



JAGUAR

PRIMARY SCHOOL CHALLENGE



UK Competition Guidebook

2018/19



Jaguar Primary School Challenge 2018/19 Season

This document has been prepared by Engineering In Motion, ratified and approved for release by the Jaguar Primary School Challenge rules committee. Any approved revisions will be officially released as supplementary regulations through the Jaguar Primary School Challenge website. This document and any future revisions will be available via www.primaryschoolchallenge.com. On behalf of the whole team, good luck and enjoy the competition!

Victoria Perry

Head of Community Relations, Jaguar Land Rover

Andrew Denford

Founder and Chairman, Engineering In Motion



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Rule revisions from the 2017/18 season



Just like in the real world of motorsport, at the end of each season we reflect on our rules and make any changes we think are important. If you see the 'NEW!' symbol next to any rule, we've made changes to it for the new 2018/19 season so make sure you read it extra carefully.

What is the Jaguar Primary School Challenge?



2018 UK National Finalists
British Motor Museum, Gaydon

The Jaguar Primary School Challenge (JPSC) engages with primary schools students and teachers across the UK to give the chance for teams of 3-6 to work and compete like a real racing team. The challenge is open to students aged 5-11 years old and involves designing and manufacturing the fastest car possible, emulating the design and engineering processes employed by real engineering companies, such as Jaguar Cars.

The Jaguar Primary School Challenge is sponsored and supported by Jaguar Cars who have been Title Partner of the project since 2013. Jaguar understand the need to encourage and motivate young people to develop key skills needed for companies such as Jaguar to be successful in producing award winning vehicles.

“Encouraging the next generation of Engineers is something Jaguar is extremely dedicated to especially when projects such as the Jaguar Primary School Challenge develop the same key skills and engineering processes that we look for in our engineers. The difference is these are primary school students learning these skills from an early age which means the future of engineering is bright.”

Victoria Perry, Head of Global Impact Jaguar Land Rover

This document aims to inform you of all you need to know about the challenge and answer any questions you may have. The secondary and primary schools participation in the challenge will be by invitation only, however if you would like to speak directly to Engineering in Motion about the challenge you can contact the UK National Project Manager:

Mark Wemyss-Holden

EIM UK National Project Manager

Engineering in Motion

Tel: 020 7344 8444

Email: JPSC@engineeringinmotion.org

Website – www.primaryschoolchallenge.com

The Jaguar Primary School Challenge website provides all the relevant information students and teachers need to take part in the challenge, including software templates, challenge documentation, information videos and up-to-date announcements.

Where Could JPSC Take You?

When the pupils move onto secondary school, they will be able to continue developing their STEM (Science, Technology, Engineering & Maths) skills and competing in the competition by forming a team and taking part in the secondary school Land Rover 4x4 in Schools Technology Challenge in the same way as the Jaguar Primary School Challenge. This will include competing in regional heats held around the country and then hopefully the UK National Final. National Champions from 20 countries around world are invited to compete at the World Finals where they will go head to head to become the Land Rover 4x4 in Schools World Champions and earn the chance to aim for a career with one of the world's most forward-thinking Technology Company.



For more information please visit <http://www.primaryschoolchallenge.com>



A word from our patron...

Creative thinking, innovation and problem solving have always been some of the fundamental reasons behind Jaguar Land Rover's success. It's extremely important we as a company develop these core skills in the next generation of Jaguar Land Rover designers so we continue to produce vehicles that are desired around the world.

This is why I am delighted and honoured to promote this project, as it not only develops students creative and hands on skills but also highlights the importance of working together as a team which is what Jaguar Land Rover is all about. I would like to wish all the teams the very best of luck with the competition."

Ian Callum, Design Director, Jaguar

The Challenge

This Challenge Handbook will provide you with all the relevant information needed, from setting up the project and delivering it within your school right through to competing at Regional's and the UK National Finals.

Students are challenged to form a team of 3-6 pupils and design a race car out of 160g/m² card complete with wheels, body and even a mini driver. They will design and manufacture a body shell to fit a standard chassis using template software before printing/cutting their designs onto card and then making their car ready to race. Cameo cutters used must be able to perforate but not score (other cutters such as a Roland Camm I must not be used for safety reasons).

IMPORTANT NOTE: The schools participation in the challenge will be by open registration. The challenge works by secondary schools acting as a HUB to work with and engage its local partner primary schools, mentoring and supporting them through the project up to the regional final. During registration, you will be able to choose your nearest JPSC HUB to work with. The secondary school will host the regional heat with the support and aid from Engineering in Motion.

For the 2018/19 season, regional finals will be held through the regional school hubs from March through to May 2019 with the UK National Final taking place in the summer of 2019. Each primary school will be permitted to enter up to 3 teams into their Regional Final. From each regional event, teams will be selected from a judging process to represent that region at the UK National Final. Please check www.primaryschoolchallenge.com for updates on the dates and venues for each challenge.



Unless otherwise stated, the outlying plan of the regional final is as follows:

09:00am	Teams arrive and set up pit displays
10:00 – 10:30	Welcome
10:30 – 12:30	Judging session I
12:30 – 13:00	Lunch (please bring packed lunches with you)
13:00 – 14:30	Racing
14:30 – 14:45	Judges de-brief
14:45 – 15:00	Awards
15:00pm	Close of event

Getting Started

This diagram gives you an idea of the process flow involved to get you started in the challenge:

1. READ THE RULES!

- Read this guide very carefully one section at a time, so your design will be fit to race. Pay **EXTRA SPECIAL** attention to the **Technical Regulations**, which explain exactly how to design your car.

2. Register your team at: www.primaryschoolchallenge.com

- Register your team(s) using our online registration system and choose your nearest regional final. A member of the Engineering in Motion team will then contact you with the details of your nearest JPSC hub.

3. Download the CAD files from www.primaryschoolchallenge.com

- There are **2** JPSC CAD files that can be downloaded to help you build your car. These are: **CHASSIS** and **ENGINE HOUSING**. Make sure you download the correct file type for your machine.

4. Design the racing car of the future

- Start designing a super cool aerodynamic body and some sleek wings for your racing car. **Remember no idea is too crazy at this stage, so do loads of sketches to experiment...** Then turn your freehand sketches into an accurate 2D CAD model, ready to be manufactured!

5. Manufacture your car

- **Make sure your design is fully legal before cutting your final car.** Make a test model of your car first, either by hand or using CNC equipment, then fine tune your design to create the finished product!

6. Create a 10-page Design Portfolio

- The judges will want to see a **10-page Design Portfolio** on Race Day. This should show sketches, images of models, 2D CAD work and testing to explain how you designed, developed and manufactured your car.

7. Create a 5-minute Verbal Presentation

- As a team, you must put together a verbal (spoken) presentation that lasts no longer than 5 minutes. You can use a powerpoint presentation to help you along, but it's all about speaking directly to the judges!

8. Create a table-top display for your Team Pit Area

- There will be an award for the best Team Pit Display on Race Day, so get creative to show off your team!

9. Attend your nearest Regional Final in March-May 2018

- Attend your nearest Regional Final, ready to compete! Remember to relax and enjoy the day, show plenty of smiles and just do your best. See www.primaryschoolchallenge.com for full details of regional finals.

10. Regional winners invited to UK National Final in summer 2018

- The top teams from around the UK will compete head-to-head to become crowned the UK National Champions 2019 at our season-finale, the UK National Final. We hope to see you there for the big day!

Equipment

How to obtain software, hardware and consumables.

If you would like to purchase any equipment for the challenge such as the FI Race system, track and Silhouette Cameo Cutter as used for the challenge, please visit our website or contact Denford Ltd to obtain a formal quotation:

Denford Limited,
JPSC Sales,
Armytage Road
Brighouse
West Yorkshire
United Kingdom
T: 01484 728000

E: sales@denford.co.uk
W: www.denford.co.uk

To view prices and buy consumables: <https://isupply3d.com/FI-In-Schools/FI-In-Schools-Consumables>



Silhouette Cameo 3 12" Cutter: £266.66 (Product code: BI01819CS3)



IMPORTANT NOTE: With older machines, you must use Silhouette Studio Design Software Version 2.9.45 (Legacy version). For new machines, simply download and use the latest software. To download the FREE software, please go to www.silhouetteamerica.com



FI Race Control System: £1550 (Product code: FIRS001000B)



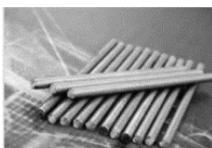
FI Race Track: £2695 (Product code: FIRT001000B)



4 gram CO₂ Cartridges - pack 120: £POA (Product code: N53338)



Primary Wheels – pack of 100: £11 (Product code: NX0846)



Wheel axles – pack of 100: £5.60 (Product code: NI6010)

The Design Brief

You are the design team commissioned to research, design, manufacture, test, promote and race the fastest car possible, driven by compact compressed air. In order to enter the championship, you should form a team of 3-6 students and allocate each team member a job role within your group. Ideally, one role should be allocated to each person.

The following job roles should either be covered by each team members or your team as a whole.

- **Team Manager** (maximum 1 person).
Responsible for managing the team, ensuring that the primary and back up cars are ready for the finals. The team manager works closely with all members of the team, offering assistance where necessary including promotion, marketing, manufacturing and sponsorship.
- **Manufacturing Engineer**
Responsible for advising team members on the manufacture of the car and the constraints of the machining process. Manufacturing engineers will need to liaise with the design engineers to report and help solve any problems with the construction of the car.
- **Design Engineer**
Responsible for the styling and aerodynamic performance of the car design. The design engineers will need to liaise with the manufacturing engineers to ensure their ideas can be realised.
- **Graphic Designer**
Responsible for producing the colour schemes applied to the vehicle, including any special sponsorship decals, together with the final graphic renderings and any additional marketing material. The graphic designer will liaise with the design engineer to ensure any schemes will fit the shape of the vehicle.

There are so many tasks that must be mastered, in order to design, manufacture, prepare and finally enter a car for racing, teamwork will be vital to your success.

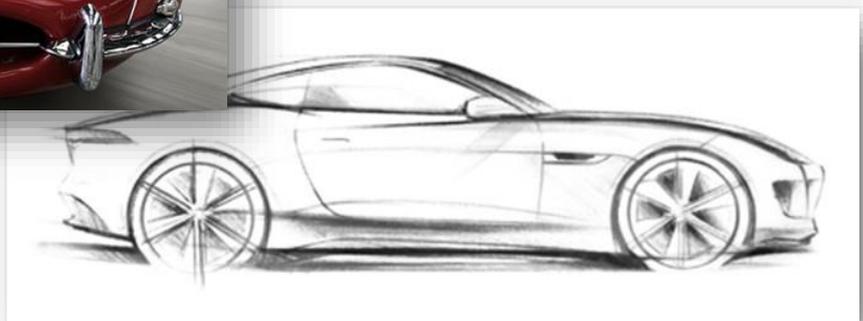
A real racing team succeeds because all the people learn to work together and support each other. Remember, no one person is more important than other members in the team.



ENSURE YOU READ AND CHECK THE RULES VERY THOROUGHLY BEFORE BEGINNING THE DESIGN AND CONSTRUCTION OF YOUR CAR.

What is a Fast Car?

Fast cars come in all different shapes and sizes. Before you get started on your designs, research as many fast cars as possible and compare their shape, size and style to investigate which aspects will be best for your design. Now it's your turn to design the fastest car with your own thoughts and imagination.



Chassis & Engine Housing Construction

Below are step by step instructions on how to build the chassis and engine housing. Please download the car 'net' templates from the JPSC website (www.primaryschoolchallenge.com/downloads) and watch the on-line video clips before construction.



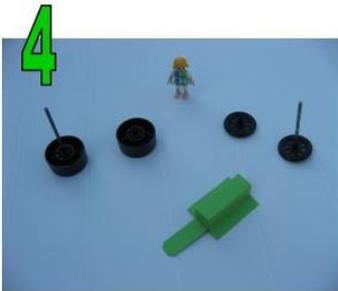
1. What you need



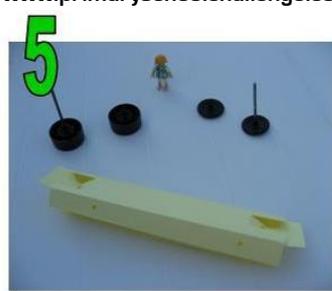
2. Download the 'nets' from www.primaryschoolchallenge.com



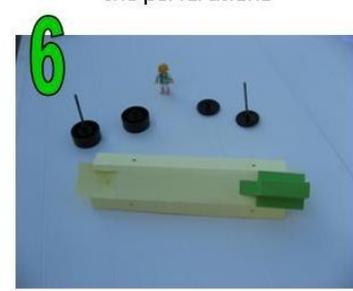
3. Fold the engine housing along the perforations



4. Glue the engine housing



5. Fold the chassis along the perforations



6. Slide engine housing long tab through slot in the chassis



7. Staple engine housing into place with 2 staples per side



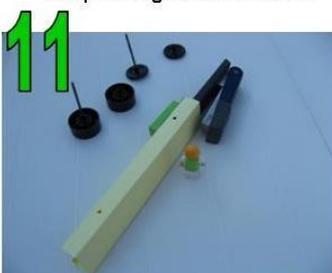
8. Using long reach stapler, staple long tab to chassis



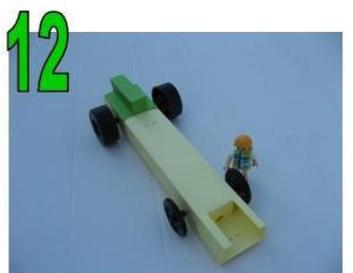
9. Glue chassis



10. Glue chassis brackets into place at both ends and staple



11. Staple chassis brackets for a rigid chassis



12. Finish chassis/engine housing with wheels and driver



IMPORTANT SAFETY NOTE

Judges will check that all race cars are safe to race before each race. Please check your cars have been correctly assembled according to this document and the engine housing is stapled to the chassis using **five (5) staples**. If testing your cars, only use 4 gram CO₂ cartridges and if possible, use a purpose-designed and tested deceleration unit. If deceleration towels are used, the cars may be damaged irreparably. The judges will check each car before racing and at the end of each race to see if it is safe to race the car again. Judges reserve the right to remove cars from racing events on safety grounds, at their discretion.

Please ensure your car meets ALL technical regulations set out in this book.

ARTICLE I - DEFINITIONS

Various terminology and phrases will be used in all documentation and during a Jaguar Primary Schools Challenge event. This article will give a definition for each one:

I.1 JPSC (Jaguar Primary School Challenge)

I.2 Article

Each section in all documentation will be referred to as an Article which brings Jaguar Primary School Challenge documents in line with the Fédération Internationale de l'Automobile (FIA) documentation.

I.3 Parc Fermé

A secure area where all primary and back-up race cars are held to prevent unauthorised handling, but to allow technical inspections to be conducted by the Judges. (Literal meaning in French of 'closed park').

I.4 Competition Schedule

The competition program will detail the schedule of judging activities for all teams.

I.5 Car race time value

A 'car race time' value is the actual time taken for a Jaguar Primary School Challenge car to travel the track from start to finish, measured from the instant the launch pod fires to when the car breaks the finish line timing beam. In the case of reaction races, the 'car race time' value is calculated as the 'total race time' value displayed on the electronic start gate minus the 'reaction time' value displayed for that race.

I.6 Total race time value

The 'total race time' value is displayed in the total time field on the electronic start gate at the conclusion of every race. This time is the sum of the 'car race time' value and any 'reaction time' value displayed on the electronic start gate. During time trial races where the automatic launch mode is used there is a zero reaction time value.

I.7 Reaction time value

A 'reaction time' value is the time recorded from the instant the five (5) start lights extinguish to the instant the start trigger is activated by the driver. This value is displayed in the reaction time field on the electronic start gate.

I.8 Project elements

These are any materials and resources that the team presents as part of its entry for any judging activity.

ARTICLE 2 – GENERAL REGULATIONS

- 2.1 Your team must contain 3-6 pupils.
- 2.2 Each school can enter up to 3 teams into the Regional Finals.
- 2.3 Your team must use Techsoft 2D Design, Silhouette Studio or Master Robo design software to produce your body shell design ideas and manufacture them on a cutter plotter that perforates, and not scores the card. Details on how to obtain this software can be found on the individual manufactures websites.
- 2.4 Each car must be manufactured at your school.
- 2.5 Each team must bring two identical cars to the regional final and national final - a primary race car and an identical spare back-up.
- 2.6 Each team must produce a design portfolio including initial ideas, design development and evidence of testing. At a regional final a maximum of 10 A4 pages of project work are required **(this does NOT include cover pages or a contents page)**. Please note: you can produce a maximum of either 5 double sided pages or 10 single sided pages. Each team's portfolio should reflect the range of skills the team has demonstrated during project. It is strongly recommended, therefore, as a minimum that pieces of work are included with the team logo/name on every page.
- 2.7 Teams must prepare a verbal presentation on their work. At the regional final 5 minutes maximum will be allocated and 8 minutes at the national final. All team members must be present.
- 2.8 At regional level and the national final, all teams will be provided with a table (without tablecloth) referred to as a team's "pit area" where teams can display their work. Teams are allowed to bring their own display system (e.g. display board).
- 2.9 Any components (wheels, axles, etc.) externally produced, must be declared and the team must have a clear understanding of how those components have been manufactured.
- 2.10 Each team will race another team using the reaction racing mechanism. The team will race twice in each lane of the track (4 races altogether).
-  2.11 On the day of the event we will set teams an Additional Challenge to test their sketching and design skills and ability to work under pressure in a limited time. Information about the Additional Challenge will be announced on the day of the event. It is highly recommended to take basic stationery with you to the event, such as pens, pencils, rubbers and coloured crayons.
- 2.12 Prizes will be awarded during the awards ceremony for the teams who score the most points throughout the day in the various judging elements:
- | | |
|---|-----------------------------|
| 1. Overall Winner (plus invitation to the national final) | 5. Best Portfolio |
| 2. 2nd Place Overall | 6. Best Verbal Presentation |
| 3. 3rd Place Overall | 7. Fastest Car |
| 4. Best Engineered Car | 8. Additional Challenge |
- 2.13 All teams must sign and submit a "School Consent Form". If any student or parent has any issues with photos being taken, they must make it clear at the time of photos being taken.

- 2.14** All cars must fit within the specified dimensions. We expect all cars to be complete, finished and ready to race.
- 2.15** Only three teams in total from each school are permitted to attend the regional and national final (if qualified). Should any teams withdraw or become disqualified, reserve teams may be selected from a previously submitted list. These teams will be informed by post/email/telephone call as soon as the organisers are aware of the situation.
- 2.16** The cars should be produced during the academic year of the regional finals. The same car design must not be entered more than once. All cars must be mounted on the standard chassis (which can be download from: <http://www.primaryschoolchallenge.com/downloads/>) using 160g/m² card.
- 2.17** Each design must leave enough space for an entry number sticker to be applied to the car body. Your number will be given to you at registration and must be placed before racing. The size of the sticker will be a maximum of 30mm (length) and 15mm (height). A standard Jaguar logo must be applied to each side of the car which will also be provided at registration.
- 2.18** The official length of the race track from start to finish is 20 metres. Race officials reserve the right to shorten the track to fit within certain venues if necessary, any changes will be made before the competition begins and will be kept constant for all teams during the event.
- 2.19** All cars will be checked for safety before they are allowed to race. If the Race Officials are unhappy with the safety of the car or a rule infringement has occurred, teams may be permitted to make modifications at the discretion of the judges, or can opt to use their spare car. Otherwise the team may be disqualified or points deducted from the overall team score.
- 2.20** Race Cars and spare cars will be handed into race control, scrutineered for compliance and held in 'Parc Fermé' for the duration of the event. Cars can only be released with the permission of the Lead Judge/ Race Official.
- 2.21** All race cars must have their race team name and school name on the base of the car.

ARTICLE 3 – COMPETITION AND JUDGING FORMAT

3.1 Competition program

3.1.1 Each team will be judged as per the competition program. The competition program will be formulated by Engineering in Motion Ltd. to best and fairly accommodate all judging and other competition activities. Teams will rotate around judging activities as per this program, with each rotation usually of 15 minutes in duration.

3.1.2 Judging Streams – The competition program will normally be divided into two parallel judging streams (unless team numbers permit one judging stream) to help ensure quality judging time intervals within the event time constraints. A number of strategies are implemented within the judging process, including Judge Briefings and Judge Reviews for cross-moderation to ensure that there is consistency across the judging streams.

3.2 Judging categories

There are six (6) main judging categories, each with its own team of judges and specified judging activities as detailed in further articles.

- Specification Judging
- Engineering Judging
- Portfolio and Display Judging
- Verbal Presentation Judging
- Racing
- Additional Challenge

3.3 Judging score cards

The Jaguar Primary School Challenge judging score cards provide detailed information in relation to what the Judges will be looking for. The key performance indicators are used by the judges in awarding points during the judging activities. The 2018/19 judging score cards can be found in the appendix of this document. **READING THE SCORE CARDS CAREFULLY IS IMPORTANT. THEY PROVIDE CRITICAL INFORMATION FOR TEAMS AS TO WHAT NEEDS TO BE PRESENTED FOR EACH JUDGING CATEGORY.**

3.4 Point allocations

Points will be awarded to teams across six (6) categories.

ARTICLE 4 – SPECIFICATIONS JUDGING

4.1 What will be judged?

Specifications judging is a detailed inspection process where the race car and back-up car are assessed for compliance with the JPSC Technical and Competition Regulations, also referred to as 'Scrutineering'. Refer to the Specifications judging scorecard for scoring details.

4.2 Team preparation

Teams must ensure that their race car(s) and design specification document are complete and ready for specification judging before they are submitted.

4.3 Who needs to attend?

Specifications judging is a closed activity that no team member or supervising teacher may attend.

4.4 Judging process / procedure

Any infringements of the Technical Regulation articles on either car will result in points being deducted and the team being ineligible to win the Fastest Car Award. Specifications judging will be conducted within the confines of Parc Fermé, where the Specifications Judges will scrutinise cars for compliance to the Technical and Competition Regulations.

ARTICLE 5 – ENGINEERING JUDGING (Including Additional Challenge)



5.1 What will be judged?

The Engineering judges will assess the team's use of cutter plotter technologies along with the quality of manufacture of both the primary and back-up race cars submitted. The specific areas to be assessed are:

- Understanding and application of CAD-CAM technology
- Analysis of design work
- Quality of manufacture and assembly of the two submitted cars
- Manufacturing process discussed in the portfolio
- Use of cutter plotter and other CAM technologies

Additional Challenge: On the morning of the regional and national final, the team will also be given an Additional Challenge which they have the day to complete in-between judging sessions. The Additional Challenge is to test the team's all round design skills and will be explained by the event staff on the day.

IMPORTANT NOTE: Teachers and additional adults must NOT directly assist the teams with the Additional Challenge, but are free to offer advice and guidance. Please refer to the engineering judging scorecard for key performance indicator information for both Engineering Judging; the Additional Challenge will be assessed separately on the day. Please take basic stationery with you on the day, such as:

- **Pencils / pencil sharpener**
- **Coloured pens / pencils**
- **Erasers**
- **Rulers**

5.2 Team preparation

The team are allowed to take their race car(s) to Engineering judging along with the design portfolio. Other items may also be taken to help the team explain any engineering or manufacturing concepts. The Engineering judges will not have access to the team pit display for judging purposes. Preparation should include careful reading of the scorecard, the key performance indicators for the application of software, analysis and associated data organisation, describe what the judges will be looking for.

5.3 Who needs to attend?

This judging session must be attended by all team members.

5.4 Judging process / procedure

Teams will be awarded points as per the key performance indicators shown on the engineering scorecard. The scheduled Engineering judging interview session will focus on the application of software, analysis and use of cutter plotter machining. This is an informal interview where judges will ask the team to demonstrate their work and query teams on what they have done. The quality of car manufacture and assembly will be judged during a separate 'closed to teams' session.

ARTICLE 6 – PORTFOLIO AND PIT DISPLAY JUDGING

6.1 What will be judged?

The Portfolio and Display judges will examine each teams A4 10 page maximum (**this does NOT include cover pages or a contents page**).design portfolio and pit display so that they can assess the following specific areas.

- Team work
- Portfolio for clarity and quality
- Team identity
- Marketing
- Pit display for clarity and quality
- JPSC car design process

Refer to the Portfolio and Display judging scorecard for detailed point scoring and key performance indicator information.

IMPORTANT NOTE: Only the first 10 pages will be assessed in any portfolios containing more than 10 pages (**this does NOT include cover pages or a contents page**).

6.2 Team preparation

Most importantly, teams need to read the Portfolio and Display judging score card carefully to ensure that all areas to be assessed are included within the context of their design portfolio and pit display. It is each team's decision how and where each area is presented. Teams should be mindful of the time constraints of judging when making these decisions.

6.3 Who needs to attend?

All team members must be present during the Portfolio and Display judging session.

6.4 Judging process / procedure

Portfolio and Display judging will take place at each teams pit display. The judges will usually introduce themselves then ask the team to stand clear of their display so the judges can conduct assessments. Team members may be asked questions by judges to help them find certain content and or seek further explanation.

ARTICLE 7 – VERBAL PRESENTATION JUDGING

7.1 What will be judged?

- Presentation technique
 - Use of visual aids – effective use of multimedia and / or other ‘props’.
 - Team contribution – effective participation by all team members
 - Dynamic – levels of enthusiasm and energy.
 - Engagement – audience interest and excitement.
- Presentation composition
 - Concepts clarification – clear and concise explanations where required.
 - Use of time – how effectively was the 5 minute (Regional) / 8 minute (National Final) used.
 - Presentation structure – overview explained and connection between topics.
- Subject Matter (the topics which need to be talked about)
 - Innovation – detail key innovations related to car design, project management, marketing or any other aspect of the teams project.
 - Learning experiences – explain how the Jaguar Primary School Challenge project has benefited team members.

Refer to the verbal presentation judging scorecard for detailed point scoring information.

7.2 Team preparation

Each team is required to prepare a 5 minute (Regional) / 8 minute (National Final) verbal presentation as per the requirements above. The team have the option to use the teams own laptop (optional) to show the presentation if they wish. Teams need to have all presentation resources tested and ready with them for Verbal Presentation judging. Most importantly, teams should read the Verbal Presentation judging scorecard carefully to ensure their Verbal Presentation features all elements and content that the judges will be looking for.

7.3 Who needs to attend?

All team members and an accompanying adult must be present during the Verbal Presentation judging session.

7.4 Judging process / procedure

Teams will be given an opportunity at the start of their time to set-up and test their laptop (optional) and any other presentation technologies and resources. The team will inform the judges when they are ready to begin. The judges start timing the 5 minute duration and will provide a discreet time warning signal when one minute of presentation time remains. The team will be asked to cease presenting when the time limit has been reached.

7.5 Verbal Presentation judging provisions

Engineering in Motion will provide a dedicated private space, such as a small meeting room, where each team will deliver their presentation to the judges. This space will include a data projector or screen and VGA cable to connect your team’s laptop (optional). These will be in fixed positions but usually with sufficient cable length to allow teams some freedom for choosing where they wish to locate their laptop. A single table will also be made available with its use and location in the presentation space being optional.

ARTICLE 8 – RACING

8.1 What races will be conducted?

The Jaguar Primary School Challenge racing points will be awarded through reaction racing – manual / driver launch mode, two races in each lane. **Single fastest ‘car race time’ value from all time trial and reaction races will determine the Fastest Car Award.**

8.2 Team preparation

8.2.1 Teams should be familiar with the operation of the FI Race Control System. Race officials will give instructions prior to their scheduled races.

8.2.2 Manual / driver starts - One or more team members (driver/s) must be nominated for launching of the teams’ car using the manual launch method.

8.2.3 Finish line management – The race judges are responsible for managing the finish line deceleration system and will return of team car along the track to the start area.

8.3 Who needs to attend?

All team members must be present during their scheduled Racing sessions and should assemble at the track start for briefing by the race track Judges at their scheduled time.

8.4 Reaction race procedure

Cars are launched in manual / driver reaction mode with four (4) races total per team, two (2) races in each lane. The TOTAL RACE TIME displayed and the REACTION TIME displayed for each race is recorded.

8.5 Reaction race scoring

All four (4) ‘total race times’ recorded from the reaction races are considered. The fastest of these four (4) times is used in the following formulae to calculate the points awarded:

8.6 Time trial race scoring

The four (4) ‘car race times’ recorded during the Time Trials and Reaction Races will be considered. Of these four (4) races, the team’s best ‘car race time’ will be recorded and used to allocate the scoring points.

8.7 Track, tether line and timing system information

8.7.1 The FI Race Track, as manufactured by Denford Ltd, will be used. The official length of the track, from start line to finish, is 20 metres.

8.7.2 Launch / Timing System – The FI Race Control System will be used for launching cars and timing races and driver reaction times to 1/1000th of a second.

8.8 Deceleration system

8.8.1 The deceleration system acts to bring cars to rest once crossing the finish line. Engineering in Motion Ltd. will provide a standard race car deceleration system,

8.8.2 Teams may supply their own deceleration system and the team will be responsible for its management. Any system supplied by a team must be simple to setup and must not impede the opposing track lane, race car or the race schedule in any way. The judges, at their discretion, can rule any system supplied by a team to be inappropriate and revert to use of the standard deceleration system.

8.9 CO₂ Race cylinders

4 gram CO₂ cylinders for all UK competition races will be used.

8.10 DNF (Did not Finish) race results

Damage or part separation occurring during a race, before the car crosses the finish line, (e.g. wheel or any other part of the car separating), or car not crossing the finish line at all, effects in a DNF race result. The judges may refer to video evidence to verify a DNF result.

8.11 False starts

A false start (jump start) occurs when the driver depresses the trigger button before the 5 start gate lights have extinguished. This will be signalled with the outer red light above a lane illuminating.

8.12 Health & Safety

Only cars that have been deemed “safe to race” by the scrutineer or track official will be allowed to race. **All cars must have the standard chassis and engine housing.** All cars will be loaded and taken off the track by track officials only. All spectators and team members must stay outside the barrier race area and only allowed track side if instructed by a track official.

ARTICLE 9 – CAR REPAIRS AND CAR SERVICING

9.1 Car repairs

- 9.1.1** All damage issues and related repair work during racing is at the Judge’s discretion and may be referred to the scrutineering Judges and/or Chair of Judges for a final decision.
- 9.1.2** No items can be removed or added to a car during racing, other than CO₂ cylinders, except in the case of a repair.
- 9.1.3** If the primary race car sustains damage during racing and this damage is ruled to be related to engineering deficiencies, the back-up race car will be reverted to immediately for races remaining in the current race event..
- 9.1.4** Team members will be allowed to make ‘trackside’ repairs to the damaged car as racing continues.
- 9.1.5** If the back-up car is damaged the repaired primary car will be reverted to and the judges may choose to suspend racing in order that repairs can be made.
- 9.1.6** If the judges rule that damaged sustained was not due to engineering deficiencies, immediate repairs or revert to back-up car will be permitted without penalty.

ARTICLE 10 – PROTESTS

10.1 Submitting a protest

Any protest issues must be submitted by the team manager to an event co-ordinator, who will register this and immediately lodge it with the Chair of Judges. All protests must be lodged in writing via the official protest form available from the event co-ordinator. The Chair of Judges decision related to any protest is final.

ARTICLE 11 – JUDGES

11.1 Overview

There will be teams of judges that form the entire judging panel. Each judging team will have one judge appointed as the Lead Judge. Judges are normally STEM Ambassadors and other education and industry experts invited by Engineering in Motion Ltd. All judges commit to ensure there are no conflicts of interest with respect to judges and the teams they are judging.



11.2 Chair of Judges

A representative from Engineering in Motion Ltd. will oversee all Judging procedures and act as The Chair of Judges. They will determine the final judging decision where a protest has been submitted or other judging issue needs resolution. The Chair of Judges will also preside over a meeting of all lead judges to ratify the final results along with nominations and winners for relevant awards.

11.3 The judging teams

- 11.3.1 Specification judges - will scrutinise each primary and back-up race car with respect to the UK Technical Regulations.
- 11.3.2 Engineering judges - The Engineering Judges will be assessing each team's use of cutter plotter technologies and quality of manufacture.
- 11.3.3 Verbal presentation judges – will assess each team as per the verbal presentation scorecard.
- 11.3.4 Portfolio and display judges – will assess each team as per the portfolio and display scorecard.
- 11.3.5 Race judges – will oversee and rule on all race events and any incidents. This will determine the Fastest Car Award.
- 11.3.6 Additional Challenge judges - The Additional Challenge judges will be assessing each team's creativity use of cutter plotter technologies and quality of manufacture.

11.4 Judging Decisions

THE DECISION OF THE JUDGES IS FINAL.

TECHNICAL & COMPETITION REGULATIONS

Car design, compliance and penalties

TECHNICAL REGULATIONS



IMPORTANT: Any specification deemed to be outside the criteria set out in the Technical and Competition Regulations, will result in a penalty at Scrutineering (see **Scrutineering score card on Page 30 for more detail**). If a car loses points during scrutineering as a result of being out of specification, that team will not be able to win the fastest car award.



Your car will be scrutineered using Vernier Calipers. It is highly recommended to purchase a set for use in school to check your car against the specifications below, before attending an event. Make sure you measure everything carefully to avoid being penalised!



T1. Body Dimensions

All teams must design and make their own car body which must comply with the following minimum and maximum dimensions. All dimensions stated are in millimetres (mm).

Please download the official 2018/19 race season chassis and engine housing 'nets' from www.primaryschoolchallenge.com. These must be used for manufacturing your cars.



T1.1 Overall car length: [3 points]

Measured between the front and rear extremities of the car, including any styling features.

Length: 220mm



T1.2 Overall car width: [3 points]

Measured from the widest point of the car, including wheels and any styling features.

Min: 40mm / Max: 90mm



T1.3 Overall car height: [3 points]

Measured from the track surface to the highest point of the car.

Max: 70mm



T1.4 Car to track distance: [3 points]

Measured from the track surface to the lowest point of the car.

Min: 3.5mm / Max: 8mm

T1.5 Car construction material: [1 point]

The type of material used to manufacture the entire car body. This includes any strengthening parts, fenders, canopies, wings, fins, exhausts or any other features, which must be attached securely to the body of the car.

Material: Card only

Min: 160g/m²



T1.6 Adhesive material: [5 points]

The adhesive used to fix the car body to the chassis. This must securely fit the body to the chassis; metal or plastic fixings are NOT permitted, with the exception of metal staples.

Materials: Glue, Velcro or double sided tape

T1.7 Chassis modifications: [2 points]

The car chassis/body forward of the front axle may be modified in profile, but not in length and must not affect the front tether guide bracket. **All race cars must use the standard chassis and engine housing as per the download "nets" available from the website. The only modifications allowed to the nets are as mentioned above.**

Modifications: Profile forward of front axle only

T1.8 Graphics: [3 points]

Graphic (visual) elements that MUST be clearly displayed on the car body.

Mandatory graphics: Team name/team logo and team number

T2. Wheels

T2.1 Number: [5 points]

All cars must have four (4) wheels, two at the front and two at the rear.

T2.2 Track contact: [1 point]

All four (4) wheels must touch the racing surface at all times.

T2.3 Manufacture: A team may use the standard wheels, available from www.isupply3D.com or manufacture their own wheels, providing they comply with all specifications within T2.

T2.4 Position: Wheels are permitted to be exposed or enclosed within the body of the car.

T2.5 Wheel diameter: [5 points]

Measured to the extreme outer edge of each wheel.

Min: 34mm / Max: 45mm

T2.6 Wheel width: [10 points]

Measured to the extreme edge of each wheel.

Min: 2.5mm / Max: 20mm

T3. Engine Housing

T3.1 Design: [1 point]

All cars must use the standard engine housing (download from website).

T3.2 Securely fixed: [10 points]

The standard engine housing **MUST** be used, securely fixed to the standard chassis using 5 staples.

T3.3 Depth: The depth of the chamber must be **unmodified** from the standard engine housing.

T4. Tether Guide

T4.1 Number & location: [1 point]

Each car must have two (2) tether guides holes at the front and rear of the car body as part of the standard chassis which can be download from: www.primaryschoolchallenge.com/downloads

T5. Driver

T5.1 Driver height: [1 point]

All cars must have a driver (Playmobile or Lego character type), with height measuring between:

Min: 40mm / Max: 60mm

T5.2 Driver position and attachment: [3 points]

The driver must be safely attached to the chassis in a sitting position, looking forward.

Adhesive: Velcro

T5.3 Driver body: [5 points]

The driver must should be complete comprising body, arms, legs, head and crash helmet.

COMPETITION REGULATIONS

C1. Repair and Maintenance

- C1.1** No repair or maintenance is to be carried out after the car has been registered and submitted without the permission of Engineering in Motion staff.
- C1.2** If any entry becomes damaged during the event, teams will be allowed to use their spare car, as long as the Judges have determined that the spare car is identical to the original. In the unlikely event that the second car also becomes damaged, the entry will be evaluated by the event coordinator. This is the only reason a team should be allowed to tamper with their car after registration.
- C1.3** Wheels that come off during the race may be replaced as determined by the race coordinator. Damaged wheels may only be replaced with the permission of the event or race coordinator.

C2. Safety

C2.1 Safe to race: [5 points]

Judges will be carefully examining all cars and will only allow them to race if they deem them structurally sound. Should a car be judged not safe to race, teams may be given the opportunity to carry out modifications at the discretion of the judges. Any modifications must be supervised by the judges and approved before a car is deemed safe to race. If a car is still deemed not safe to race, the judges reserve the right to remove it from any racing events.

C3. Racing

- C3.1** All cars must complete two runs and remain intact until the car crosses the line at the end of the second race.



APPENDIX

JPSC Judging Score Cards

Portfolio & Pit Display

Team name:

Team number:

P

KPIs	Low	Medium	High
PORTFOLIO ONLY			
Project Management	1 2 3 Little evidence of project management presented.	4 5 6 7 Simple management and planning used to guide progress. A range of resources considered.	8 9 10 Comprehensive project management. A wide range of factors considered; e.g. scope, time, resources and project risks.
	1 2 3 Limited team work evident.	4 5 6 7 Evidence of effective team work and roles defined	8 9 10 Highly structured team with clear roles. All team members had effective and critical contributions. Role interactions recognised
	1 2 3 Difficult to follow with basic presentation standard.	4 5 6 7 Clear structure, well organised. Good use of ICT's enhancing presentation and impact.	8 9 10 High impact and professional throughout. Consistent and clear organisation. Excellent use of ICT's to enhance presentation

Portfolio Total

/30

PIT DISPLAY & MARKETING			
Team Identity	1 2 3 Inconsistent, limited or obscure identity	4 5 6 7 Effective team identity consistent through various project components.	8 9 10 Excellent and highly effective team identity. Consistently applied through all project elements.
	1 2 3 Limited or irrelevant	4 5 6 7 Some marketing activity / sponsorship explained	8 9 10 Creative and effective activities linked to sponsorship
	1 2 3 Repetition of folio elements	4 5 6 7 Clear and effective presentation and messaging. Some project development displayed.	8 9 10 Clean, well-organised and has high impact. Highly professional with attention to detail. Well-presented project developments.

Pit Display & Marketing Total

/30

Portfolio Total + Pit Display & Marketing Total = PORTFOLIO & PIT DISPLAY TOTAL

/60

Verbal Presentation

Team name:

Team number:



KPIs	Low	Medium	High
TECHNIQUE			
Visual Aids	1 2 3 Little use of aids.	4 5 6 7 Some aids used effectively	8 9 10 Highly professional aids effectively improve communication
Team Contribution	1 2 3 Minimal team participation	4 5 6 7 Good contributions from most team members	8 9 10 Excellent team work with all members participating effectively
Dynamic	1 2 3 Artificial and/or low energy	4 5 6 7 Generally enthusiastic and lively delivery	8 9 10 Passionate with consistent and appropriate levels of animation
Engagement	1 2 3 Minimal engagement	4 5 6 7 Some audience connection at times	8 9 10 Audience fully engaged and excited throughout presentation

Technique Total

/40

COMPOSITION			
Concept Clarification	1 2 3 Several concepts lacked clarification	4 5 6 7 Clear and appropriate explanations	8 9 10 Concise and creative clarification of ideas requiring explanation
Use of Time	1 2 3 Too fast or ran out of time	4 5 6 7 Good timing. Balanced topic depth and pace	8 9 10 Ran on time or under. Excellent balance of depth for each topic
Presentation Agenda	1 2 3 No agenda presented	4 5 6 7 A basic agenda presented and could be followed by audience	8 9 10 Clear presentation outline. Excellent connections between topics and easy for audience to follow

Composition Total

/30

SUBJECT MATTER			
Innovation	1 2 3 Little innovation presented	4 5 6 7 Innovations described and justified	8 9 10 Originality. Clever innovations with high positive project affect
Collaboration (i.e. Sponsorship and/or Support)	1 2 3 Little collaboration	4 5 6 7 Links with industry or higher education described	8 9 10 Collaborations justified with learning and project outcomes
Learning Experiences	1 2 3 No real reflections discussed	4 5 6 7 Good explanation of some learning outcomes	8 9 10 A range of personal, lifelong learning and career skills acquired

Subject Matter Total

/30

Technique Total + Composition Total + Subject Matter Total = VERBAL PRESENTATION TOTAL

/100

Engineering

Team name:

Team number:

E

KPIs	Low	Medium	High
MANUFACTURING			
Application of CAD-CAM	1 2 3 Basic application. Final design in CAD only	4 5 6 7 Appropriate use of CAD in product development stages. Good understanding of CAM evident	8 9 10 Advanced use and understanding of CAD and CAM processes throughout. Final CAD identical to the physical model car produced
Quality of Finish	1 2 3 Reasonable finish with inconsistencies	4 5 6 7 Good overall finish quality with attention to detail	8 9 10 Showcase finish quality on all components. Exceptional attention to detail. Two cars are identical (NF only) .
Assembly	1 2 3 Poorly assembled	4 5 6 7 Generally well assembled and engineered	8 9 10 Professional assembly, engineered. Sound techniques
Use of Machine	1 2 3 Minimal evidence of CAM understanding	4 5 6 7 Effective use and understanding of CAM machining	8 9 10 High level of CAM machining competence. Appropriately complex techniques and processes used.
Team Member Involvement	1 2 3 Minimal evidence team work	4 5 6 7 All team members contributed	8 9 10 All team members contributed and well organised
Car Style	1 2 3 Minimal car styling	4 5 6 7 Good level of car styling	8 9 10 Very good – excellent car styling
Graphics	1 2 3 Minimal graphics and or logos	4 5 6 7 Good level of graphics and team logo	8 9 10 Very good – excellent graphics and use of logo

Manufacturing Total

/70

CAR DESIGN PROCESS			
Ideas	1 2 3 Single or basic concepts	4 5 6 7 Multiple concepts with links to research.	8 9 10 Technically inspired ideas. Form linked to function.
Development and Testing	1 2 3 Limited development shown	4 5 6 7 Logical design developments based on testing	8 9 10 Clear & justified developments linked to tests & research
Manufacture	1 2 3 Little manufacturing detail	4 5 6 7 Manufacturing processes and issues presented	8 9 10 Detailed assessment of manufacture, stages, materials & issues
Evaluation	1 2 3 No or limited evaluation	4 5 6 7 Ideas or process evaluations at different stages	8 9 10 Excellent project aspect evaluation linked to improvement action

Car Design Process Total

/40

CAD Analysis Total + Manufacturing Total + Car Design Process Total = ENGINEERING - CAD TOTAL

/110



Team name:

Team number:



Specifications

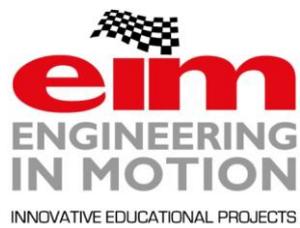
Rule No.	Criteria	Min	Max	Points	Car 1	Car 2
T1.1	Overall car length	220mm		3		
T1.2	Overall car width including wheels	40mm	90mm	3		
T1.3	Overall car height	—	70mm	3		
T1.4	Car to track distance	3.5mm	8mm	3		
T1.5	Car body made from minimum 160g/m ² card	Yes		1		
T1.6	Body securely fitted to chassis using adhesive	Yes		5		
T1.7	Standard chassis & engine housing used	Yes		2		
T1.8	Graphics / team name / logo & number	Yes		3		
T2.1	No. of wheels	4		5		
T2.2	Wheels in constant contact with track	4		1		
T2.5	Wheel diameter	34mm	45mm	5		
T2.6	Wheel width	2.5mm	20mm	10		
T3.1	Cartridge chamber design	Standard housing		1		
T3.2	Sufficient staples used to secure engine housing	Min: 5		10		
T4.1	No. of tether guides	2		1		
T5.1	Driver height	40mm	60mm	1		
T5.2	Driver is secured in a sitting position using Velcro	Yes		3		
T5.3	Driver is a complete Lego character	Body, arms, legs, helmet		5		
C2.1	Safe to race	Yes		5		

SCRUTINEERING TOTAL:

/70

/70

Comments



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