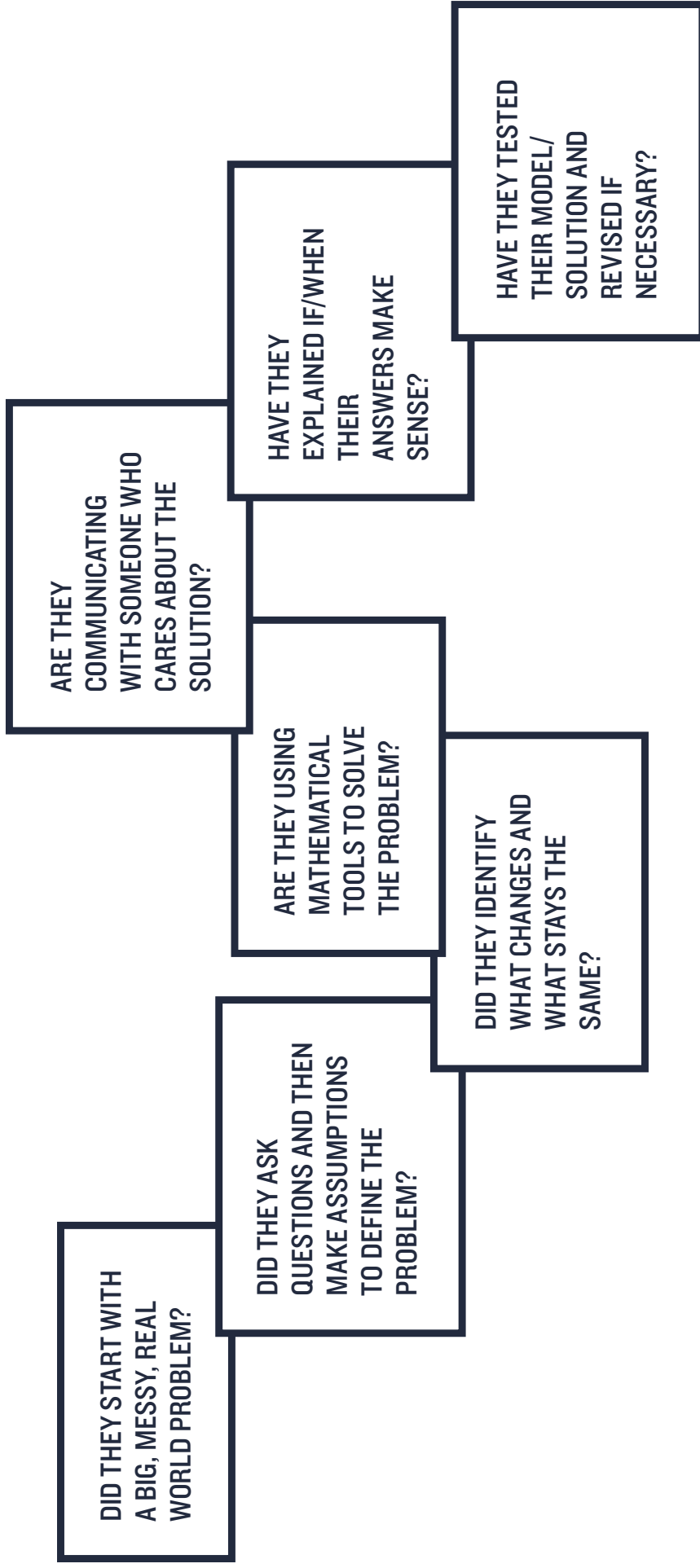


ARE MY STUDENTS MODELING?



