# Year 8 Apollo Archimedes Lesson plans

## Motion of Toys Term 2

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Lesson Plans
Designed as a term 4 unit of 2 lessons per week, as term 4 generally have disruptions and alternative activities offered in the last week of term this unit is only 18 lessons.

Lesson 1 – Design Challenge 4 (Jumping Marbles)

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<th>Topic: Motion</th>
<th>Time: 70 min</th>
<th>Lesson Number: 1</th>
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**Lesson Title:** Design Challenge 4

**Lesson Intentions:**
- Work in groups
- Communicate orally within groups
- Use PEEL paragraphs to analyse a design

**Sequence/Strategies:**
- Assign groups randomly
- Start design challenges by showing students an image of the Design process (Resource 1.1).
- Students need to work in groups to design a ramp that will allow a marble to jump the greatest distance before landing in a cup (the parameters and materials allowed can be modified based on the experience level of the students).
- Allow student planning time to brainstorm on butcher’s paper, followed by building and testing time before they must demonstrate their ramp.
- Discuss as a group the strengths and limitations of each design, make notes on the board.
- Go through the PEEL paragraph presi (link given below)
- Model one paragraph on the board.
- Students reflect using PEEL paragraphs in their journal

**Resources/Materials/Weblinks:**
- Butchers paper and pens
- PEEL paragraphs: [http://prezi.com/ebwgyb_2gyb/peel-paragraphs/](http://prezi.com/ebwgyb_2gyb/peel-paragraphs/)
- Per group: glass marble, masking tape, plastic cup, foam pipe insulation cut in half lengthways.
- A selection of paper, card, string etc

**Prior Knowledge:**
- Knowledge of Gravity, Potential Energy, Kinetic energy an advantage
- Previous experience writing reflections on challenges PMI tables etc

**Homework/Assessment:**
- Finish PEEL paragraph analysis (teacher to collect and give feedback on this)
### Lesson 2 – What is Engineering?

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**Lesson Title:** What is Engineering?

**Lesson Intentions:**
- Develop an understanding of what Engineers do and what skills they may need.

**Sequence/Strategies:**
- **Warm up:** ‘Buzz’ Students stand in a circle, the count by saying one number each moving in a clock wise direction. For each multiple of 3 or number containing a 3 they say ‘buzz’ instead of the number. Stumble and they are out. Requires students to think quickly and listen to others.
- Spend some time discussing the term outline, upcoming assessment and excursion. Explain that the purpose of this term is to take their knowledge from last term and apply it in a practical way. Also take some time to reiterate that this unit is the background to engineering and its purpose is to learn the skill that Engineers, Scientists and Mathematicians may need in their career.
- Create a class version of the Resource 2.1 document either on the board or in a shared digital file.
- Start by brainstorming what students already know about Engineers
- Give student some time to conduct internet research to fill in the tables; if they find one of their previous comments is inaccurate it needs to be crossed off the list. You can give students free rein or suggest some websites to look at.
- At the end discuss these findings; were any of the students surprised? Circle the skills that they will be focusing on this term (designing, modifying, analysing, working in groups, problem solving, writing reports)
- **Closure:** Journal writing, what do they think about engineering as a future career path?
- Need to submit analysis of Design Challenge for feedback

**Resources/Materials/Weblinks:**
- Access to laptops or computer labs

**Prior Knowledge:**
- Effective internet research

**Homework/Assessment:**
- Nil
### Lesson 3- Experimental Design 1

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**Lesson Title:** Experimental Design

**Lesson Intentions:**
- Design and experiment using an air powered car

**Sequence/Strategies:**
- Hand back feedback from journal
- **Warm up:** ‘Word Bingo’ Ask student to quickly and privately write down 4 features, sections or aspects of a scientific report. Teacher then call out aspects *(Resource 3.1)* one at a time and the first person to check off all four gets bingo.
- Explain to student that their assessment this term will be designing an engineering experiment which is almost the same as a scientific one; the main difference is the format of how it is written up.
- Hand out the air powered cars and show students how to use them, give the students some time to become familiar with how it works before moving on.
- Tell the class that we are going to design an experiment to see how increasing the volume of air in the car affects how far it travels (students copy this down). Ask them to write down what they predict will happen. Explain that we have just created an aim and a hypothesis, label them.
- **Class discussion:** Discuss the list of questions from *(Resource 3.2)* as a group and make a decision on each.
- Students now need to write a set of steps for carrying out this experiment; they can be in present tense and need to have as many details as possible. Give a time limit for this.
- Students share some of their methods. Select one to use to collect data in a future lesson.
- **Closure:** ‘Thumbs’ state the following topics and have the student show the thumbs (up, down or sideways) to indicate how confident they are with each. How to write a scientific report. How to design a method for a report. How to use excel to create a graph.

