

Activity Descriptions, Prompts and Rubrics, and a Course Calendar for Introduction to Geometry

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1 Interactive Videos

The interactive video slides and interactions are available at <https://appstate.edu/~greenwaldsj/class/3610/>. Interactive videos are videos that stop regularly to engage students with course content and add to their notes before they can proceed. Students engage with the interactions I’ve programmed in and answer questions in the video environment, which is an H5P environment. Students use the check feature on interactive questions in order to help them so they can redo the responses until they are all correct. Interactive videos have multiple chances to succeed. I ask students to attempt items for completion and take interactive video notes by the listed date when possible as the material builds on itself.

1.1 interactive video prompt

To earn credit you’ll watch the entire video and submit the correct answers via the green “Submit Answers” button at the very end of the video, the one that shows all the questions you have answered—you’ll use the check feature on interactive questions in order to help you so you can redo the responses until you get them correct. You’ll also need

- a notebook or tablet or similar to take video notes on that you can bring with you to class. Research has shown that the effort to write activates parts of the brain that watching alone does not and video notes will be needed in upcoming classes. Your own personal video notes also form a portion of the final assessment grade on our final exam day. At the end of the semester, you can bring them with you to turn in and/or turn them in online. Pause regularly to take notes, especially on concepts, proofs, Interactive Geometry Software and other visualizations, and any remaining questions. In addition, at times you'll be specifically directed to add items to your notes.
- Euclid's *Elements*
- GeoGebra Geometry at <https://www.geogebra.org/download> or <https://www.geogebra.org/geometry>

2 Worksheets

All the classroom worksheets are available at <https://appstate.edu/~greenwaldsj/class/3610/>. Worksheets showcase student learning outcomes, at the top, and allow students to review, practice, solidify and extend course content with their peers. The students complete most worksheets during class but have until just before the next class to turn them in.

2.1 turn in worksheet prompt

During class, you work with your classmates to help each other and discuss as you handwrite your responses. To handwrite, you can write on the handout I give you or use a stylus to electronically handwrite on the electronic version from the tentative calendar with in-class listings.

Collate your responses into one full size multipage PDF to submit here by the listed deadline. If you have a phone or tablet, apps can work well to scan work to one full size multipage PDF. You can also use many printers or photo copiers to scan to PDFs—the school library lists that as an option and they can help: <https://library.appstate.edu/services-search/print-zone-tech-help>.

Worksheets have a strict deadline, listed here. I recommend you turn it in on the day we work on it, prior to that, but you typically have until just before the next class, as listed here. I can help in office hours!

You'll see your personalized feedback after I've had a chance to assess it for completion.

3 “Begin” Assignments

A “begin” assignment earns completion when students read through a project or reflection and send me any questions or give me a brief update otherwise. The idea is that students should begin these assignments early and continue working on them until their listed due date. Some projects have a “select a topic” activity instead of a “begin” activity.

3.1 “begin” prompts for Project 1 and Reflection 1

Begin Project 1 prompt

You are ready to begin Project 1, even as we continue with related content with activities that will help you solidify the material for it. Skim through Project 1. The idea of the “begin” is to have you skim through, acclimate to the policies and start working. I intend you to continue working on it and the new activities will help too. Here, send me any questions you have or give me a brief update if you don't have questions. To achieve completion, select “answer questions” and then write your response in the space provided and

submit it. The begin and the project itself both have strict deadlines. The project itself isn't due until later but the responses here are due.

Begin Reflection 1 prompt

You are ready to begin Reflection 1. The idea of the “begin” is to have you acclimate to the policies and start working. Please skim through

- reflection instructions and rubric (see above)

Defines a successful reflection and is what I will use to assess. Reflections are individual expositions because of the personalization requirement.

- sample reflection of a different learning goal: Educational Connections

This is a sample reflection response. However, you will be reflecting on three learning goals, one at a time: Interactive Geometry Software, Proof Considerations, and Geometric Perspectives. This reflection is from a different semester when students additionally reflected on Educational Connections. This semester, this learning goal will be credited for you within Project 4 instead.

Here, send me any questions you have or give me a brief update if you don't have questions. To achieve completion, select “answer questions” and then write your response in the space provided and submit it. The begin and the reflection itself both have strict deadlines. The reflection itself isn't due until later but the responses here are due.

For a successful reflection, you reflect on all the items in the specific learning goal itself, every word in the learning goal, plus the four items at the bottom of the rubric. All five of these items in the rubric (learning goal, reflection and personalization of learning goal, examples, support of arguments, and communication) must be achieved at the highest level for successful completion of the learning goal in the reflection.

