

Flight Plan Physics – Scoring Sheet

Student Name: _____

Place a score (1-4) in each row corresponding to the student's college readiness level.

Exceeding College Ready (4): Substantially exceeds the performance expectations**College Ready (3):** Shows proficiency in all of the performance expectations**Approaching College Ready (2):** Meets only some of the performance expectations**Initiating College Ready (1):** Does not yet meet the performance expectations

KEY COGNITIVE SKILLS	Student's Self-Assessment	Instructor's Score
Intellectual Curiosity (engages in scholarly inquiry and dialogue; accepts constructive criticism and revises personal views when valid evidence warrants)		
Reasoning (considers arguments and conclusions of self and others; constructs well-reasoned arguments; gathers evidence to support arguments; supports or modifies claims based on data)		
Problem Solving (analyzes a situation to identify the problem to be solved; applies multiple strategies; collects evidence, data systematically and directly relates them to solving a problem)		
Academic Behaviors (self-monitors learning needs and seeks assistance when needed; uses good study habits; strives for accuracy and precision; perseveres to complete and master tasks)		
Work Habits (works collaboratively)		
Academic Integrity (attributes ideas and info to sources; evaluates sources for quality of content, validity, credibility, and relevance)		
FOUNDATIONAL SKILLS	Student's Self-Assessment	Instructor's Score
Reading Across the Curriculum (identifies the key information and supporting details)		
Writing Across the Curriculum (writes clearly, coherently using standard writing conventions; writes in a variety of forms for various audiences, purposes; composes, revises drafts)		
Research Across the Curriculum (explores appropriate topic; refines topic based on research, timeline; synthesizes, organizes info; designs, presents effective product; integrates sources)		
Use of Data (presents analyzed data and communicates findings in a variety of formats)		
Technology (uses technology to organize, manage, and analyze information and to communicate, display findings in a clear and coherent manner; uses technology appropriately)		
SCIENCE STANDARDS	Student's Self-Assessment	Instructor's Score
Nature of Science: Scientific Ways of Learning and Thinking (exercises cognitive skills in science; demonstrates collaborative, safe practices; effectively communicates scientific info)		
Foundational Skills: Scientific Applications of Mathematics (uses basic math and symbols; understands math relationships; applies scientific problem solving; measures appropriately)		
Foundational Skills: Scientific Applications of Communication (demonstrates appropriate reading and writing practices for science; presents scientific information accurately)		
Physics (demonstrates understanding of length scales, vectors, forces, motion, potential energy, and kinetic energy)		

See reverse for
comments.

Score	College Readiness Level
53-60	Exceeding College Ready
44-52	College Ready
23-43	Approaching College Ready
0-22	Initiating College Ready

Total Score: _____

Grade: _____

See Scoring Guide for grade
conversion chart.

Flight Plan Physics – Scoring Guide

Note: The letters and numbers of the skills below refer to their designation in the College and Career Readiness Standards.

KEY COGNITIVE SKILLS

A. Intellectual Curiosity

1. Engage in scholarly inquiry and dialogue.

College Ready Description: Student engages fellow classmates in discussion, correcting their misconceptions as well as considering their reasoning and arguments.

Evidence for Scoring: Student attempts to answer questions informally posed by the instructor.

2. Accept constructive criticism and revise personal views when valid evidence warrants.

College Ready Description: Student integrates new information into his or her arguments when his or her thought processes are incorrect or incomplete.

Evidence for Scoring: When a classmate correctly and logically explains why the student is incorrect, the student is open to change.

B. Reasoning

1. Consider arguments and conclusions of self and others.

College Ready Description: Student listens attentively to fellow classmates' arguments, weighing what is presented against what they think.

Evidence for Scoring: Student is open to changing his or her views when unable to refute classmates' views and logic.

2. Construct well-reasoned arguments to explain phenomena, validate conjectures, or support positions.

College Ready Description: Student uses logical responses to support his or her opinions. Student should be able to explain his or her reasoning in a step-by-step manner, citing sound logic at each step.

Evidence for Scoring: Rather than jumping from one topic to the next, the student states his or her arguments in a linear manner.

3. Gather evidence to support arguments, findings, or lines of reasoning

College Ready Description: Student references examples, graphs, and past experiences when making logical arguments. Student finds supporting evidence when none is currently present.

Evidence for Scoring: Student refers to graphs that were distributed with the Student Notes or information that he or she found through independent research to justify the use of specific values or assumptions in the calculations.

4. Support or modify claims based on the results of an inquiry.

College Ready Description: Student is open to re-examining and changing his or her arguments when other data or situations are presented.

Evidence for Scoring: Student demonstrates that he or she reviewed and responded to feedback from the instructor by addressing questions and concerns in subsequent work.

C. Problem solving

1. Analyze a situation to identify a problem to be solved.

College Ready Description: Student recognizes the situation he or she is trying to logically argue and identifies key areas of the problem as well as discarding content that does not play a role.

Evidence for Scoring: Student sees that the height of the aircraft determines its flying efficiency and is also related to the fuel it needs to obtain that height.

2. Develop and apply multiple strategies to solve a problem.

College Ready Description: Student will look at the problem from multiple angles to see which approach will work best.

Evidence for Scoring: Student might try to maximize and minimize the values of the graphs but may find that trying to model the graphs and using calculus is a better approach.

3. Collect evidence and data systematically and directly relate to solving a problem.

College Ready Description: Students will systematically change the values to see which produces increases and decreases of cost.

Evidence for Scoring: Student might choose to change the flying height and then systematically figure out if it was a good or bad change

D. Academic Behaviors

1. Self-monitor learning needs and seek assistance when needed.

College Ready Description: Student keeps a mindful eye on his or her integration of knowledge as it progresses and is able to ask fellow students and the instructor for help.

Evidence for Scoring: Student is comfortable admitting he or she does not know an answer and is willing to re-examine the material to relearn.

2. Use study habits necessary to manage academic pursuits and requirements.

College Ready Description: Student looks over the material he or she needs to incorporate and tries to come up with a logical approach to complete the task in the allotted time.

Evidence for Scoring: Student may determine that they are going to spend their time looking at one particular set of variables to minimize and just use a “best guess” on the other two approaches to save some time. They will then go back later to see if they can incorporate the skipped section.

3. Strive for accuracy and precision.

College Ready Description: Student looks at his or her graphs, tries to figure out the actual values needed, and keep track of significant figures to produce accurate costs. Student approaches problems in a step-by-step manner to make sure they do not miss any key steps.

Evidence for Scoring: Student may look at the height graph and determine that the maximum efficiency is at 25,450 feet instead of 25,000 feet.

4. Persevere to complete and master tasks.

College Ready Description: Student does not get overwhelmed with the task at hand.

Evidence for Scoring: Student doesn't believe that if he or she can't solve the lowest cost the first time through that it's an impossible task but rather divides the task into manageable steps.

E. Work Habits**2. Work collaboratively.**

College Ready Description: Students actively and equally work together on the problem at hand. Students recognize different people have different skills and knowledge and tries to use the best everyone has for the betterment of the group.

Evidence for Scoring: One student does not do all the work while the other students just sit passively.

F. Academic Integrity**1. Attribute ideas and information to source materials and people.**

College Ready Description: Student references any sources that they use.

Evidence for Scoring: Student references the given graph on efficiency vs. height in their flight plan.

2. Evaluate sources for quality of content, validity, credibility, and relevance.

College Ready Description: Students look at sources of external information, determine who wrote each source, and if it is useful to them.

Evidence for Scoring: Student may go to Google Maps to get distances between the cities and determine that those values are pretty accurate.

FOUNDATIONAL SKILLS**A. Reading Across the Curriculum****4. Identify the key information and supporting details.**

College Ready Description: Student examines the information given and determines what is useful and what is not useful.

Evidence for Scoring: Student can look at the efficiency graphs and determine where the maximum efficiency is.

B. Writing Across the Curriculum**1. Write clearly and coherently using standard writing conventions.**

College Ready Description: Student explains in writing what they observe in the data graphs and clearly conveys consequences of their observations. Student uses technical definitions in their explanations.

Evidence for Scoring: Student can correctly use the word "altitude" in their writing.

2. Write in a variety of forms for various audiences and purposes.

College Ready Description: Student produces a complete typed flight plan (more technical) and a presentation (a marketing pitch).

Evidence for Scoring: Student demonstrates that he or she can write to persuade, rather than merely inform, by creating a proposal that is both technically correct and convincingly conveyed.

3. Compose and revise drafts.

College Ready Description: Student revises his or her flight plan over many iterations to produce the best final product.

Evidence for Scoring: Student tries multiple iterations of data to produce the most cost effective flight.

C. Research Across the Curriculum**1. Understand which topics or questions are to be investigated.**

College Ready Description: Student takes the description of the assignment and figures out how the information is to be used in completing the goal.

Evidence for Scoring: Given a broad and challenging problem, student is able to break the primary question into subsidiary questions and develop appropriate strategies for addressing each one.

2. Explore a research topic.

College Ready Description: Student researches the assignment to get a better understanding of what he or she is trying to solve.

Evidence for Scoring: If a student doesn't understand why different altitudes have different efficiencies, the student is willing to research this subject until comfortable with the concept.

3. Refine research topic based on preliminary research and devise a timeline for completing work.

College Ready Description: Student tries to solve the first task and then refines his or her approach. Student is able to produce a timeline that will keep him or her on track to completing the flight plan and presentation on the allotted day.

Evidence for Scoring: Student produces a timeline in which milestones are appropriate and evenly distributed.

5. Synthesize and organize information effectively.

College Ready Description: Student sees how the data given in the graphs and tables are related to each other and how to organize this data in a way that is useful.

Evidence for Scoring: Student produces a report in which relevant information is prominently displayed, and the relevance of the information to the research question is made very clear.

6. Design and present an effective product.

College Ready Description: Student completes a cost effective flight plan and produces an associated marketing presentation.

Evidence for Scoring: Student's flight plan and marketing pitch are technically accurate and precise, as well as demonstrating an attempt to convince the audience to buy into his or her approach.

7. Integrate source material.

College Ready Description: Student uses the data given in the graphs and tables in producing his or her flight plan.

Evidence for Scoring: Student effectively incorporates the data from provided graphs and tables as well as other sources and cites all references clearly and appropriately.

8. Present final product.

College Ready Description: Student makes an effective marketing presentation. Student presents a typed flight plan.

Evidence for Scoring: Student's presentation is clear and coherent so that the quality of the work is not impeded by the delivery of the pitch.

D. Use of Data

3. Present analyzed data and communicate findings in a variety of formats.

College Ready Description: Student displays data from the graphs and tables in a clear manner in his or her flight plan.

Evidence for Scoring: Student may show his or her flight path on a map but present the altitude as a number.

E. Technology

2. Use technology to organize, manage, and analyze information.

College Ready Description: Student uses a spreadsheet program to organize all the facets of his or her flight plan and aid in calculations of cost.

Evidence for Scoring: Student might use a spreadsheet to organize data across multiple variables and perform optimizations.

3. Use technology to communicate and display.

College Ready Description: Student types up his or her flight plan and includes the necessary charts, figures, and tables that accompany it. Student uses technology to make his or her marketing presentation.

Evidence for Scoring: Student may use PowerPoint to organize his or her presentation or use a spreadsheet program to produce a graph of flying direction vs. time.

4. Use technology appropriately.

College Ready Description: Student makes good use of the technology.

Evidence for Scoring: Student uses a computer to do quick computer calculations but does not spend all of his or her time reproducing entire graphs in Excel when using his or her eyes will be more time effective.

SCIENCE STANDARDS

I. Nature of Science: Scientific Ways of Learning and Thinking

A.1, 3. Cognitive skills in science.

College Ready Description: Student utilizes skepticism, logic, and professional ethics in science. Student formulates appropriate questions to test understanding of natural phenomena.

Evidence for Scoring: Student thinks logically through all the steps of the process of creating a complete and effective flight plan. Student asks questions such as “What if we change this?” and follows through to see how different changes in variables affect cost.

C.1. Collaborative and safe working practices.

College Ready Description: Student collaborates on joint projects.

Evidence for Scoring: All group members equally participate, and one does not do all the work while the others sit and do nothing.

E.1, 2. Effective communication of scientific information.

College Ready Description: Student uses several modes of expression to describe or characterize natural patterns and phenomena. These models of expression include narrative, numerical, graphical, pictorial, symbolic, and kinesthetic. Student uses essential vocabulary of the discipline being studied.

Evidence for Scoring: Student presents his or her flight plan using various forms, such as graphs, charts, and words. Student’s flight plan might include a map of the path as well as a chart of numbers for how much each component costs. Student uses the word “altitude” instead of the word “height.”

II. Foundation Skills: Scientific Applications of Mathematics

A.6, 7. Basic mathematics conventions.

College Ready Description: Student estimates results to evaluate whether a calculated result is reasonable. Student uses calculators, spreadsheets, computers, etc. in data analysis.

Evidence for Scoring: Student will do quick order of magnitude calculations to check to see if his or her numbers make sense. Student recognizes that if the total flight time takes more than a few hours then something is probably wrong.

B.1, 2. Mathematics as a symbolic language.

College Ready Description: Student carries out formal operations using standard algebraic symbols and formulae. Student represents natural events, processes, and relationships with algebraic expressions and algorithms.

Evidence for Scoring: Student shows how the total cost is calculated, using algebraic expressions in a spreadsheet to quickly figure out the flight cost. Student can relate the different values to previously learned quantities and equations. When a student is talking about flying speed, he or she knows that the distance traveled is equal to the ground speed multiplied by the time traveled at that speed.

C.1. Understand relationships among geometry, algebra, and trigonometry.

College Ready Description: Student understands simple vectors, vector notations, and vector diagrams, and carries out simple calculations involving vectors.

Evidence for Scoring: Student can calculate the air velocity and add it to the wind vector to calculate ground speed.

D.1. Scientific problem solving.

College Ready Description: Student uses dimensional analysis in problem solving.

Evidence for Scoring: Student knows how to deal with the efficiency graphs and how to calculate cost from the appropriate quantities, such as flying time and cost per hour.

F.1. Scientific measurement.

College Ready Description: Student selects and uses appropriate Standard International (SI) units and prefixes to express measurements for real world problems.

Evidence for Scoring: Student clearly shows that appropriate units are being used throughout the analysis and that unit conversions are carried out properly.

III. Foundation Skills: Scientific Applications of Communication

A.1. Scientific writing.

College Ready Description: Student uses correct applications of writing practices in scientific communication.

Evidence for Scoring: Student properly types up his or her flight plan. The flight plan should not just be a set of numbers but should include some text explaining what the numbers mean and how to interpret them.

B.3. Scientific reading.

College Ready Description: Student recognizes scientific and technical vocabulary in the field of study and uses this vocabulary to enhance clarity of communication.

Evidence for Scoring: Student correctly uses the technical words for science and some of the aviation lingo. Student refers to the airplane's height as altitude and the directions given should be in reference to North and not the traditional x-axis, which points east.

C.1. Presentation of scientific/technical information.

College Ready Description: Student prepares and presents scientific/technical information in appropriate formats for various audiences.

Evidence for Scoring: Student's flight plan should not just be a set of numbers but should include some text explaining what the numbers mean and how to interpret them. Student is able to properly produce a marketing presentation.

VIII. Physics

A.1. Matter.

College Ready Description: Student demonstrates familiarity with length scales from sub-atomic particles through macroscopic objects.

Evidence for Scoring: Student can determine approximately how far it is from AUS to MSY.

B.1, 3. Vectors.

College Ready Description: Student understands how vectors are used to represent physical quantities. Student demonstrates knowledge of vector mathematics using a numerical representation.

Evidence for Scoring: Student knows that to figure out ground speed, he or she needs to calculate the air velocity and add it to the wind vector.

C.1. Forces and motion.

College Ready Description: Student understands the fundamental concepts of kinematics.

Evidence for Scoring: Student understands how velocity, distance, and time relate to each other. Student knows that if a plane travels at a certain speed over a certain distance, then the time it takes can be determined.

D.1, 2. Mechanical energy.

College Ready Description: Student understands potential energy, kinetic energy, and conservation of energy.

Evidence for Scoring: Student realizes that the energy used in flying a plane is provided from fuel and there is energy lost to air friction. Student should realize that there is a cost to achieving a certain altitude but that to return to the ground recoups some of that energy (although the weight of the plane is different than if no energy was initially used to obtain the altitude).

Flight Plan Physics – Scoring Instructions

Place a score (1-4) in each row of the scoring sheet corresponding to the student's college readiness level.

Exceeding College Ready (4): Substantially exceeds the performance expectations

College Ready (3): Shows proficiency in all of the performance expectations

Approaching College Ready (2): Meets only some of the performance expectations

Initiating College Ready (1): Does not yet meet the performance expectations

Suggested Grade Conversion:

This chart reflects equal weight given to each skill. As key cognitive skills, foundational skills, and discipline content knowledge are all important elements of college readiness, we recommend this grading approach. However, you may certainly choose to implement different weights to particular scales and assign a grade at your discretion.

Score	Grade		Score	Grade		Score	Grade		Score	Grade
60	100		49	91		38	80		27	73.5
59	99.5		48	90		37	79.5		26	73
58	99		47	88.5		36	79		25	72
57	98.5		46	86		35	78.5		24	71
56	98		45	85		34	78		23	70
55	97		44	84.5		33	77.5		22	68
54	96		43	84		32	77		21	66
53	95		42	83.5		31	76		20	64
52	94		41	83		30	75		19	62
51	93		40	82		29	74.5		18	60
50	92		39	81		28	74			