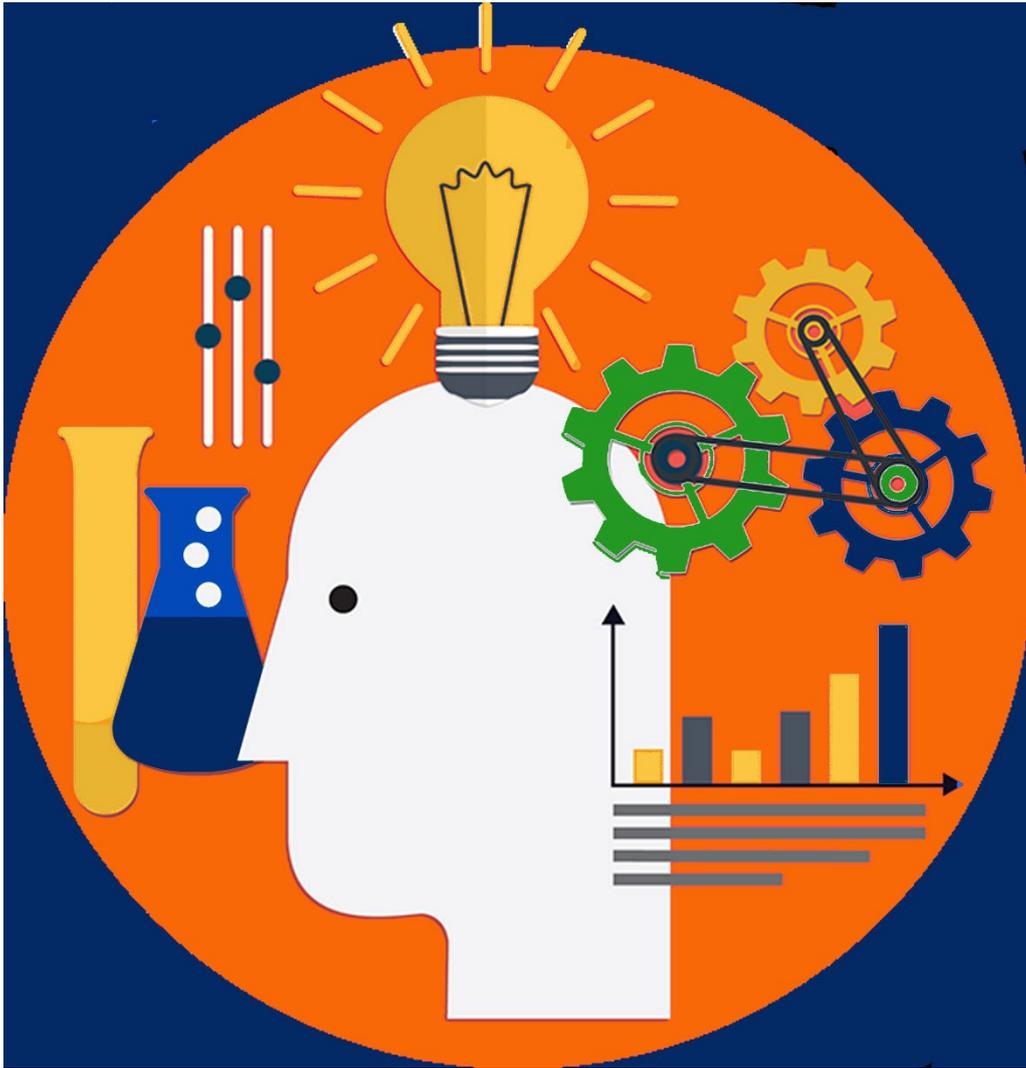


# UNIT 5



# TEST & MODIFY

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# **TEACHERS' NOTES**

## UNIT 5:

### TEST & MODIFY

In this unit pupils will test and modify their racing car. Using their knowledge of aerodynamics and forces to inform their decision making

#### LEARNING OUTCOMES

##### **Pupils will aim to**

- Evaluate and improve the performance of their F1 style car.
- Understand the principles of air pressure.

##### **Most pupils will be able to**

- Understand that air pressure can be used to propel the car forward.
- Evaluate their car and recognise where improvements can be made to improve performance.

##### **Some pupils will**

- Have an understanding of how air pressure is used in the real world.
- Make modifications and improvements to their initial design following testing.