**Resources/Materials/Weblinks:**

**Prior Knowledge:**
- Prior experience with science experiments and advantage

**Homework/Assessment:**
- Nil
### Lesson 4 - Experimental Design 2

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<thead>
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<tbody>
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<tr>
<td>Lesson Intentions:</td>
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<tr>
<td>• Follow a set of instructions to collect data</td>
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<table>
<thead>
<tr>
<th>Sequence/Strategies:</th>
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<tr>
<td>• Warm up: ‘Buzz’ Students stand in a circle, the count by saying one number each moving in a clock wise direction. For each multiple of 3 or number containing a 3 they say ‘buzz’ instead of the number. Stumble and they are out. Requires students to think quickly and listen to others.</td>
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<td>• Assign students to groups (depending on how many cars you have) and get them to follow one of the methods developed last lesson to collect data. Ask students to annotate the method and make alterations while conducting the activity. Give a time limit for this. Monitor each group and discuss how they are dealing with failed attempts etc.</td>
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<td>• Make sure every student has a copy of a data set to use later.</td>
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<td>• Discuss as a class what each group did for a failed attempt and whether they conducted multiple trials.</td>
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<td>• Closure: Journal writing, have students reflect on how the data collection went today compared to their expectations</td>
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<tr>
<th>Resources/Materials/Weblinks:</th>
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<tr>
<td>• Air powered cars: <a href="http://www.profbunsen.com.au/shop/item/air--water-powered-car">http://www.profbunsen.com.au/shop/item/air--water-powered-car</a> or other device that is easy to use and measurements can be taken with.</td>
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<tr>
<td>• Measuring tapes</td>
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<td>• Metre rulers</td>
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<td>• Marker pen or chalk to draw on the ground</td>
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<td>• Any other materials indicated by students in the previous lesson</td>
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<table>
<thead>
<tr>
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<td>• Nil</td>
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<tr>
<th>Homework/Assessment:</th>
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<tr>
<td>• Complete journal</td>
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### Lesson 5 – Assignment Lesson 1

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<tr>
<td>Lesson Intentions:</td>
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<tr>
<td>• Start working on assignment</td>
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<thead>
<tr>
<th>Sequence/Strategies:</th>
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<tr>
<td>• Hand out task: Read through and discuss with students, ensure you highlight important points like due dates and parameters for task i.e. group, time constraints</td>
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<td>• Allocate Groups: Do this based on area of interest</td>
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<td>• Hand out Cars: Do not use the air pressure car from the demonstrations</td>
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<td>• Brainstorming: Student work in groups to start planning their experimental design</td>
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<td>• Closure: Journal writing, ensure it is dated and they reflect on the progress they have made on their task so far.</td>
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<thead>
<tr>
<th>Resources/Materials/Weblinks:</th>
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<tbody>
<tr>
<td>• Student copies of task</td>
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<tr>
<td>• Butchers paper and pens</td>
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<table>
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<tr>
<th>Prior Knowledge:</th>
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<tr>
<td>• Previous experience in group work and scientific investigations an advantage</td>
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<tr>
<th>Homework/Assessment:</th>
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<tr>
<td>• Create a list of possible aims and hypotheses for their investigation to compare with others from their group</td>
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Lesson 6 – The need for speed

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<th>Topic: Motion</th>
<th>Time: 70 min</th>
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<th>Author: Moody</th>
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**Lesson Title:** The need for speed

**Lesson Intentions:**
- Discuss some methods used to increase speed of a vehicle
- Begin developing an understanding about aerodynamics

**Sequence/Strategies:**
- **Warm up:** ‘Buzz’ Students stand in a circle, the count by saying one number each moving in a clockwise direction. For each multiple of 3 or number containing a 3 they say ‘buzz’ instead of the number. Stumble and they are out. Requires students to think quickly and listen to others.
- **Brainstorm:** What forces do you need to overcome to get a car to travel faster?
- **Explicit teaching:** Go through friction, aerodynamics etc. notes from Resource 6.1
- Take some time to discuss how this applies to their assignment, if time students can have a discussion with their groups about this.
- **Closure:** Journal writing, ensure it is dated and they reflect on the progress they have made on their task so far.

