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| **Title**  | **Taking Off With Estimation Through the Field of Aviation** |
| **Introduction**  | Throughout this entire module, students will be investigating how estimation and formula manipulation are used in the field of aviation. The lessons and assessments will provide realistic Algebra applications for airplane mechanics, private pilots and airplane engineers. This lesson requires students to estimate fuel consumption and mileage of different length flights. In the field of aviation pilots are required to determine this information before takeoff in order to know if the airplane has adequate fuel and for the passengers to know their air time.  |
| **Curriculum Alignment**  | N.Q.1: Use units as a way to understand problems and guide the solution of multi-step problems; choose and interpret units consistently in formulas. N.Q.2: Define appropriate quantities for the purpose of descriptive modeling. N.Q.3: Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.  |
| **Learning Outcomes**  | * Students will estimate reasonable answers and manipulate formulas related to fuel consumption in airplanes.
* The students will analyze different scenarios.
* Students will determine if their estimations are accurate and derive formulas from the scenarios.
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| **Time Required and Location**  | The time required to complete this lesson is two block periods (180 minutes). It is recommended that day one should include pre-activity, Prezi and assessment. Day two should include day two assessment. |
| **Materials Needed**  | * All lesson attachments
* Envelopes
* Tape
* Construction paper
* Aviation video
* Vis-à-vis markers
* Lamination or post-it paper
* Popsicle sticks labeled A through D or student whiteboards with markers

**Technology Resources :** * Projector
* DVD player
* [Prezi titled: Estimating in Aviation & Algebra](http://prezi.com/ufpwyghujbqt/estimating-in-aviation-algebra)
* <http://www.youtube.com/watch?v=yYqSdbFzFUo&feature=player_embedded>
* Calculators
* PowerPoint
* CPS clickers (optional)

**Student Handouts (with Teacher Answers):*** [**ActivityOpener**](file:///C%3A%5CUsers%5CDanielle%5CDownloads%5CActivityOpener.docx)
* [**Formula Note Guide**](file:///C%3A%5CUsers%5CDanielle%5CDownloads%5CFormulasNoteguide.docx)
* [**Formula Fill-In**](file:///C%3A%5CUsers%5CDanielle%5CDownloads%5CFormula%20Fill%20In.docx)
* [**ManipulatingForm Quiz**](file:///C%3A%5CUsers%5CDanielle%5CDownloads%5CManipulatingFormQuiz.pptx) **(PowerPoint)**
* [**Manipulating Formulas Quiz**](file:///C%3A%5CUsers%5CDanielle%5CDownloads%5CManipulatingQuiz.docx) **(Word)**
* [**Teacher Key For Quiz**](file:///C%3A%5CUsers%5CDanielle%5CDownloads%5CManipulatingQuizKEY.docx)
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| **Safety**  | Follow typical classroom safety procedures. |
| **Critical Vocabulary**  | * Fuel Consumption: the average fuel used by a vehicle during a trip
* Within-class Ability Grouping: A teacher’s practice of dividing students of similar abilities into small groups
* Flight Computer: a type of circular slide rule used in aviation
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| **Modifications**  | * Sometimes pilots use a flight computer to figure out the fuel consumption and flight time, it could be beneficial to show students what a flight computer is and if time permits show them how to use it
* Flight computer can be purchased at [www.sportys.com](http://www.sportys.com) or a more affordable paper flight computer can be purchased from [www.mypilotstore.com](http://www.mypilotstore.com)
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| **Alternative Assessments**  | * Instead of doing the quiz as an informal assessment, give the ten question [Manipulating Formulas Quiz](file:///C%3A%5CUsers%5CDanielle%5CDownloads%5CManipulatingQuiz.docx).
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| **Supplemental Information** | * [www.sharingsuccess.org](http://www.sharingsuccess.org)
* [www.youtube.com](http://www.youtube.com)
* [www.prezi.com](http://www.prezi.com): Prezi is an alternative to the usual PowerPoint presentation slide show.
* [www.alternativefuels.about.com](http://www.alternativefuels.about.com)
* <http://natgeotv.com/uk/air-crash-investigation/videos>: This site offers many different videos on plane crashes throughout history. These videos attempt to explain some reasoning for the crashes and they can be used to engage students about aviation. This site also refers to the new series on NatGeo called *Air Crash Investigations: Videos*.
* [www.mypilotstore.com](http://www.mypilotstore.com) : This website sells many pilot necessities. For use of this lesson it has a paper flight computer available for purchase.
* <http://www.sportys.com> : This website has a more advanced flight compute than the paper flight computer for purchase.
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