

# Engineering Notebook

## Purpose

The purpose of the *Engineering Notebook* is to document students' work and guide them through the engineering design process. The *Engineering Notebook* relies on supplemental content contained in the *Competition Catalog*.

## How to Use

Each student should be given an *Engineering Notebook* that he or she is expected to complete. While students will work in teams to complete many of the activities in their notebooks, each student will be expected to turn in a notebook for grading.

The suggested grading breakdown for the *Engineering Notebook* is shown in the table below. As with all suggestions in this book, feel free to customize the activity to better fit your goals and students.

<b>Notebook Section</b>	<b>Points</b>	<b>Grade Criteria</b>
Initial Ideation	5 pts	Completed/Not completed
Decision Matrix	15 pts	15 pts for thoughtful, logical responses 13 pts for average attempt 11 pts for below-average attempt
Worksheet 1	15 pts	See worksheet rubric.
Worksheet 2	15 pts	See worksheet rubric.
Experiment	20 pts	See experiment rubric.
Final Concept & Description	5 pts	5 pts for discussion of drive train and wheel choices 4 pts for partial discussion 3 pts for sketch only
Cost & Weight Calculations	5 pts	5 pts perfect 4 pts minor math errors 3 pts major math errors
Vehicle Requirements Sign-Off	5 pts	Completed/Not completed
<b>Total</b>	<b>85 pts</b>	

A copy of the *Engineering Notebook* is provided in Appendix C. Additional printed copies of the notebook are available for purchase through Pitsco Education. In addition, the provided template may be photocopied for use within the classroom. Please do not copy or distribute this teacher's guide. By honoring our copyright, you enable us to invest in research for education.

# Worksheets

There are four worksheets included in the *Engineering Notebook*. The four worksheets are:

1. **“Go Fast”** – Students race their car and then calculate the average speed of the car. The concept of acceleration is also addressed.
2. **“Climb High”** – Students test their car to determine the maximum incline it can climb. Students must measure and use slope and angle to complete the experiment.
3. **“Ratio Soup”** – Students use plastic gears from the provided materials to observe and calculate different gear ratios. The effects of different gear ratios on speed of rotation and force output are addressed.
4. **“Gears Versus Pulleys”** – Students test their car with a gear-drive system and compare the results to a pulley system with the same drive ratio. Average speed and gear ratios are calculated and compared.

It is recommended that each student team complete two worksheets. However, if this is your first semester using the activity or if your students do not have a strong background in experimentation, you might want to only require one worksheet be completed.

Suggested worksheet grading criteria are detailed below. Results will vary among each group of students, but general trends should be consistent. The trends to look for are identified in the **tables**.