For instance, for proof considerations that would look like all four of: a) writing rigorous proofs in geometry, b) identifying underlying assumptions, c) understanding limitations, and d) applications, plus the four items at the bottom of the rubric: creative reflection on, and personalization related to the course learning goal, typically the equivalent of 2–3 pages long, single-spaced text, one or more suitable example(s) are provided that relate to course content and showcase the learning goal, viewpoints and interpretations are correct and are supported appropriately, and communicates effectively in a logical, organized manner that demonstrates consideration of context, audience, and purpose.

The University Writing Center <https://writingcenter.appstate.edu/> offers writing consultations to help! You can bring them drafts plus our rubric and I can also help in Zoom hours.

4 “Review” Assignments

In the “review” assignments, I summarize important propositions and activities, ask students to reflect on the learning goals and outcomes in this context, and list some related items from the Common Core State Standards Initiative and state standards. Like the begin, students earn completion by sending me any questions or providing a brief update otherwise.

4.1 “review” prompt on congruence and similarity

Review and reflection can help solidify learning and strengthen retention, especially if it is spaced out and requires some retrieval to help make connections as in *Make it Stick: The Science of Successful Learning* by Henry L. Roediger III, Mark A. McDaniel, and Peter C Brown

(graphic with): Embrace difficulties, Avoid illusions of knowing, To learn, retrieve, space it out, mix it up, Move beyond learning styles

So review and reflect on the following as related to congruence and similarity and then respond below via an update or any remaining questions:

Proposition I-4: SAS

familiarity with IGS exploration of SAS

familiarity with proof of SAS

identify underlying assumptions (e.g., superposition, there is a unique Euclidean segment connecting two points)

identify limitations of the proof (e.g., sketch a pair of triangles that give a counterexample on the sphere and

identify what goes wrong with the Euclidean proof in spherical geometry)

identify applications of SAS

SSA is not a congruence theorem

IGS exploration: sketch a pair of triangles that give a counterexample for SSA in Euclidean geometry

proof that SSA isn't a congruence theorem

How does the law of cosines factor in?

What theorem is needed to prove the law of cosines in the proof referenced on the worksheet

AAA

IGS exploration related to AAA

familiarity with proof that AAA gives similarity in Euclidean geometry

identify underlying assumptions

identify limitations of the proof (e.g., in spherical geometry AAA provides congruence instead)

identify applications of AAA

any point on a perpendicular bisector is equidistant from the endpoints and circumcenter connection
familiarity with proof

name a congruence or similarity theorem that we used in the proof

sketch of related diagram showing the circumcenter and perpendicular bisectors of a triangle

midpoints of Euclidean quadrilaterals

what figure do we form when we construct the segments connecting the midpoints of a quadrilateral?

related IGS exploration and paper folding

familiarity with proof

name a congruence or similarity theorem that we used in the proof

transformations of an acute angle

the effects of various transformations on congruence and similarity

congruence and similarity in Euclidean triangles

what information guarantees congruence (e.g. SAS) and related propositions from Euclid's *Elements*

what information guarantees similarity (e.g. AAA)

Next, review and reflect as related to our Learning Goals as follows:

IGS Explorations: I can use Interactive Geometry Software (IGS) to discover relationships and demonstrate they seem to apply in a wide variety of examples.

Select one or two IGS explorations we completed in congruence and similarity from the videos, worksheets, or project 3 to review as you consider the following:

How did this IGS exploration help us discover relationships and what relationship(s) did we discover

How an IGS exploration typically showed us a wide variety of helpful examples via the dynamic dragging.

Why “seem” in the learning goal? I.e. why an IGS exploration was never a proof on their own, because we can’t check every example for general statements, because there is rounding in GeoGebra at the pixel level, and because even though they can convince us they don’t show all the reasons why as a proof would.

Proof Considerations: I can write rigorous proofs in geometry, identify underlying assumptions, and understand limitations and applications.

Notice that I already asked you to make connections to all the words in proof considerations via reviewing the questions above.

Geometric Perspectives: I can compare and contrast multiple geometric perspectives, such as relationships among Euclidean and non-Euclidean geometries, axiomatic and analytic approaches, informal intuition and rigorous proof, or 2-D polygons and 3-D polyhedra, just to name a few.

Notice that we explored relationships among Euclidean and non-Euclidean geometries as well as informal intuition and rigorous proof within this section

Educational Connections: I can make connections between learning geometry in this class and learning and teaching geometry, especially in high school.

Consider some of the connections to the following items from the North Carolina Standard Course of Study and Common Core State Standards Initiative:

NC.M2.G-CO.2 Experiment with transformations in the plane: Represent transformations in the plane. Compare rigid motions that preserve distance and angle measure (translations, reflections, rotations) to transformations that do not preserve both distance and angle measure (e.g. stretches, dilations). Understand that rigid motions produce congruent figures while dilations produce similar figures.

NC.M2.G-CO.8 Use congruence in terms of rigid motion. Justify the ASA, SAS, and SSS criteria for triangle congruence. Use criteria for triangle congruence (ASA, SAS, SSS, HL) to determine whether two triangles are congruent.

NC.M2.G-CO.9 Prove theorems about lines and angles and use them to prove relationships in geometric figures including:… Points are on a perpendicular bisector of a line segment if and only if they are equidistant from the endpoints of the segment.

NC.M3.G-CO.10 Verify experimentally properties of the centers of triangles (e.g. circumcenter).

NC.M2.G-SRT.1 Verify experimentally the properties of dilations with given center and scale factor.

NC.M2.G-SRT.4 Use similarity to solve problems and to prove theorems about triangles. Use theorems about triangles to prove relationships in geometric figures.

NC.M3.G-CO.14 Apply properties, definitions, and theorems of two-dimensional figures to prove geometric theorems and solve problems

CCSS.MATH.CONTENT.HSG.SRT.A.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

CCSS.MATH.CONTENT.HSG.SRT.D.11 Understand and apply the ... Law of Cosines to find unknown measurements in ... triangles

NC.M3.G-MG.1 Apply geometric concepts in modeling situations.












There are other state and national standards that apply!

Reviews and reflection can be completed later if you are running short on time and I’m happy to help anytime in office hours with anything you are working on, including this. Some of these items are also in the suggested topics to review for our in-class final assessment during our final exam assigned time (see the “begin final assessment guide” at the end of the semester). Using my personalized feedback on your worksheets and projects, consider whether you have any remaining questions. For completion, write down any questions you have, if any, or let me know that you don’t have any questions via a smiley face or brief

update! I'll try to respond to any questions by contacting you individually or within a class announcement or asking you to come into office hours.

5 Moodle Completion Credit

The above items, as well as others, earn completion credit in Moodle, our Learning Management System (LMS). We tell students:

completion activities may be ones where you can manually mark the activity as completed or are earned for a good faith effort when you access an activity or receive a proficient grade by a deadline . Attempt items for completion and take interactive video notes by the listed date when possible as the material builds on itself. The percentage of completed activities determines the overall engagement grade. While many items have strict deadlines, there is flexibility built in and multiple pathways for success—interactive videos have multiple chances to succeed, many ASU Learn items can be completed ahead, plus, to accommodate for emergencies, the lowest 3 completion assignments are dropped. Activities may include           web pages, PDFs, files, interactive videos, surveys, forums, turn-ins, begin projects and reflections, select a topic, and peer review.

6 Reflections

We tell students that:

Taking time to look back at what you have done and make new connections allows you to solidify knowledge and put your understanding in context. Reflections are expositions, typically the equivalent of 2—3 pages long, single-spaced typed text, and can also include images and references. Reflections connect content in the course to course learning goals. They are quite flexible so that you can follow up on and make connections to your own interests. For each reflection, list the learning goal you want me to assess from among IGS Exploration, Proof Considerations, and Geometric Perspectives, reflect on every single component of it—every word in the learning goal—and give at least one example we covered that you feel best showcases the goal and your understanding of it. In addition, reflect and personalize. For example, you might focus on your own development as related to the goal, what you are still working on, and/or you could conduct research to find additional new connections. Reflections are individual expositions because of the personalization. For the first reflection, you will receive feedback from peers and myself and have a chance to revise it and there are other revision opportunities on reflections too. Other than those, there are no late reflections accepted.

Success in reflections is tied to rubric standards, rather than a percentage correct or point system. This will allow you (and I) to identify strengths and weaknesses early in the class. Your work must be turned in to the ASU Learn assignment on or before the due date and time, but there are multiple opportunities to work on problem areas and succeed as there are four reflections total (plus the revision on the first one) in which to satisfy the three learning goals. In reflections, we'll employ Star Wars terminology as a metaphor—Padawans are training to one day become a Jedi. Jedi complete their training and pass the Jedi Trials to become full members. The numerical version of your grade is calculated as the percentage of learning goals achieved.