##### **Pupil differentiation**

More able pupils will be able to take on roles of responsibility such as track set up and operation. This will encourage other pupils to learn by example and grow in confidence.

## LESSON 1

### AIR PRESSURE & TESTING

<p><b>LEARNING OBJECTIVES</b></p> <p>Pupils will</p> <ul style="list-style-type: none"> <li>• Learn about air pressure and how it is used to propel the chassis forward</li> <li>• Begin to evaluate their car against others</li> <li>• Identify areas where improvements could be made to their cars.</li> </ul>	<p><b>INDIVIDUALS</b> <b>PAIRS</b> <b>GROUP</b></p>
<p><b>RESOURCES</b></p> <p><b>WORKSHEETS</b></p> <p>PAPER AEROPLANE CHALLENGE AIR PRESSURE LET'S RACE CAR EVALUATION SHEET</p>	<p><b>EQUIPMENT</b></p> <p>*Writing Tools * Primary STEM Launch System *Roll Out Race Track</p>
<p><b>IN PREPARATION</b></p> <p>Set out the track in advance, FOLLOWING MANUFACTURERS INSTRUCTIONS. 2 or 3 pupil helpers could observe this process and would then be able to set it up themselves next time.</p> <p style="text-align: center;"><b>ALWAYS CHECK/TEST EQUIPMENT BEFORE USING WITH PUPILS</b></p>	
<p><b>STEPS</b></p> <ul style="list-style-type: none"> <li>• Use <b>AIR PRESSURE</b> worksheet to help explain the principles of air pressure.</li> <li>• Using the Launch System and the <b>PAPER AEROPLANE</b> worksheet demonstrate aerodynamics using paper aeroplanes.</li> <li>• Set up the track. If using the Primary STEM Project Roll Out Race Track, simply unroll the track and assemble the launch system as per the instructions. The equipment is safe and can be assembled by pupils under instruction, with adult supervision.</li> <li>• If you are not using the Primary STEM Roll Out Track, mark out a race track on a smooth floor. You will need 10 metres of racing length with about a meter at each end to hold the launch system. The track could be marked out using masking tape, string and sticky tape. Alternatively, a roll of wallpaper lining paper stuck to the floor can be used to race on. This could be decorated by the pupils to create their own bespoke roll out race track.</li> <li>• Allow each team to test their car, by racing against each other and watching other cars racing to formulate ideas about what improvements could be made to increase the speed of their car.</li> <li>• Pupils will need to take it in turns, 2 teams at a time on the track to test their cars.</li> <li>• Each team should fill in a car evaluation sheet. This will be useful when considering improvements to their design</li> </ul>	
<p><b>PLENARY</b></p> <p>Review <b>CAR EVALUATION SHEETS</b>. As a class discuss the results of testing and consider solutions. Look at <b>AIR PRESSURE WORKSHEET</b>. Discuss how the air launch system works. (Classroom activity to be included in lesson 2)</p>	
<p><b>ENRICHMENT</b></p> <p>More able pupils could be encouraged to help with the running of the track. This role could then be available to other pupils in the future, as they become more familiar with the set up and running of the track.</p>	

## LESSON 2 ESTIMATING

<p><b>LEARNING OBJECTIVES</b></p> <p>Pupils will:</p> <ul style="list-style-type: none"> <li>• Use simple mathematics to estimate air pressure, based on limited data.</li> <li>• Listen to the opinions of others and be encouraged to make decisions as a team.</li> </ul>	<p><b>INDIVIDUALS</b> <b>PAIRS</b> <b>GROUP</b></p>
<p><b>RESOURCES</b></p> <p><b>WORKSHEETS</b></p> <p>LET'S RACE CAR EVALUATION SHEET AIR PRESSURE CLASSROOM ACTIVITY AIR PRESSURE CHALLENGE RESULTS SHEET</p>	<p><b>EQUIPMENT</b></p> <p>*Writing Tools *Scissors *Drawing Equipment *Coloured Pencils</p>
<p><b>IN PREPARATION</b></p> <p>Set out the track in advance, FOLLOWING MANUFACTURERS INSTRUCTIONS. 2 or 3 pupil helpers could observe this process and would then be able to set it up themselves next time.</p> <p><b>ALWAYS CHECK/TEST EQUIPMENT BEFORE USING WITH PUPILS</b></p>	
<p><b>STEPS</b></p> <ul style="list-style-type: none"> <li>• The <b>AIR PRESSURE CLASSROOM ACTIVITY</b>.</li> <li>• Each team gets 3 turns on the track to try and stop their car at a specific point on the track.</li> <li>• Pupils should be able to make an educated guess after the first run, whether it needs more or less air pressure to allow it to stop at the specific point. The pressure gauge should only be seen by the team that is using it, to avoid teams that have not yet tried having an unfair advantage.</li> <li>• Pupils should measure the nose of the car either + or – number of cm away from the required stopping place. The best result is to be recorded in the final column of the results sheet, to decide which team stopped nearest to the chosen point.</li> </ul>	
<p><b>PLENARY</b></p> <p>Group discussion on how each team decided what air pressure to use and how they modified their decisions based on the results of testing.</p>	
<p><b>ENRICHMENT</b></p> <p>More able pupils could be conduct further research into air pressure and its applications in everyday life</p>	

## LESSON 3 MODIFY

<p><b>LEARNING OBJECTIVES</b></p> <p>Pupils will</p> <ul style="list-style-type: none"> <li>• Learn how to evaluate and modify their initial designs to improve performance, based upon observation.</li> <li>• Learn the value of testing and recording accurate results.</li> <li>• Be able to recognise where improvements can be made.</li> <li>• Make a plan of improvements and implement it.</li> </ul>	<p><b>INDIVIDUALS</b> <b>PAIRS</b> <b>GROUP</b></p>
<p><b>RESOURCES</b></p> <p><b>WORKSHEETS</b></p> <p style="text-align: center;">BACK TO THE DRAWING BOARD</p> <p><b>INFORMATION POSTER</b></p> <p style="text-align: center;"><a href="#">WHY DO F1 CARS GO SO FAST?</a></p>	<p><b>Equipment</b></p> <ul style="list-style-type: none"> <li>*Writing Equipment</li> <li>*Car chassis net</li> </ul> <p>Plus other materials needed to build a chassis</p> <p>Glue</p> <ul style="list-style-type: none"> <li>*Sticky tape</li> <li>*Craft materials</li> <li>*Paints or coloured pens</li> </ul>
<p><b>RELATED WORKSHEETS</b></p> <p style="text-align: center;">RULES &amp; REGULATIONS</p>	
<p><b>IN PREPARATION</b></p>	
<p><b>STEPS</b></p> <ul style="list-style-type: none"> <li>• Pupils will consider the results from testing the cars and decide upon suitable improvements that can be made in an attempt to improve performance.</li> <li>• They will then work together as a team to design and make a new and improved vehicle which will be raced on Race Day.</li> <li>• Close attention must be paid to accuracy and detail.</li> <li>• The car must be representative of the team and adhere to all the rules and regulations.</li> </ul>	
<p><b>PLENARY</b></p> <p>Discuss the implication of an inaccurate build. What are the dangers? How might this affect the performance of the car? Apply this to a real-world setting. How would inaccurate build affect an F1 racing car that can accelerate to 62 mph in only 2 seconds with a top speed of about 200mph?</p>	

## LESSON 4 EVALUATION

<b>LEARNING OBJECTIVES</b> Pupils will: <ul style="list-style-type: none"><li>• Reflect upon what they have learned during this UNIT and evaluate where improvements could be made in the future.</li><li>• Recap on forces that act upon a moving vehicle.</li></ul>	<b>INDIVIDUALS</b> <b>PAIRS</b> <b>GROUP</b>
<b>RESOURCES</b> <b>WORKSHEETS</b> SUMMARY & EVALUATION LABEL FORCES (2 PAGES)	<b>EQUIPMENT</b> <ul style="list-style-type: none"><li>• Writing Equipment</li></ul>
<b>RELATED WORKSHEETS</b> BLANK EVALUATION SHEET LABEL WORKSHEETS (no prompts)	
<b>IN PREPARATION</b>	
<b>STEPS</b> <ul style="list-style-type: none"><li>• Pupils should now have experienced a number of different methods of evaluation.</li><li>• As a class decide how to evaluate this part of the project.</li><li>• Hand out <b>LABEL FORCES</b> worksheet.</li></ul>	
<b>PLENARY</b> Review and recap EVALUATION and LABEL FORCES worksheets.	
<b>ENRICHMENT</b> More able pupils could use the <b>BLANK EVALUATION SHEETS</b> and <b>LABEL FORCES</b> worksheet without prompts.	