SCORING RUBRIC FOR THE MINI GOLF PROJECT

DIMENSIONS	SCORE OF 0	SCORE OF 1	SCORE OF 2	SCORE OF 3	SCORE OF 4
FIRST SIX PLUS ONE MINI GOLF HOLES ARE CONSTRUCTED USING GEOGEBRA	Not completed at all	Mini golf course holes are constructed with major issues	Mini golf course holes are constructed with minor issues and no practice hole is included	Mini golf course holes are constructed with minor issues	Mini golf course holes are well constructed
COORDINATES OF CORNERS OF HOLES AND CUP ARE IN THE REPORT	Coordinates not included at all	Coordinates of all holes are included, but not even close to correct	Coordinates of all holes are included with major issues	Coordinates of all holes are included with minor issues	Coordinates of all holes are perfect
PERIMETER	Perimeter not included at all	Perimeters of all holes are included, but not even close to correct	Perimeters of all holes are included with major issues	Perimeters of all holes are included with minor issues	Perimeters of all holes are perfect
AREA	Areas not included at all	Areas of all holes are included, but not even close to correct	Areas of all holes are included with major issues	Areas of all holes are included with minor issues	Areas of all holes are perfect
PARALLEL LINES AND ANGLES	Parallel lines and angle measures not included at all	Parallel lines and angle measures of all holes are included, but not even close to correct	Parallel lines and angle measures of all holes are included with major issues	Parallel lines and angle measures of all holes are included with minor issues	Parallel lines and angle measures of all holes are perfect
COMPOSITION OF POLYGONS AND SOLIDS	Composition of polygons and solids not mentioned	Composition of polygons and solids mentioned, but not even close to correct	Composition of polygons and solids described, but with major errors	Composition of polygons and solids described with only minor errors	Composition of polygons and solids described perfectly
SURFACE AREA	Surface Areas not computed	Surface Areas computed, but not even close to correct	Surface Areas computed, but with some major errors	Surface Areas computed with only minor errors	Surface Areas computed perfectly
VOLUME	Volumes not computed	Volumes computed, but not even close to correct	Volumes computed, but with some major errors	Volumes computed, but with only minor errors	Volumes computed perfectly
REGULAR POLYGON ANGLE MEASURES	Regular Polygon angles not computed	Regular Polygon angles computed, but not even close to correct	Regular Polygon angles computed, but with major errors	Regular Polygon angles computed with only minor errors	Regular Polygon angles computed perfectly
AREA OF WALKWAYS	Areas of walkways not computed	Areas of walkways computed, but not even close to correct	Areas of walkways computed, but with major errors	Areas of walkways computed with only minor errors	Areas of walkways computed perfectly
CARPETING	Tessellation is not discussed at all.	Tessellation is discussed, but is not even close to correct	Tessellation is discussed with major errors	Tessellation is discussed with minor errors	Tessellation is discussed perfectly
SECOND SIX PLUS ONE MINI GOLF HOLES ARE CONSTRUCTED USING GEOGEBRA	Not completed at all	Mini golf course holes are constructed and labeled with major issues	Mini golf course holes are constructed and labeled with minor issues and no practice hole is included	Mini golf course holes are constructed and labeled with minor issues	Mini golf course holes are well constructed and labeled
TRANSFORMATIONS FOR SECOND DESIGN	Transformations not described	Transformations described, but not even close to correct	Transformations described, but with some major errors	Transformations described but with only minor errors	Transformations described perfectly
COST	Costs not computed	Costs computed, but not even close to correct	Costs computed, but with some major errors	Costs computed with only minor errors	Costs computed perfectly
REPORT	There is no report	Report is not well organized and does not convey information well	Report is organized but does not convey information well	Report is not organized but conveys information well	Report is organized and conveys information well
				SCORE OUT OF 60	

RUBRIC FOR MODELING ASSESSMENT

MODELING COMPONENT	QUESTIONS ABOUT YOUR MODEL AND HOW YOU MADE IT	MODELING-RELATED VOCABULARY TO BUILD
DEFINING THE PROBLEM	What is the big problem that you have been asked to solve? It might have more than one possible answer.	open-ended problem, constraints
DEFINING THE PROBLEM	What is the specific problem your model is going to solve? (My model will tell you...)	specific, focus
MAKING ASSUMPTIONS	What ideas did you think about that you decided not to try?	eliminate, prioritize
MAKING ASSUMPTIONS	What have you assumed in order to solve the problem? Why did you make these choices?	assumption/assumed
DEFINING VARIABLES	What quantities are important? Which ones change and which ones stay the same?	variable
DEFINING VARIABLES	Where did you find the numbers that you used in your model?	resources, citations
GETTING A SOLUTION	What pictures, diagrams or graphs might help people understand your information, model, and results?	diagram, graph, labels
GETTING A SOLUTION	What mathematical ideas did you use to describe the situation and solve your problem?	situation
ANALYSIS AND MODEL ASSESSMENT	How do you know that your calculations are correct? Did you remember to use units (like dollars or inches?)	calculation, unit
ANALYSIS AND MODEL ASSESSMENT	When does your model work? When do you need to be careful because it might not?	limitations
ANALYSIS AND MODEL ASSESSMENT	How do you know you have a good/useful model? Why does your model make sense?	testing, validation
ANALYSIS AND MODEL ASSESSMENT	If you were going to make your model better, what would you do?	improvement, iteration
REPORTING RESULTS	Explain your mathematical model in words and math.	testing, validation
REPORTING RESULTS	How did each of your teammates help?	model
REPORTING RESULTS	What did you learn from each other member of your team?	collaborate
REPORTING RESULTS	What are the 5 most important things for your audience/client to understand about your model and/or solution?	client, audience