6.1 Reflection prompt and rubric

Reflections are expositions that connect content in the course to learning goals. As a reflective practitioner, taking time to look back at what you have done and make new connections allows you to put your understanding in context. For each reflection, list the learning goal you want me to assess, reflect on every single component of it—every word in the learning goal—and give at least one example we covered that you feel best showcases the goal and your understanding of it. In addition, reflect and personalize. For example, you might focus on your own development as related to the goal, perhaps including what you are still working on, or conduct research to find additional new connections, to name a few possibilities. Creative reflection and personalization is encouraged—they are quite flexible so that you can follow up on and make connections to your own interests.

all * are mandatory	Padawan Reflection	A Successful Reflection
*Learning Goal (choose one per reflection)	One or more goal components is unclear, unsuccessful, or missing	Identify the course learning goal you want me to assess (IGS Exploration, Proof Considerations, or Geometric Perspectives) and reflect on every single component of it below—components are terms in the learning goal, found in the following 3 blocks:
IGS Exploration	Discovery of relationships, dynamic aspect of IGS, or “seem” unclear	Explores the use of Interactive Geometry Software to discover relationships and demonstrate that they seem to apply in a wide variety of examples
Proof Considerations	Rigorous proofs, assumptions, limitations or applications unclear	Considers writing rigorous proofs in geometry, identifying underlying assumptions, and understanding limitations and applications
Geometric Perspectives	Multiple perspectives, comparing them or contrasting them unclear	Compares and contrasts multiple geometric perspectives, such as relationships among Euclidean and non-Euclidean geometries, axiomatic and analytic approaches, informal intuition and rigorous proof, or 2-D polygons and 3-D polyhedra, to name a few.
*Reflection on and Personalization of Learning Goal	Contains minimal reflection or personalization	Creative reflection on and personalization related to the course learning goal, typically the equivalent of 2–3 pages long, single-spaced text
*Examples	Examples are missing, not in enough depth, or they don’t relate well	One or more suitable examples (e.g., a specific proof, IGS exploration...) that we covered in or between classes are described and analyzed to showcase the learning goal
*Support of Arguments	Viewpoints and interpretations are unsupported or flawed	Viewpoints and interpretations are correct and are supported appropriately
*Communication	Communication could use improvement	Communicates effectively in a logical, organized manner that demonstrates consideration of context, audience, and purpose in the language of our course

A reflection is only successful if every single component of the learning goal you select as well as the items marked with * are satisfied, so each comes with a revision opportunity. In the revision, you will highlight the changes you have made, like highlighting them in yellow in your paper, or list the changes you have made at the top of your paper. This is a standard practice for professional revisions.

6.2 Double-Anonymous Peer Review for Reflection 1 prompt

For Reflection 1, students participate in double-anonymous peer review inside the Moodle “workshop” activity. The prompts we give to students are:

Submission settings:

Submit Reflection Suitable for Double-Anonymous Peer Review

Submit your individual reflection as an anonymous PDF. For a successful reflection, you reflect on all the items in the specific learning goal itself plus the four items at the bottom of the reflection rubric. All five of these items in the rubric must be achieved at the highest level for successful completion of the learning goal in the reflection. For instance, for proof considerations that would look like all four of: a) writing rigorous proofs in geometry, b) identifying underlying assumptions, c) understanding limitations, and d) applications, plus the four items at the bottom of the rubric: creative reflection on and personalization related to the course learning goal, typically the equivalent of 2–3 pages long, single-spaced text, one or more suitable example(s) are provided that relate to course content and showcase the learning goal, viewpoints and interpretations are correct and are supported appropriately, and communicates effectively in a logical, organized manner that demonstrates consideration of context, audience, and purpose. Reflections are individual expositions because of the personalization requirement. The University Writing Center <https://writingcenter.appstate.edu/> offers writing consultations to help!

For Reflection 1, people who submit by the deadline will also participate in double-anonymous peer review, the cornerstone of equitable peer review in publishing. No exceptions to the due dates can be accommodated in ASULearn’s workshop mode. The idea of double-anonymous peer review is that the work and the reviews should stand on their own, independent of prior reputations and hopefully reducing or eliminating implicit biases.

In anonymous reviewing, people don’t know whose work they are reviewing and authors don’t know who reviewed their work. I have tried to set this up on my end. If you would like to take advantage of double-anonymous reviewing then please make sure that you don’t have any identifying information in your submission, like your name in your PDF or in your file name!

Assessment settings:

Peer Reviewing Reflections

During the reviewing phase, you’ll examine 2 papers. Goals include

- to see multiple perspectives relating to learning goals and review other models people have used in their reflections
- to consider how peers respond to your own reflection. While peer feedback is not expert feedback and may be flawed at times, it is considered a best practice in the teaching of writing as well as presentations. You may need to read the feedback critically. It is also how professionals obtain feedback on their own work. For each reflection rubric item (learning goal, reflection and personalization of learning goal, examples, support of arguments, and communication), try to provide at least one area where the author can improve their work and at least one strength, so that they can receive constructive feedback that helps them revise reflection 1 and turn in high quality reflections in the future.

Sometimes it is only after we see other models that we have ideas for improvement on our own work, so another goal of reviewing is to help you in your own reflections.

Be honest in a professional manner to point out problematic areas but at the same time try to be kind and gracious in your comments and tone whenever possible. Focus on ideas and constructive suggestions toward positive solutions rather than implications about the author. For instance, “your grammar sucks” is not a professional reviewer comment. Instead, a reviewer could write something like: “Here is an example of a sentence that can use improvement ... My suggested revision of that sentence is ... Here are some other examples where grammar can be improved.”

Assessment Form Aspect 1:

learning goal: identifies the one course learning goal you want me to assess and reflects on all components of it, every word in the learning goal, as below:

If IGS exploration: explores the use of Interactive Geometry Software to discover relationships and demonstrate they seem to apply in a wide variety of examples

If proof considerations: considers writing rigorous proofs in geometry, identifying underlying assumptions, and understanding limitations and applications

If geometric perspectives: compares and contrasts multiple geometric perspectives, such as relationships among Euclidean and non-Euclidean geometries, axiomatic and analytic approaches, informal intuition and rigorous proof, or 2-D polygons and 3-D polyhedra, to name just a few

Comment on this rubric item. Try to provide at least one area where the author can improve their work and at least one strength, so that they can receive constructive feedback that helps them revise reflection 1 and turn in high quality reflections in the future.

Be honest in a professional manner to point out problematic areas but at the same time try to be kind and gracious in your comments and tone whenever possible. Focus on ideas and constructive suggestions toward positive solutions rather than implications about the author. For instance, “didn’t meet the goal” is not specific enough. Instead, a reviewer could write something like: “I could not find “identifying underlying assumptions” and would suggest you specifically address that. It could fit in well in paragraph 2...”

Assessment Form Aspect 2:

reflection on and personalization of learning goal: creative reflection on and personalization related to the course learning goal, typically the equivalent of 2–3 pages long, single-spaced typed text

Comment on this rubric item. Try to provide at least one area where the author can improve their work and at least one strength, so that they can receive constructive feedback that helps them revise reflection 1 and turn in high quality reflections in the future.

Be honest in a professional manner to point out problematic areas but at the same time try to be kind and gracious in your comments and tone whenever possible. Focus on ideas and constructive suggestions toward positive solutions rather than implications about the author.

Assessment Form Aspect 3:

examples: One or more suitable example(s) are provided that relate to course content and showcase the learning goal

Comment on this rubric item. Try to provide at least one area where the author can improve their work and at least one strength, so that they can receive constructive feedback that helps them revise reflection 1 and turn in high quality reflections in the future.

Be honest in a professional manner to point out problematic areas but at the same time try to be kind and gracious in your comments and tone whenever possible. Focus on ideas and constructive suggestions toward positive solutions rather than implications about the author.

Assessment Form Aspect 4:

support of arguments: viewpoints and interpretations are correct and are supported appropriately

Comment on this rubric item. Try to provide at least one area where the author can improve their work and at least one strength, so that they can receive constructive feedback that helps them revise reflection 1 and turn in high quality reflections in the future.

Be honest in a professional manner to point out problematic areas but at the same time try to be kind and gracious in your comments and tone whenever possible. Focus on ideas and constructive suggestions

toward positive solutions rather than implications about the author.

Assessment Form Aspect 5:

effective communication: communicates effectively in a logical, organized manner that demonstrates consideration of context, audience, and purpose in the language of our course

Try to provide at least one area where the author can improve their work and at least one strength, so that they can receive constructive feedback that helps them revise reflection 1 and turn in high quality reflections in the future.

Be honest in a professional manner to point out problematic areas but at the same time try to be kind and gracious in your comments and tone whenever possible. Focus on ideas and constructive suggestions toward positive solutions rather than implications about the author. For instance, “your grammar sucks” is not a professional reviewer comment. Instead, a reviewer could write something like: “Here is an example of a sentence that can use improvement ... My suggested revision of that sentence is ... Here are some other examples where grammar can be improved.”

Feedback

Examine feedback for your Reflection 1 with an eye toward upcoming reflections as well as toward revisions on Reflection 1 (if needed). For those who participated in peer reviewing, the peer review comments on your work will be available by clicking on the title of your original submission, just below the “grade for submission 0.00/0.00”. To see the peer reviews, once you are in your submission link, scroll down to the comments in the assessment form. If there are multiple peer reviews, keep scrolling to see the comments! My feedback on the reflection and credit for your peer reviewing of others appear in separate ASULearn items.