**Resources/Materials/Weblinks:**
- Teacher information:

**Prior Knowledge:**
- Knowledge of forces especially friction

**Homework/Assessment:**
- Assignment

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Lesson 7 – Researching Effectively

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<tr>
<th>Topic: Motion</th>
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**Lesson Title:** Researching Effectively

**Lesson Intentions:**
- Practice effective research techniques while conducting background research for the drag racer assignment
- Follow steps to decide whether a source is reliable
- Create an annotated bibliography from a source you have found on the internet

**Sequence/Strategies:**
- **Warm up:** ‘Countdown’ Give the students a scrambled up version of terms from the semester, countdown 20 seconds and then students have to hold up their mini whiteboard with the correct spelling on it.
- Go through effective research tips with students (Resource 7.1), discuss each point as you go through.
- Select an article from a website like ‘weekly world news’ [http://weeklyworldnews.com/](http://weeklyworldnews.com/) for students to analyse and annotate
- Read through the article
- TPS – Is this article reliable? How can you tell?
- Give student a handout or digital copy of the Annotated bibliography template. Resource 7.2
- Complete the annotated bibliography together.
- Now get students to complete one of their own, get partners to check each other’s work along with the teacher checking. Ensure their first is done accurately before allowing them to continue on.
- **Closure:** Journal writing, ensure it is dated and they reflect on the progress they have made on their task.

**Resources/Materials/Weblinks:**
- TPS: [https://learningplace.eq.edu.au/cx/resources/file/98953d22-08d0-c9c3-991d-9208f29754f5/1/index.html#think-pair](https://learningplace.eq.edu.au/cx/resources/file/98953d22-08d0-c9c3-991d-9208f29754f5/1/index.html#think-pair)
- Mini whiteboards, pens and erasers

**Prior Knowledge:**
- Previous experience with internet research an advantage.

**Homework/Assessment:**
- Assignment – Must have initial research, aim and hypothesis by next lesson.
**Lesson 8- Assignment Lesson 2 (Writing an Introduction)**

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<th>Topic: Motion</th>
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**Lesson Title:** Writing an introduction

**Lesson Intentions:**
- State the language features of an introduction
- Explain the purpose of each paragraph in an introduction
- Write a first draft of your introduction

**Sequence/Strategies:**
- **Warm up:** ‘Buzz’ Students stand in a circle, the count by saying one number each moving in a clock wise direction. For each multiple of 3 or number containing a 3 they say ‘buzz’ instead of the number. Stumble and they are out. Requires students to think quickly and listen to others.
- Hand out the ‘Introduction Exemplar’ Resource 8.1, give the student 2 min to read and circle the language features they can identify. Share their answers with the person next to them. Check their answers.
- Reread the first paragraph again, what is the purpose of this paragraph? Discuss
- Now write your own! Give students very limited time to do this, ensure they are writing under pressure.
- Each student now takes 15 steps in any direction around the room and swap paragraphs with the closet person.
- Proof read the other persons paragraph, give comments, correct spelling etc (this can be done on laptops and ‘track changes’ in a word document).
- Repeat this process paragraph at a time.

**Resources/Materials/Weblinks:**
- Students must have completed some initial research, have their aim and their hypothesis before completing this lesson.

**Prior Knowledge:**
- Initial research for assessment

**Homework/Assessment:**
- Continue working on assignment, need to have method decided by end of next lesson and will submit introduction for review by teacher.

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**Lesson 9 – Assignment Lesson 3 (Method Finalisation & Data Presentation)**

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**Lesson Title:** Assignment Lesson 3 (Method Finalisation)

**Lesson Intentions:**
- Work in groups to plan an investigation
- Use Microsoft Excel to create a line graph from data collected

**Sequence/Strategies:**
- **Have student submit their introduction for review this lesson.**
- **Warm up:** ‘Countdown’ Give the students a scrambled up version of terms from the semester, countdown 20 seconds and then students have to hold up their mini whiteboard with the correct spelling on it.
- Students work in groups to finalise their methods and request equipment to conduct their investigations (this should not take long).
- **Explicit Teaching:** Using the previously collected data the teacher creates a graph using excel. Complete step by step and have student copy on their own screens.
- **Closure:** ‘Door pass’ (Resource 9.1) students complete the door pass and hand in before they leave.

**Resources/Materials/Weblinks:**
- Data set collected previously
- Access to laptops or computer labs
- Website that guides you to make a line graph: [http://www.wikihow.com/Create-a-Graph-Using-a-Spreadsheet](http://www.wikihow.com/Create-a-Graph-Using-a-Spreadsheet)

**Prior Knowledge:**
- Some experience with excel beneficial

**Homework/Assessment:**
- Decide how they will collect and present data for their assignment; write a journal entry on this.
Lesson 10 - Assignment Lesson 4 (Practical Investigation)

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**Lesson Title:** Practical Investigation

**Lesson Intentions:**
- Students work in groups to modify, test, and collect data on the motion of their drag racer.

**Sequence/Strategies:**
- **Hand back introductions to students this lesson with feedback on literacy and content.**
- **Warm up:** ‘Buzz’ Students stand in a circle, the count by saying one number each moving in a clock wise direction. For each multiple of 3 or number containing a 3 they say ‘buzz’ instead of the number. Stumble and they are out. Requires students to think quickly and listen to others.
- Majority of lesson is spent working on the practical side of their assignment. Teacher monitors groups and give guidance. Students will need assistance with collected enough data and collecting the right data to be presented later.
- **Closure:** Journal writing, ensure it is dated and they reflect on the progress they have made on their task so far.

**Resources/Materials/Weblinks:**
- Pre ordered practical equipment

**Prior Knowledge:**
- Must have pre planned investigation an ordered equipment

**Homework/Assessment:**
- Assignment, students should fix up their introduction based on teacher feedback

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Lesson 11 – Assignment Lesson 5 (Practical Investigation)

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**Lesson Title:** Practical Investigation

**Lesson Intentions:**
- Students work in groups to modify, test, and collect data on the motion of their drag racer.

**Sequence/Strategies:**
- **Warm up:** ‘Buzz’ Students stand in a circle, the count by saying one number each moving in a clock wise direction. For each multiple of 3 or number containing a 3 they say ‘buzz’ instead of the number. Stumble and they are out. Requires students to think quickly and listen to others.
- Majority of lesson is spent working on the practical side of their assignment. They may have to modify their original plan, if they do this should be documented in their journal. Teacher monitors groups and give guidance. Students will need assistance with collected enough data and collecting the right data to be presented later.
- **Closure:** Journal writing, ensure it is dated and they reflect on the progress they have made on their task so far.

**Resources/Materials/Weblinks:**
- Pre ordered practical equipment

**Prior Knowledge:**
- Must have pre planned investigation an ordered equipment

**Homework/Assessment:**
- Assignment, students should be starting to present data and decide whether designs need to be modified
### Lesson 12 - Assignment Lesson 6 (Practical Investigation)

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<tbody>
<tr>
<td>Lesson Title</td>
<td>Practical Investigation</td>
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<tr>
<td>Lesson Intentions:</td>
<td>- Students work in groups to modify, test, and collect data on the motion of their drag racer.</td>
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<tr>
<td>Sequence/Strategies:</td>
<td>- This is the last lesson students are permitted to complete practical work in class</td>
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<td>- Warm up: ‘Buzz’ Students stand in a circle, the count by saying one number each moving in a clock wise direction. For each multiple of 3 or number containing a 3 they say ‘buzz’ instead of the number. Stumble and they are out. Requires students to think quickly and listen to others.</td>
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<td>- Majority of lesson is spent working on the practical side of their assignment. They may have to modify their original plan, if they do this should be documented in their journal. Teacher monitors groups and give guidance. Students will need assistance with collected enough data and collecting the right data to be presented later.</td>
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<td>- Closure: Journal writing, ensure it is dated and they reflect on the progress they have made on their task so far.</td>
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<tr>
<td>Resources/Materials/Weblinks:</td>
<td>- Pre ordered practical equipment</td>
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<tr>
<td>Prior Knowledge:</td>
<td>- Must have pre planned investigation an ordered equipment</td>
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<tr>
<td>Homework/Assessment:</td>
<td>- Assignment, draft results due next lesson</td>
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### Lesson 13 - Assignment Lesson 7 (Write up)

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<tr>
<td>Lesson Title</td>
<td>Assignment Write up</td>
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<tr>
<td>Lesson Intentions:</td>
<td>- Students work on the write up of their assignment</td>
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<tr>
<td>Sequence/Strategies:</td>
<td>- Warm up: ‘Countdown’ Give the students a scrambled up version of terms from the semester, countdown 20 seconds and then students have to hold up their mini whiteboard with the correct spelling on it.</td>
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<td>- Students spend the majority of the lesson working on writing up their assignment. At the end of the lesson today they must submit a draft of their results for review. Teacher spends time helping individual students.</td>
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<td>- Closure: Journal writing, ensure it is dated and they reflect on the progress they have made on their task so far.</td>
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<tr>
<td>Resources/Materials/Weblinks:</td>
<td>- Access to laptops or computer lab</td>
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<tr>
<td>Prior Knowledge:</td>
<td>- Practical investigation needs to be complete</td>
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<td>Homework/Assessment:</td>
<td>- Assignment</td>
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### Lesson 14 - Assignment Lesson 8 (Write up)

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**Lesson Title:** Assignment Write up  

**Lesson Intentions:**  
- Students work on the write up of their assignment

**Sequence/Strategies:**  
- **This is the last lesson Students will be given time to complete assessment**  
- **Warm up:** ‘Buzz’ Students stand in a circle, the count by saying one number each moving in a clock wise direction. For each multiple of 3 or number containing a 3 they say ‘buzz’ instead of the number. Stumble and they are out. Requires students to think quickly and listen to others.  
- **Teacher goes through general feedback on results to the group before students continue working.**  
- Students spend the majority of the lesson working on writing up their assignment. Teacher spends time helping individual students.  
- **Closure:** Journal writing, ensure it is dated and they reflect on the progress they have made on their task so far.

**Resources/Materials/Weblinks:**  
- Access to laptops or computer lab

**Prior Knowledge:**  
- Practical investigation needs to be complete

**Homework/Assessment:**  
- Assignment

### Lesson 15 – Your Choice

<table>
<thead>
<tr>
<th>Topic: Motion</th>
<th>Time: 70 min</th>
<th>Lesson Number: 15</th>
<th>Author: Moody</th>
</tr>
</thead>
</table>

**Lesson Title:** Your Choice  

**Lesson Intentions:**  
- Your Choice

**Ideas:**  
- Guest Speaker on literacy strategies eg. Nominalisation  
- Guest Speaker on writing a newspaper article (to be used after excursion)  
- Video based lesson, there are a multitude of interesting videos that students can summarise eg. James May’s Toy stories, Mythbusters etc
Lesson 16 – Excursion preparation (The Physics of Rides)

<table>
<thead>
<tr>
<th>Topic: Motion</th>
<th>Time: 70 min</th>
<th>Lesson Number: 16</th>
<th>Author: Moody</th>
</tr>
</thead>
</table>

**Lesson Title:** The Physics of Rides

**Lesson Intentions:**
- Investigating how motion is applied in theme park rides

**Sequence/Strategies:**
- Assessment Submitted this lesson
- Students watch this video( [https://www.youtube.com/watch?v=vsDnBln1ouk](https://www.youtube.com/watch?v=vsDnBln1ouk) ) and discuss the questions in resource 16.1
- Students draw a line diagram of the ‘Tower of terror’. Students label the diagram with distances, heights, velocities and location of brakes (they can do some internet research to find this).
- Discuss how they should confirm the height of the tower while at Dreamworld. Show student how to use a clinometer by calculating heights in the school grounds.
- Closure: ‘Door pass’ (Resource 9.1) students complete the door pass and hand in before they leave.

**Resources/Materials/Weblinks:**
- Access to laptops of computer lab
- Clinometer

**Prior Knowledge:**
- Trigonometry
- Scientific drawing

**Homework/Assessment:**
- Look at the Dreamworld website and become familiar with other rides.

Lesson 17 – Excursion preparation and Assessment Feedback

<table>
<thead>
<tr>
<th>Topic: Motion</th>
<th>Time: 70 min</th>
<th>Lesson Number: 17</th>
<th>Author: Moody</th>
</tr>
</thead>
</table>

**Lesson Title:** Excursion Preparation and Assessment Feedback

**Lesson Intentions:**
- Attain feedback on assessment
- Prepare for excursion

**Sequence/Strategies:**
- Warm up: ‘Countdown’ Give the students a scrambled up version of terms from the semester, countdown 20 seconds and then students have to hold up their mini whiteboard with the correct spelling on it.
- Hand out excursion booklet and go through procedures for trip.
- Allow students to read through the booklet and use the internet to start completing and pre excursion sections.
- While students are working on the booklet spend time going through feedback from their TER. You may like to speak to them one on one while the class work on the booklet.
- Finish of the lesson with a reflection on the term in their journal. They should make a point of setting some goals and outlining strategies in this journal entry.

**Resources/Materials/Weblinks:**
- Mini whiteboards, pens and erasers

**Prior Knowledge:**
- Laptops or computer lab
- Pre-prepared excursion booklet

**Homework/Assessment:**
- Read through excursion booklet
Lesson 18 - End of Year Excursion

<table>
<thead>
<tr>
<th>Topic: Motion</th>
<th>Time: Full Day</th>
<th>Lesson Number: 18</th>
<th>Author: Moody</th>
</tr>
</thead>
</table>

Lesson Title: End of Year Excursion

Lesson Intentions:
- Observe motion and engineering in a real world environment

Sequence/Strategies:
- We chose to attend Dreamworld. Students were given a talk and tour by an onsite engineer then completed activities provided by Dreamworld.
- Excursion booklet was submitted to teacher on the bus on the way home.

Resources/Materials/Weblinks:
- Create Excursion booklet based on excursion.

Prior Knowledge:
- Expected knowledge of motion and simple machines.

Homework/Assessment:
- Nil

Resources

1.1 Design Process
1.2 2.1 Engineers

Engineers

<table>
<thead>
<tr>
<th>Types of Engineers</th>
<th>Where do they work?</th>
<th>What academic knowledge do they need?</th>
<th>What personal skills do they need?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

3.1 Scientific Report Features

Abstract  
Aim  
Conclusion  
Discussion  
Hypothesis  
Introduction  
Materials  
Method  
Past Tense  
Paragraphs  
Reference List  
Results  
Technical Language  
Third person  
Title

3.2 Experimental Design Questions

- What volume of air will we start at?
- How much will we increase by each time?
- What volume will we go up to?
- How many trials for each volume?
- What surface will the trials be conducted on?
- What distance will we measure the speed over?
- How will we calculate distance?
- How will we present the data?
- How will we record our data?
- What equipment do we need?
6.1 The Need for Speed Notes

To get a car to travel faster:

- Reduce friction with the ground
- Reduce air resistance
- Increase thrust
- Reduce weight

To reduce friction:

- Smooth surfaces
- Lubrication
- Reduce contact between surfaces
- This is not just between the wheels and the ground

To reduce air resistance:

- Smooth surfaces to allow air to flow over the car
- Shape the car so that air flows around it smoothly

- Use of a spoiler to ‘push’ the car down onto the ground
- Usually modelled of birds or aquatic animals

Increase thrust:

- Increase the size of the ‘engine’
- Make the ‘engine’ more efficient
- Increase the fuel used

Reduce weight:

- Remove any mass that is unnecessary

Coefficient of drag

- Used to indicate how aerodynamic a vehicle is
- The smaller the number the more aerodynamic
- $Cd = \frac{D}{(A \times 0.5 \times r \times V^2)}$ where $D$=drag, $A$=area, $V$=velocity, $r$=density
- Most family cars have a $Cd$ of .30

7.1 Tips for Effective Research

1. **Start early, give yourself plenty of time**
2. **Identify your research topic or question.**
   - How to make a car travel faster
   - How to make a car more efficient
3. **Conduct background research**
   - Wikipedia is a good place to start
   - Use different key word combinations
   - Use different search engines
4. **Decide whether your sources are reliable**
   - Can you trust the author?
5. **Record your sources as you use them**
   - OneNote will do this for you if you copy text across
6. **Are there any gaps in your research?**
   - Do you need to find definitions for any words?
   - Have you actually covered your initial question?
<table>
<thead>
<tr>
<th>Title:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bibliographical Information</td>
</tr>
<tr>
<td>Author:</td>
</tr>
<tr>
<td>Date published/viewed and most recently update if a website:</td>
</tr>
<tr>
<td>Published by or managed by:</td>
</tr>
<tr>
<td>Country of origin:</td>
</tr>
<tr>
<td><strong>Summary</strong></td>
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<td><strong>Evaluation</strong></td>
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<td></td>
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<tr>
<td><strong>Reflection</strong></td>
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</tbody>
</table>
**Technical Engineering Report: Fishing Robot**

*Daniel Ash 2013*

Robotics is a branch of technology which involves design, operation, application and construction of robots. Robots are machines capable of performing complex tasks automatically with the use of sensors and movements and have a power source. They are applied in many jobs which a human cannot partake in such as life threatening jobs like bomb disposal. Also, robots are used when a job requires a high level of repetition or requires much precision, robots used in car manufacturing for example. Another use for robots is for human entertainment such as soccer playing robots.

The robot the group decided to design was a fishing robot. Fishing is a great recreational activity and is enjoyed by people all over the world. But there are some disadvantages to fishing. Fishing is a long and often tedious task which requires a lot of repeated actions and movements. Our robot helps to reduce the amount of repetition and patience required for the smaller catches such as bait fish out in open waters. It can also be used to bob for the smaller fresh water fish in creeks and dams. The robot is semi-automatic which allows the fisherman/angler to be catching the larger fish while the robot is catching the smaller bait fish they will then use.

The robot has a very simple design using a regular rod and reel concept. Two sensors were used to help reduce the human interaction required, a sound and touch sensor. The sound sensor was used to allow the angler to command the robot to drop the line in the water. This allows the person to continue fishing while the robot casts itself. The touch sensor is used to sense when a fish is hooked. As the touch sensor is bumped by the rod, the robot is programmed to start reeling the line back in hopefully with a fish.

Two simple machines were incorporated in the design of our robot, lever and wheel and axle. Levers can provide two types of advantages, force and distance. The rod used in the design of the robot is a first class lever as the resistance and effort are on either end and the fulcrum (pivot point) is in between the two. This provides a distance advantage as it allows the rod further range. The wheel and axle used in the spool and reel mechanism is also a type of lever and provides the robot with a mechanical advantage.

Newtons second law (F=ma) is relevant to the design of the robot. When a large fish is caught on the rod the mass of the load is higher to when a smaller fish is caught. This higher mass means the force required to reel in the catch is much higher which will then ultimately slow the acceleration of the motor. This could prove to be a problem when investigating the robot as a stronger motor may be required for larger fish.

The aim of this experiment was to create a robot which efficiently catches fish with as little human interaction as possible.
9.1 Door Pass

Name: __________________________________________

One thing I found challenging/difficult: __________________________________________________________
___________________________________________________________________________________________

One thing I found interesting/fun: ______________________________________________________________
___________________________________________________________________________________________

16.1 Questions from video
1. Predict what velocity you think the car travels at?
2. What height do you think it would reach?
3. It uses a magnetic breaking system, why do you think this is used over conventional brake pads?
1.1 Technical Engineering Report

Drag Racer Technical Engineering Report

Background and Outline of the Task

Engineers don’t always create new products, in fact the majority of their work involves take something that already exists and making it better. Drag racers are an example of this, watching videos of drag cars you will see that they all look very similar but it is the subtle differences that can make the difference to their performance. Regardless of whether a new product is being created from scratch or an existing product is being modified the same design principals need to be followed; the design process.

The design process requires the engineer to fully research, fault find and design their project before creating prototypes which are tested and analysed.

Your task will be to take one of the drag racers used in class and modify it to either:

- Move faster
- Travel further, or
- Carry a 200g mass

You will follow the design process step by step collating your research and notes and keeping an experimental journal. You will then write a Technical Engineering Report on your results.

Your Drag racer will be created as a group however all or your research, notes and report are expected to be individual.
Technical Engineering Report Format

**Audience:** Write your report assuming that the readers have basic scientific knowledge. This means that any technical language specific to your design will need to be explained.

**Language Features:** The language of your report needs to be formal written language. This means you do not use contractions (i.e. don’t and can’t), you need to use technical terminology and you cannot use personal pronouns (i.e. I, we and us, this is also referred to as third person). Like in scientific reports, any procedures need to be written in past tense. Finally, don’t forget to PEEL in your paragraphs (point, explain, example, link).

**Layout:** The following is a basic layout for a Technical Engineering Report, taken from the Engineering Technology syllabus. Your report may vary slightly depending on the way you collect information. Your teacher will help you with this.

- **Title Page**
- **Table of contents**
- **Introduction**
  Begin with a paragraph about what Engineers do and about what drag racers are. Then explain your drag racer and how it works and any other relevant background information.
- **Design Ideas**
  Write about each design idea and why you did not use it.
- **Final Solution**
  Which design idea did you select and why.
- **Test Results**
  How did your drag racer perform? Include any actual data collected, images, graphs, drawings that can support your work.
- **Conclusions and Recommendations**
  This is the same as the analysis you have been doing for the design challenges.
  Include a reflection on:
  - Did your drag racer meet the challenge? Include details
  - Strengths and limitations of your design
  - How you worked as a team.
  - Ideas for further development
- **References**
  A list of all sources used.
- **Appendices**
  Anything extra
1.1 Criteria Sheet
Modified from the ‘Engineering Technology’ Syllabus

<table>
<thead>
<tr>
<th>Knowledge and application</th>
<th>Where?</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notes Intro Design ideas Final solution Conclusions</td>
<td>Notes Intro Design ideas Final solution Conclusions</td>
<td>The student work has the following characteristics:</td>
<td>The student work has the following characteristics:</td>
<td>The student work has the following characteristics:</td>
<td>The student work has the following characteristics:</td>
<td>The student work has the following characteristics:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• accurate and consistent recall and comprehensive explanation of engineering knowledge, mathematical concepts and techniques relevant to complex engineering situations, across the areas of study</td>
<td>• accurate recall and explanation of engineering knowledge, mathematical concepts and techniques relevant to engineering situations, across the areas of study</td>
<td>• recall and explanation of engineering knowledge, mathematical concepts and techniques relevant to engineering situations</td>
<td>• recall of engineering knowledge related to engineering situations</td>
<td>• recall of basic engineering facts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• critical elements of engineering problems are clearly identified and prioritised</td>
<td>• significant elements of engineering problems are identified</td>
<td>• obvious elements of engineering problems are identified</td>
<td>• basic aspects of engineering problems are recognised</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• discerning selection and correct and efficient application of engineering knowledge, mathematical concepts and techniques to complex familiar and unfamiliar engineering problems.</td>
<td>• appropriate selection and correct application of engineering knowledge, mathematical concepts and techniques to complex familiar or simple unfamiliar engineering problems.</td>
<td>• selection and application of engineering knowledge, mathematical concepts and techniques to simple familiar engineering problems.</td>
<td>• application of basic engineering knowledge to situations.</td>
<td>• use of basic engineering knowledge.</td>
</tr>
<tr>
<td>Where?</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td></td>
</tr>
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<td>---</td>
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<td></td>
</tr>
<tr>
<td>Design ideas</td>
<td>The student work has the following characteristics:</td>
<td>The student work has the following characteristics:</td>
<td>The student work has the following characteristics:</td>
<td>The student work has the following characteristics:</td>
<td>The student work has the following characteristics:</td>
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</tr>
<tr>
<td>Final solution</td>
<td>effective interpretation and thorough analysis of relevant engineering data</td>
<td>correct interpretation and detailed analysis of obvious relevant engineering data</td>
<td>interpretation and analysis of engineering data</td>
<td>explanation of basic engineering data</td>
<td>factual statements are made about data</td>
<td></td>
</tr>
<tr>
<td>Test results</td>
<td>solutions are analysed in depth and detail from multiple perspectives to identify relevant engineering principles</td>
<td>solutions are analysed in detail to identify relevant engineering principles</td>
<td>solutions are analysed in relation to engineering principles</td>
<td>prototypes or models that test aspects of solutions are developed.</td>
<td>incomplete models are produced.</td>
<td></td>
</tr>
<tr>
<td>Conclusions</td>
<td>optimal prototypes and/or models that validate solutions are developed and refined.</td>
<td>effective prototypes and/or models that test solutions are developed and modified.</td>
<td>workable prototypes and/or models that test solutions are developed.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigative and analytical processes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Conclusions</td>
<td>The student work has the following characteristics:</td>
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<td>The student work has the following characteristics:</td>
<td>The student work has the following characteristics:</td>
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</tr>
<tr>
<td>Overall report</td>
<td>comprehensive evaluation of solutions in relation to the critical elements of engineering problems</td>
<td>considered evaluation of solutions in relation to the significant elements of engineering problems</td>
<td>evaluation of solutions in relation to obvious elements of engineering problems</td>
<td>comparison of solutions in relation to engineering problems</td>
<td>comparison of ideas</td>
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</tr>
<tr>
<td>Evaluation and technical communication</td>
<td>valid, well-reasoned conclusions and recommendations based on investigations and justified by relevant engineering knowledge and data</td>
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<td>conclusions and recommendations are based on investigations</td>
<td>conclusions are stated and recommendations made</td>
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<td></td>
</tr>
<tr>
<td>Conclusions</td>
<td>effective organisation and succinct presentation of information in the most appropriate modes relevant to engineering situations</td>
<td>logical organisation and clear presentation of information in appropriate modes relevant to engineering situations</td>
<td>organisation and presentation of information in modes relevant to engineering situations</td>
<td>presentation of engineering information</td>
<td>presentation of some information related to engineering.</td>
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</tbody>
</table>