CHECKLIST FOR GENERAL ASSESSMENT OF A MODELING PROJECT

PROJECT FEEDBACK

- Provided a write-up
- Demonstrated understanding of the premise of the problem: explicit (writing)/ implicit (math)
- Demonstrated proper use of Separation of Variables
- Complete mathematical analysis presented and used to address problem
- Organization (spelling, grammar, format, style, mathematical notation)

GRADE _____

RESUBMIT FOR GRADE

If resubmit for grade is circled, then there are critical errors in either your mathematics or the writing. It might be a good idea to see me before trying again on your own, so I can help you understand what is required.

COMMON ISSUES

Figures & Tables

- Refer to all figures and tables by numbers in the main body of the text
- Figure numbers and captions are required at the bottom of each figure
- Table numbers and titles are required at the top of each table

Tense and Person

- Avoid first person singular (I, me, my)
- Make sure you are consistent in tense throughout
- Passive voice is acceptable in technical writing!

Appendices

- If you use any appendices, be sure to reference it in the main text (otherwise the reader may never know all the good things you've hidden back there!)
- Appendices should either be lettered (A, B, C) or numbered with Roman numerals (I,II,III)

Flow

- There should be a narrative arc—be sure that all ideas are properly introduced, much like you'd need to introduce a character in a story
- Although a non-mathematician might get lost in a couple of the details, anyone should be able to read your paper and get a sense of what you did and why it was important

CHECKLIST FOR MODELING PROJECT SUBMISSION

MODELING PROJECT CHECKLIST

- Separate title page with names, ID numbers, professor, section, staple
- An introduction which clearly states the problem to be solved
- A paper with distinct sections and concise and clear assumptions, description of model parameters and variable, solution process, summary and conclusions (does your answer make sense and why? What are the strengths and weaknesses of your approach?)
- Use equation editor or hand write equations on their own
 - ex: $\sqrt{x^2+y^2}$ is bad
 - ex: $\sqrt{x^2+y^2}$ is good
- Derivations and computations are clear logical and easy to follow?
- A clear description of the variables and diagrams/tables properly labeled with correct units.
- Give acknowledgment where it is due (this included help from people). References stated.
- Answered all questions being asked, including discussion questions?
- All work is shown? Hand calculations attached and easily referenced?
- Spelling, grammar, and punctuation correct? Is the mathematics correct?

SPECIFIC TO THIS PROJECT

- Proposed a model to predict cat population
- Proposed an intervention strategy
- Used both models to make some future predictions and assessed the quality of the solutions
- Included all parts of the final report guidelines

GENERIC RUBRIC FOR STAND-ALONE EXECUTIVE SUMMARY ASSESSMENT

DEFINE THE MODELING PROBLEM (3 POINTS TOTAL)			
IDEAL	SATISFACTORY	NEEDS IMPROVEMENT	INCOMPLETE
(3 points) Concise problem statement that indicates exactly what the output of the model will be and, if appropriate, identifies the audience and/or perspective of the modeler. Statement is presented early in the paper.	(2 points) Problem statement is easily identifiable but not precise or consistent with other statements in paper.	(1 point) Problem statement is difficult to understand or is buried in the text.	(0 points) No problem statement is given.

BUILDING THE MODEL: MAKE ASSUMPTIONS AND ACKNOWLEDGE LIMITATIONS (3 POINTS TOTAL)			
IDEAL	SATISFACTORY	NEEDS IMPROVEMENT	INCOMPLETE
(3 points) Primary assumptions used to develop the model are clearly identified, easy-to-read and well justified. Limitations due to simplification are stated when appropriate.	(2 points) Primary assumptions are noted; justification or readability is lacking.	(1 point) Assumptions and justification exist, but are difficult to identify in the text.	(0 points) No assumptions –or justification for lack of assumptions is provided.