7 Projects

There are 6 projects over the course of the semester, which include problem sets as well as research projects that you will also share with your classmates. They are designed to apply course learning goals to the content of the course in novel settings and from numerous points of view in order to practice the material and make connections. The Educational Connections learning goal is specifically credited within Project 4. Your work must be turned in to the ASULearn assignment on or before the due date and time because we will often talk about them during class. Problem Sets earn a numerical grade toward your course average. To accommodate issues that may arise, you can revise one project as you reflect on it to replace its grade. Some days are lighter than others and it will help you to progress on upcoming activities in advance, especially major assignments.

7.1 Project 4 prompt and rubric

Collate your responses to Project 4 into one full size multipage PDF for submission here in in this ASULearn assignment. However, the peer review and self-evaluation go in a different ASULearn assignment.


Projects have a strict deadline but there is an optional revise and reflect on one project to replace its grade and accommodate for emergencies.

Project 4: Concept Development of Course Topics

In this project, you will research the geometric development of a concept from its early geometric history to today, such as earliest known uses, real-life applications, and high school teaching and learning. The purpose of this assignment is the diverse geometric perspectives of the concept development of a major course topic.

Project Components:

1. ASULearn select a topic for project 4

Using the ASULearn  choice feature, select a topic for project 4. There is a limit of 2 people for each topic. If you select the same topic as someone else then you may either work alone or together. The topics are: analytic geometry (with coordinates/metric), area and area measurements, axiomatic systems for Euclidean geometry (synthetically, without coordinates), circles, geometric constructions (including IGS and dynamic geometry), modeling with geometry, parallel postulates, perimeter and circumference and their measurements, polygons, polyhedra (three-dimensional objects), right triangles, similarity, solid figures other than polyhedra (prisms, cylinders, pyramids, cones, and spheres), geometric transformations, or volume and volume measurements.

2. Historical Geometric and Current Geometric Perspectives

Provide as complete as possible a listing of the major geometric discoveries and geometric development of the topic. The result should be an in depth exploration of the important and interesting geometric events—not the entire history. Be sure to include related geometric images, recent information or applications related to your topic, and contributions from diverse mathematicians. Approximate dates can be noted as ~1762, by a range of dates such as 1700–1800, or by notations like the 18th century.

During one class, we will be working on a research guide for project 4, to help you find scholarly information.

3. High School Educational Connections

All of our future intended careers are impacted in some way or another by our past experiences in high school. Research and report back on how your topic, or items related to it, arises in

Common Core High School Geometry

<https://www.thecorestandards.org/Math/Content/HSG/>

North Carolina Standard Course of Study Math 1

<https://files.nc.gov/dpi/documents/curriculum/mathematics/scos/current/math-1.pdf>

North Carolina Standard Course of Study Math 2

<https://files.nc.gov/dpi/documents/curriculum/mathematics/scos/current/math-2.pdf>

North Carolina Standard Course of Study Math 3

<https://files.nc.gov/dpi/documents/curriculum/mathematics/scos/current/math-3.pdf>

Another possible source is

Unpacking the NC High School Standards: The North Carolina Collaborative for Mathematics Learning (NC²ML)

<https://www.nc2ml.org/high-school-teachers/high-school-teachers/>

4. Publication Quality Product

You will create a typed two-page or three-page single-spaced product in your own words that is of publication quality and brings together historical geometric and current geometric perspectives as well as high school connections and satisfies the rubric (see below).

5. Annotated Bibliography (not included in the page count)

Use different sources, including scholarly sources. Create an annotated bibliography with annotations explaining how you used each reference in your timeline and where the pictures came from. Use as many pages as you need for the bibliography. Any consistent reference format is fine, although you should try to list authors, even if it is a webpage (sometimes that requires some additional searching, like taking off the end of a web address to see whose page it is, if it isn't listed at the bottom). Try to find the original sources too (for instance, Google is a database and not a source for images). While there are standards in some fields, every journal I submit to has its own specific reference style, but they all do follow these general principals. Rather than in-text citations, an annotated bibliography pushes that information to the end so that the main content is more readable. Here is a sample project from a first-year seminar class with different criteria:

<https://appstate.edu/~greenwaldsj/class/fs/ResearchProject2Diabetes.pdf>

6. Research Presentations and Revision Opportunity

The research presentation sessions are similar to research day at Appalachian where people are presenting posters, which in turn is similar to research conferences and science fairs. Rather than being at the front of the room with us sitting, you bring printouts to tape up, including the bibliography. I'll supply the tape. You tape up your entire project, including your bibliography.

On this first day of presentations, to begin with, half the class presents their project to classmates and answers their questions. That typically involves a small group listening to and looking at your project so they can take notes for peer review. Then we'll switch so that the other half of the class has a chance to present too. Thus the entire class can present and conduct peer review on this day. During your session, you must stand by your timeline to discuss your topic and answer questions. If you work with another person, they will be in the other session so you should be prepared to present the entire project. When you are working on peer review, try to spread around so that everyone has someone to present to.

Between then and the second day of presentations, you have a chance to revise your project. Sometimes it is only after we present and see other models that we have ideas for improvement. Regardless, you'll collate your responses to Project 4, including the annotated bibliography, into one full size multipage PDF for submission to ASULearn.

For the second day of presentations, bring printouts to tape up, including the bibliography. You may bring the original from Monday, or a revised copy, if you made revisions. We'll all take another turn presenting as well as conducting peer review.



<https://magicineducation.wordpress.com/2011/03/30/make-your-own-comics-witty-comics/>

<https://serc.carleton.edu/details/images/15703.html>. Photo by Carol Ormand.

<http://hosted.jalt.org/pansig/2005/HTML/Bayne.htm>

7. Peer Review and Self-reflection in a Separate ASULearn Assignment

During the sessions when you are not presenting, you'll conduct peer review (see below). You reflect on your project after you present (see below). These are collated into a separate ASULearn assignment that you'll share with me only.

Rubric for Grading

clear geometric connections	missing	good/suggestions	exceptional
earliest geometric perspectives	missing	good/suggestions	exceptional
geometric breakthroughs/important events	missing	good/suggestions	exceptional
current perspectives	missing	good/suggestions	exceptional
real-life applications	missing	good/suggestions	exceptional
contributions from diverse mathematicians	missing	good/suggestions	exceptional
related geometric pictures	missing	good/suggestions	exceptional
timeframes	missing	good/suggestions	exceptional
depth of connections	missing	good/suggestions	exceptional
Common Core State Standards Initiative	missing	good/suggestions	exceptional
North Carolina Standard Course of Study	missing	good/suggestions	exceptional
own words	missing	good/suggestions	exceptional
creative & two-or-three-page typed product	missing	good/suggestions	exceptional
professional & flows well	missing	good/suggestions	exceptional
annotated references (not included in page count)	missing	good/suggestions	exceptional
image refs (no annotations needed for pics)	missing	good/suggestions	exceptional
quality references	missing	good/suggestions	exceptional
discussions & engagement at the presentations	missing	good/suggestions	exceptional
peer review	missing	good/suggestions	exceptional
self-reflection	missing	good/suggestions	exceptional

Peer Review

1. Name of the person and the topic.
2. Name the strongest part(s) of their project.
3. Give a constructive suggestion for improvement.
4. What was the most interesting thing you learned from their project?
5. Ask the speaker a question about their project. Write down your question and their response.

Self-Reflection (after you have presented your project)

1. What would you have improved about your project?
2. What did you feel went well?
3. What would you have included with more time and space?

8 Final Assessment

Designed to help you solidify and make connections, we'll have an assessment during our assigned time at finals. There will be an interactive video notes portfolio component, an individual component, and a component where you can work in groups. You work alone until I collect the individual part of the assessment and say it is "group time." Then you may continue to work alone or in groups (or a combination!). The idea is to give you opportunities to communicate course content with your peers, since this is one of ASU's main educational goals.

9 Course Calendar

This is the course calendar for a flipped, hybrid geometry. The second and fourth columns show what assignments students completed between classes. The third and fifth columns are the fifty minute classes. The third credit hour of this hybrid model is accounted for in the assignments between classes.

Week	Assignments	Class Session	Assignments	Class Session
1		<ul style="list-style-type: none"> • active learning worksheet 	<ul style="list-style-type: none"> • axiomatic systems and constructions interactive video 1 • course interactive video • turn in worksheet • obtain rental book • read syllabus 	<ul style="list-style-type: none"> • learning goals worksheet
2	<ul style="list-style-type: none"> • axiomatic systems and constructions interactive video 2 • IGS intro interactive video • begin Project 1 • turn in worksheet 	<ul style="list-style-type: none"> • axiomatic systems and constructions worksheet 1 	<ul style="list-style-type: none"> • Project 1 • turn in worksheet 	<ul style="list-style-type: none"> • axiomatic systems and constructions worksheet 2
3	<ul style="list-style-type: none"> • congruence and similarity interactive video 1 • select topic for Project 2 • turn in worksheet 	<ul style="list-style-type: none"> • congruence and similarity worksheet 1 	<ul style="list-style-type: none"> • congruence and similarity interactive video 2 • turn in worksheet • Review 1: axioms and constructions 	<ul style="list-style-type: none"> • congruence and similarity worksheet 2
4	<ul style="list-style-type: none"> • Project 2 • turn in worksheet 	<ul style="list-style-type: none"> • Project 2 presentations 	<ul style="list-style-type: none"> • Euclidean and spherical perspectives interactive video • begin Reflection 1 	<ul style="list-style-type: none"> • spherical perspectives worksheet
5	<ul style="list-style-type: none"> • Reflection 1 • begin Project 3 • turn in worksheet 	<ul style="list-style-type: none"> • spherical angle sum and AAA worksheet 	<ul style="list-style-type: none"> • peer review Reflection 1 • turn in worksheet 	<ul style="list-style-type: none"> • Pythagorean theorem worksheet 1
6	<ul style="list-style-type: none"> • Project 3 • turn in worksheet 	<ul style="list-style-type: none"> • Pythagorean theorem worksheet 2 	<ul style="list-style-type: none"> • Pythagorean theorem interactive video • select topic for Project 4 • turn in worksheet • Review 2: congruence and similarity 	<ul style="list-style-type: none"> • Project 4 research guide
7	<ul style="list-style-type: none"> • analytic geometry and metric perspectives interactive video • read Reflection 1 feedback 	<ul style="list-style-type: none"> • analytic geometry and metric perspectives worksheet 1 	<ul style="list-style-type: none"> • prepare for Project 4 presentations • turn in worksheet 	<ul style="list-style-type: none"> • Project 4 presentations
8	<ul style="list-style-type: none"> • revise and turn in Project 4 	<ul style="list-style-type: none"> • Project 4 presentations 	<ul style="list-style-type: none"> • turn in Project 4 peer review and self-evaluation 	<ul style="list-style-type: none"> • analytic geometry and metric perspectives worksheet 2
9	<ul style="list-style-type: none"> • Reflection 1 revision • begin Project 5 • turn in worksheet 	<ul style="list-style-type: none"> • polyhedra worksheet 	<ul style="list-style-type: none"> • polyhedra and angle defect interactive video • turn in worksheet 	<ul style="list-style-type: none"> • measurement worksheet
10	<ul style="list-style-type: none"> • measurement and angle sum interactive video • turn in worksheet 	<ul style="list-style-type: none"> • earth and universe measurement worksheet 	<ul style="list-style-type: none"> • Project 5 • turn in worksheet 	<ul style="list-style-type: none"> • equidistant worksheet
11	<ul style="list-style-type: none"> • turn in worksheet • Review 3: polyhedra, analytic, metric and Pythagorean theorem 	<ul style="list-style-type: none"> • proof worksheet 	<ul style="list-style-type: none"> • Reflection 2 • turn in worksheet 	<ul style="list-style-type: none"> • hyperbolic worksheet 1
12	<ul style="list-style-type: none"> • parallels interactive video 1 • begin Project 6 • turn in worksheet 	<ul style="list-style-type: none"> • hyperbolic worksheet 2 	<ul style="list-style-type: none"> • parallels interactive video 2 • Reflection 2 revision • turn in worksheet 	<ul style="list-style-type: none"> • hyperbolic worksheet 3

13	<ul style="list-style-type: none"> • parallels interactive video 3 • turn in worksheet • Review 4: measurement and parallelism 	<ul style="list-style-type: none"> • hyperbolic worksheet 4 	<ul style="list-style-type: none"> • Project 6 • turn in worksheet 	<ul style="list-style-type: none"> • Desargues' theorem worksheet 1
14	<ul style="list-style-type: none"> • projective geometry interactive video • Reflection 3 • turn in worksheet 	<ul style="list-style-type: none"> • Desargues' theorem worksheet 2 	<ul style="list-style-type: none"> • survey and evaluations • turn in worksheet 	<ul style="list-style-type: none"> • reflections on geometry worksheet
15	<ul style="list-style-type: none"> • Reflection 3 revision • Begin final assessment guide • turn in worksheet 	<ul style="list-style-type: none"> • concluding activities 	<ul style="list-style-type: none"> • prepare for final assessment • prepare to turn in video notes • (optional) revise project and reflect • (optional) revise reflection and reflect 	<ul style="list-style-type: none"> • timed assessment

10 Additional Info: Course Grading and Technical Details

Course grading information can be found in section 1.3 Assignment Types, Grades, and Policies of <https://appstate.edu/~greenwaldsj/class/3610/3610syllabuss.pdf>

Technical details that explain some of my LMS activity settings are in:

Greenwald, S. J. and J. E. Thomley. 2021. *Using Technology as a Pathway Towards Equity, Diversity, and Inclusion*. New Jersey: Pearson Education.

<https://www.pearson.com/content/dam/one-dot-com/one-dot-com/us/en/files/ICTCM20-Proceedings-Greenwald-Thomley.pdf>