



Teacher Information & Resource Pack 2018

GMEC: A little background...

The **Greater Manchester Engineering Challenge (GMEC)** is an innovative project that will run during the academic year of 2017-18. It aims to engage and inspire primary and secondary pupils and their teachers in the engineering design process and developing engineering habits of mind. Sponsored by the Institute of Engineering and Technology and the Institute of Mechanical Engineers, this project forms part of the Engineering Education Grant Scheme.

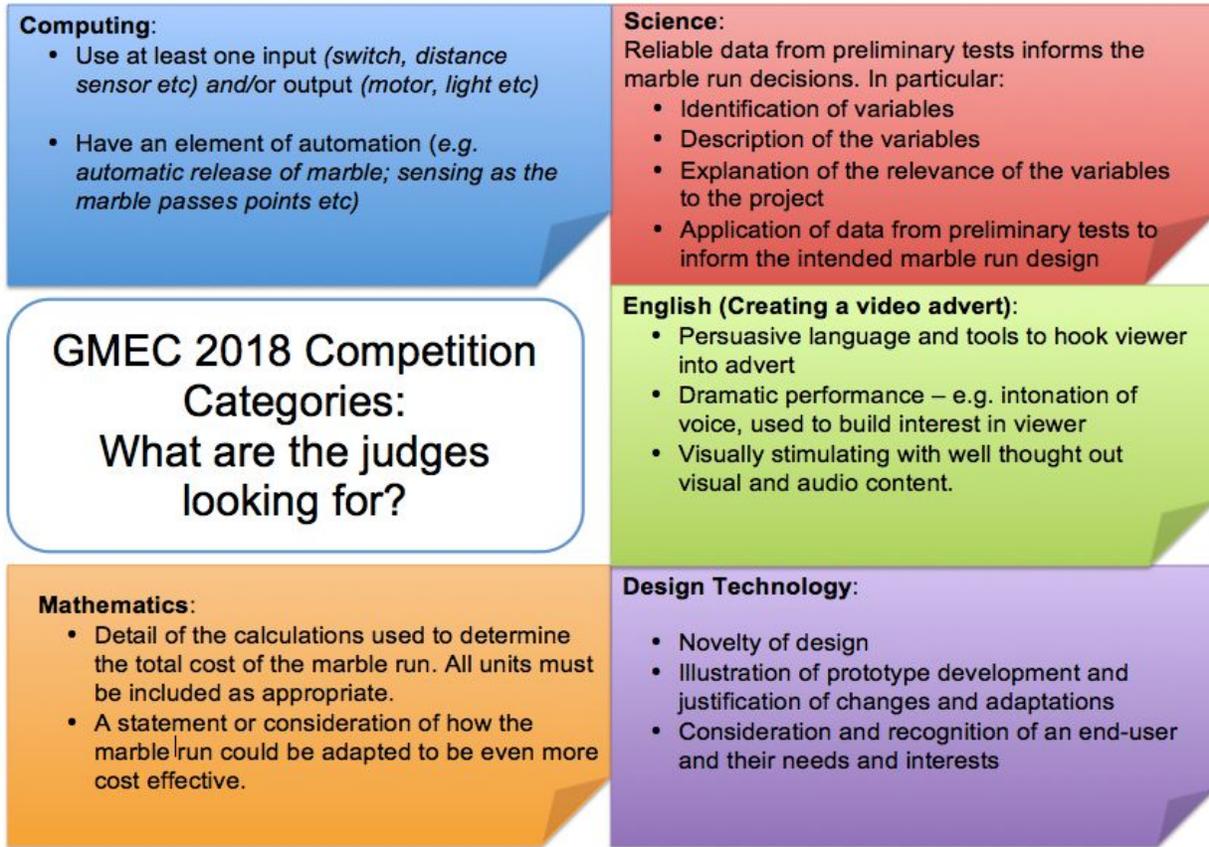
This year's challenge is focusing on **Marble Runs**. Pupils will create marble runs and enter these into up to two of five categories. Since engineering is a diverse discipline which draws on many subjects, the range of categories reflect this and include:

- Science
- Computing
- Maths
- Design technology
- English

What does each category involve?

The table at the top of the following page sets out what we are looking for in each of the categories (essentially a success criteria). There won't be a single winner for each category but rather an award for any group that meets the requirements of that category. When you send us your evidence (see more info below) we'll review it and send out a certificate of achievement for the category you've entered if you meet the criteria.

You can use a single marble run to enter **up to two of the categories**.



What support can you provide for each category?

Please find below some guidance on each subject area, including links to additional resources where applicable.

Computing

We would suggest the Crumble controller (available from Redfern electronics <http://redfernelectronics.co.uk/shop/>) as the ideal tool if you choose to pursue the computing category. It is cheap and easy to use as its programming language is based upon MIT's Scratch.

It will easily link with inputs (such as a distance sensor) and outputs (such as lights and servo motors)

The link below will take you to a range of videos on how to connect up and use the Crumble controller. Whilst the videos were made for the university's Robot Orchestra project, the content they include can be directly applied to the marble runs.

<https://www.youtube.com/playlist?list=PL1INJr44zLIbODr05qLXYOCaAALhAedaB>

Science

Science and engineering are closely linked. This category is all about demonstrating how you have used scientific enquiry to inform the creation of your marble run. What investigations could you undertake which would provide useful data for your marble run construction. We want to see evidence of you completing an investigation and then using your findings.

For example, you might conduct a fair test investigation into the strength of a single rolled up sheet of various materials. You would then use this by building certain sections of your marble run from the stronger materials.

Or, you might investigate how the angle of a slope affects the speed the marble rolls down it. You could then use this data in your design by setting the correct angles of the marble run to ensure the marble doesn't go either too fast or too slow.

The key thing is we want to see your understanding of the connection between science and engineering. We want to see evidence (see section below on submitting evidence) of your investigation results being used to inform your design.

English

The English category focuses on creating a video advert to accompany the marble run to sell its greatness! We would suggest that the 'trailer' feature within the iMovie app running on Apple iPads would be ideal for this, (though of course you can use any app you wish) as it provides a structure and template for the video into which you record your content.

The following is an excellent tutorial on using this app.

<https://www.youtube.com/watch?v=yT9V2aN8OYQ>

You might also wish to experiment with 'green screening' whereby the background of videos can be replaced with pictures or other video content. You might have 1 pupil presenting about their marble run in front of a picture or a video of it perhaps?

We recommend the app 'DoInk Green Screen' for green screening, available for both Apple and PC devices. It's very easy to use (and did you know the screen doesn't have to be green!)

Here's a tutorial to help you with this if you'd like to give it a go

<https://www.youtube.com/watch?v=wh4EYxpZb2Q&t=1s>

Maths

Cost is an important factor in engineering. This category is about showing us you understand the costs associated with construction your marble run, and, importantly, consideration as to how you could make it more cost efficient.

For entries into this category we would like to see a full breakdown of costs for materials. You could then create calculations such as: 'Cost per second run' or 'Cost per meter travelled'. We would also like you to provide a statement as to how you believe it could have been made more efficient. A key aspect here is reduction in waste - could you have gotten more from your resources using them in a different way for example?

Design Technology

Engineering is closely linked with design and technology, which is about pupils solving real problems using their imagination and creativity.

A key element of this category is prototyping and evolution of design. Dyson famously went through 5127 prototypes of his cyclone style vacuum cleaner before he achieved his desired results. Iteration is an incredibly powerful tool in the optimisation of ideas - just look at what evolution has achieved!

As such, entries to this category should show evidence of this evolution through pictures of past prototypes for examples, with annotations of changes made with reasons for these adaptations.

This category also focus on coming up with novel designs drawing upon pupils' imagination and creativity but also applying these with an end user in mind. Are we creating a marble run with a young child in mind - what colours might they like or images?

Any tips on making the actual marble run?!

Yes - tinker, fail often and adapt! Prototypes are great and how engineers work.

We are a big fan of 'tinkering'. We see tinkering as affording pupils genuine 'room' to exercise their curiosity and creativity in problem solving. Don't start with a predetermined end in mind but let pupils lead their learning experience; let them play, fiddle, fail and adapt.

This approach means scaling back guided instruction and modelling. Don't specify exactly what resources to use for example. Obviously there is a balance here, as you have to work within the time, budget and resource constraints of your school, but where possible do please let pupils lead things.

To get them started, you might want to share some inspiration from existing marble runs. Here are some pictures and links for ideas. Those pictured here range from the wonderfully simple to the fantastically complex. We are big fans of both and everything in between - whatever works for your pupils.



Mega Marble Run Videos

<https://www.youtube.com/watch?v=kwedBdWIRuQ&t=255s>

<https://www.youtube.com/watch?v=wzNSvA3BCks>

<https://www.youtube.com/watch?v=4Zk7dcwLWBw>

<https://www.youtube.com/watch?v=Rc-bgMijF14>

<https://www.youtube.com/watch?v=qxOZbmROfew>

How do I send you the evidence of what my pupils have created?

We would like you to send in a short Powerpoint presentation with a **maximum of 5 slides** with evidence to support your entry. You will have **received the GMEC Participation Evidence Powerpoint template** to use for this when you signed up for GMEC 2018.

Important - This template includes **two evaluation slides which you must complete**. This captures feedback from pupils on the impact of the project.

The remaining slides will contain your evidence. Examples of what these slides might include:

- Pictures of marble run construction
- Pictures of completed marble run
- Videos of marble run and it's construction
- Evidence to support competition category requirements (science results, pictures of prototype etc)

Please Email these to: fascinate@manchester.ac.uk with subject line: GMEC 2018 by: Friday 1st of June 2018.