BUILDING THE MODEL: DEFINE VARIABLES AND IDENTIFY PARAMETER (3 POINTS TOTAL)			
IDEAL	SATISFACTORY	NEEDS IMPROVEMENT	INCOMPLETE
(3 points) Notes and rationalizes the need for the primary factors that influence the phenomena being modeled in a readable format; proper units are specified.	(2 points) Important parameters and variables are listed properly but without sufficient explanation.	(1 point) Variables/parameters are wither barely mentioned or hard for the reader to identify in the text.	(0 points) No variables or parameters are identified.

SOLUTION: MODEL USES MEANINGFUL MATHEMATICS (4 POINTS TOTAL)			
IDEAL	SATISFACTORY	NEEDS IMPROVEMENT	INCOMPLETE
(4 points) Provides a readable glimpse into the mathematical method(s) used to solve the problem. Plausible approach and outcome is presented.	(3 or 2 points) Mathematical approach is stated, but aspects of the method(s) are inconsistent, difficult to understand or incomplete.	(1 point) Model is stated and/or contains fixable mathematical errors.	(0 points) Model is not presented or contains significant errors.

SOLUTION: RESULTS ARE ACCESSIBLE TO THE AUDIENCE (4 POINTS TOTAL)			
IDEAL	SATISFACTORY	NEEDS IMPROVEMENT	INCOMPLETE
(4 points) Clearly presents a solution that is consistent with the original problem statement. If appropriate, a useful visual aid/graphic is included.	(3 or 2 points) Answer is stated, but aspects of the solution(s) are inconsistent, difficult to understand or incomplete (e.g. fail to identify units of measure).	(1 point) Answer is given without contextual background (i.e. appropriate graphics, proper units, etc.).	(0 points) Solution is not provided.

ANALYSIS & ASSESSMENT OF MODEL (3 POINTS TOTAL)			
IDEAL	SATISFACTORY	NEEDS IMPROVEMENT	INCOMPLETE
(3 points) The viability and reliability of the math modeling solution are addressed. For example, how sensitive is the model to changes in parameter values or altered assumptions? How does it compare to other solutions or historical data?	(2 points) Addressed, but the analysis is lacking proper dimensionality. For example, obvious consequences of the stated outcome are ignored or well-known comparisons are disregarded.	(1 point) Some analysis is provided but without any sense of perspective.	(0 points) No analysis or assessment of model is included in the write-up. Incorrect mathematics used in analysis.

WRITING STYLE & ORGANIZATION (5 POINTS TOTAL)			
IDEAL	SATISFACTORY	NEEDS IMPROVEMENT	INCOMPLETE
(5 or 4 points) Correct spelling and grammar is used throughout. Paper is well formatted and enjoyable to read. Visual aids (if appropriate) are well chosen and easy to interpret.	(3 or 2 points) Multiple spelling, formatting or grammatical errors. Visual aids are missing key readability features or do not clearly connect to the solution.	(1 point) Significant disregard for common spelling, grammatical and mathematical rules.	(0 points) Complete disregard for common spelling, grammatical and mathematical rules.

PEER ASSESSMENT RUBRIC FOR ORAL PRESENTATION OF RESULTS

MATH MODELING PRESENTATION SCORE SHEET

Presentation made by team:

Please select a value (1-5) reflecting the extent to which you agree with the given statement.

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
I understood the presenting team's interpretation of the question.	1	2	3	4	5
All stated assumptions were adequately justified.	1	2	3	4	5
The model's strengths and weaknesses were addressed.	1	2	3	4	5
Appropriate mathematics was used to create the model.	1	2	3	4	5
A final solution was clearly presented.	1	2	3	4	5
The mathematical model produced a plausible result.	1	2	3	4	5
Visual aids were easy to read and understand.	1	2	3	4	5
The team addressed authentic alternative scenarios and/or the need for future work.	1	2	3	4	5
I enjoyed the presentation; the presenter(s) held my attention for the full extent of the talk.	1	2	3	4	5
I would like to learn more about this team's solution method.	1	2	3	4	5

What is one question you would like to ask this team?

Additional questions or comments: