 – 35mm** above the ground.		
	Eyelet Dimensions		
17	**Number & Shape:** Car must have two rectangular prism eyelets, each with a cylindrical hole.		
18	**Width & Height:** Eyelets must have width and height of **12mm**.		
19	**Length:** Eyelets must have length of **6mm**.		
20	**Hole Diameter:** Eyelet hole must have **5mm** diameter.		
21	**Hole Alignment:** Eyelet hole must be centred in the eyelet.		
	Eyelet Location		
22	**Eyelet Gap:** Eyelets must be **more than 50mm** apart.		
23	**Alignment:** Eyelets must be in line with centre of the car, parallel to the ground and equal distance to the ground.		
24	**Clear Path:** Must have a clear path between eyelet holes.		
25	**Clearance:** Eyelets must be **3mm** off the ground.		

D – Assessment Rubric: Portfolio

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Criteria	High	Medium	Low	
1 - Team Profile Page				**5 points**
Team Name	Clearly included		Missing	**0.5**
School Name	Clearly included		Missing	**0.5**
Team Logo	Clear, well-designed logo	Logo included	Missing or unclear	**3**
Team Photo	Photo included		Missing	**0.5**
Team Members – names and roles	All names and roles listed		Missing or unclear	**0.5**
2 - Initial Planning				**10 points**
Brainstorming – initial ideas	Clear and thoughtful ideas described	Ideas described	Minimal or unclear	**2**
Concept Sketch – first car design	Clear sketch with labelled features	Sketch included	Missing or unclear	**2**
Inspiration	Inspiration clearly described	Inspiration identified	Missing or unclear	**2**
Research	Relevant research included	Some research included	Missing or unclear	**2**
Timeline	Planned timeline explained	Basic timeline included	Missing	**1**
Requirements (Field Guide)	Key requirements clearly identified	Some requirements identified	Missing	**1**
3D Printing – printer & software	Printer and software clearly identified	One identified	Missing	**1**
3 - Prototyping				**20 points**
First Designs				
3D Modelling	Clear explanation	Basic explanation	Missing or unclear	**2**
Software	Software clearly identified	Software named	Missing	**1**
Skill development	Learning new skills explained	Some learning mentioned	Missing	**1**
Screenshot	Clear screenshot included	Screenshot included	Missing	**1**
Changes to first design	Clear changes and reasons	Changes identified	Missing or unclear	**2**
3D Modelling	Clear explanation	Basic explanation	Missing or unclear	**2**

First Print				
Photo – first print	Clear photo included	Photo included	Missing	**1**
Design improvements	Clear successes and improvements	Some improvements identified	Missing or unclear	**2**
Printing improvements	Print settings discussed	Some settings mentioned	Missing	**1**
Next Designs & Prints				
More designs	Multiple designs described	At least one described	Missing	**2**
Design screenshots	Clear screenshots included	Screenshots included	Missing	**1**
More prints	Multiple prints described	At least one described	Missing	**1**
Reflection				
Successes	Clear successes explained	Successes identified	Missing	**2**
Challenges	Clear challenges explained	Challenges identified	Missing	**2**

4 - Qualifiers Car — 10 points

Qualifiers Car Design				
Screenshots – final design	3+ clear screenshots	Screenshots included	Missing	**2**
Design features	3+ features labelled and described	Some features described	Missing or unclear	**2**
Wheels	2+ wheel features described	At least one described	Missing	**1**
Physics concepts	Physics concepts clearly explained	Physics mentioned	Missing or unclear	**1**
Design challenges	Challenges clearly explained	Challenges identified	Missing	**1**
Qualifiers Car Print				
Unassembled car photo	Clear photo included	Photo included	Missing	**0.5**
Assembled car photos	Front, side, top photos included	Some views included	Missing	**1.5**
Filament details	Manufacturer, material & colour listed	Some details listed	Missing	**1**
Filament research	2+ properties identified	1 property identified	Missing	**1**
Slicing settings	Settings and software explained	Basic settings included	Missing	**1**

5 - Reflection — 5 points

Looking back – achievements	Achievements clearly described	Achievements identified	Missing	**2**
Successes	Clear strategies explained	Strategies identified	Missing	**1.5**
Improvements	Clear improvements suggested	Improvements identified	Missing	**1.5**

6 - Finals Preparation (Finals Only)				25 points
Criteria	**High**	**Medium**	**Low**	**Points**
Reflection & Planning				
Qualifiers Results	Clear, thoughtful reflection on race performance	Basic reflection on performance	Minimal or unclear	**3**
Improvements	Clear improvements explained	Improvements identified	Missing or unclear	**3**
Steps and Timeline	Clear, logical improvement steps outlined. Clear and realistic timeline included.	Improvements identified, some steps outlined.	Minimal or unclear	**3**
Finals Car Design				
Screenshots	3+ clear screenshots from different angles	Screenshots included	Missing	**2**
Design Features	3+ features labelled and described	Some features described	Missing or unclear	**2**
Wheels	2+ wheel features described	At least one described	Missing	**1**
Challenges	Challenges clearly explained	Challenges identified	Missing	**1**
Flair & Finishing				
Team Branding & Decorations	Clear use of team colours/logo. Decorations added and explained.	Some branding included. Decorations added	Missing or unclear	**2**
Finishing Techniques	3+ techniques labelled and described.	Some techniques labelled or described.	Missing or unclear.	**2**
Qualifiers Car Design				
Unassembled car photo	Clear photo included	Photo included	Missing	**1**
Assembled car photos	Front, side and top photos included	Some views included	Missing	**2**
Filament details	Manufacturer, material & colour listed	Some details listed	Missing	**1**
Slicing settings	Settings and software explained	Basic settings included	Missing	**1**
Printing challenges	Printing challenges explained	Challenges identified	Missing	**1**

E – Assessment Rubric: Car Construction

QV STAFF USE ONLY

Criteria	High	Medium	Low	Not shown	Points
Support Material	All traces of support material have been removed.	Traces of hard-to-reach support material still visible.	Easily removable support material still visible.	Support materials not removed.	**2**
Large Surface Finish (body & wheels)	Main body surfaces are smooth to the touch. Wheel sides and edges are smooth. No rough surfaces are noticeable.	Some components or parts of components have a rough surface.	Most components have a rough surface.	All rough surface components have extensive delaminating or warping.	**3**
Fine Detail Finish	No evidence of holes or voids in or adjacent to small features. Feature surfaces are smooth and outermost layer is intact.	Some evidence of holes or voids in the features OR features are rough OR the outermost layer is compromised.	Minimal attempt to smooth features or remove printing voids.	No attempt to create smooth features or remove printing voids.	**3**
Car Assembly	All parts are securely attached and/or glued.		Parts have fallen off or broken. OR Parts are loose or not well connected and may fall off or break.	No assembly.	**2**
Decoration (Finals Only)	Paint / decorations are applied well to the surface, and/or filament choice improves the visual appearance of the car. Surfaces have been sanded/smoothed to remove 3D printing artifacts.	Paint / decorations aren't applied well to the surface and/or some attempt to sand/smooth surfaces to remove 3D printing artifacts.	Minimal decorations and/or little attempt to sand/smooth surfaces to remove 3D printing artifacts.	No decorations applied after 3D printing. Filament choice has not been considered.	**3**

F – Assessment Rubric: Self-Assessment

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Self-Assessment Degree of Completion			Points
All specifications checked and Y/N recorded. All measurements recorded as required.			**5**
All or MOST specifications checked and Y/N recorded. Most measurements recorded as required.	OR	Approximately 80% completion.	**4**
Some specifications checked and Y/N recorded. Some measurements recorded.	OR	Approximately 60% completion.	**3**
Some specifications checked and Y/N recorded. No measurements recorded.	OR	Approximately 40% completion.	**2**
Few specifications checked and Y/N recorded. No measurements recorded.	OR	Approximately 20% completion.	**1**
Not completed or not submitted.			**0**

G – Assessment Rubric: Poster/Visual Display

QV STAFF USE ONLY

Criteria	High	Medium	Low	Not shown	Points
Poster/visual display provided	Poster: A2 size OR other medium: able to be displayed either on display board or table.			Not shown	**1**
Team Profile	All required information provided.		Some required information missing.	Not shown	**2**
Photos of Car	Present			Not shown	**1**
Important Features	The summary identifies at least 3 key features of the car.	The summary identifies 2 key features of the car.	The summary identifies 1 key feature of the car.	Not shown	**4**
Clarity of Communication	All features are well-explained, and reference is made as to why these features are unique/important.	There are some explanations of the features and brief references as to why they are unique/important.	There are limited explanations of the features and no reference as to why they are important.	Not shown	**3**
Visual Appeal	Overall, visually appealing. Creative design choices make the display stand out. Colours, fonts and graphics enhance the poster /visual display. Content arranged clearly and is easy to follow.	Overall, visually appealing. Colours, fonts and graphics support the readability of the poster /visual display. Content arranged so it is fairly easy to follow.	Colours, fonts and graphics affect the readability of the poster/visual display. Layout of information is somewhat confusing and difficult to follow.	Layout difficult to follow and information difficult to read	**4**