Nebraska Algebra

Welcome to Nebraska Algebra. Nebraska Algebra is a NebraskaMATH program focused on the goal of extending success in algebra to all students. As such, the program is both a 2-week summer institute and an academic year initiative in which NebraskaMATH will work with partner districts that share the goal of building the capacity to successfully teach Algebra I to all students.

Algebra I is recognized as a “gateway” course. Students who successfully complete Algebra I often continue to pursue the study of high school mathematics that prepares them for college, while students who are unsuccessful in Algebra I find their path to success blocked. Thus, while districts are often successful in offering Algebra I in middle school to their best-prepared students, others arrive in high school not yet ready to take Algebra I.

Nebraska Algebra seeks to encourage districts to adopt the goal of having all students succeed in Algebra I and, to the extent possible, to do so by the end of Grade 9 (or Grade 10 at the latest). Some districts are experimenting with versions of “Extended Algebra” where students who are behind grade level take mathematics for two periods each day. Others may offer Algebra I over a two-year period.

**Program Overview:** During two summer weeks, participants will take two integrated courses – Math 810T, Algebra for Algebra Teachers and EDPS 991, Seminar in Educational Psychology: Cognition, Motivation, and Instruction for Algebra Teachers – and earn six hours of graduate credit. During the academic year following their participation in the Nebraska Algebra summer institute, teachers will return to the classroom and work with an instructional coach or teaching mentor as they strive to transfer knowledge gained in the summer institute into improved classroom practice. In addition, participants will take a three graduate credit hour yearlong pedagogy class focused on enhancing their ability to teach algebra to all students and to becoming a reflective practitioner.

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Math 810T
Algebra for Algebra Teachers

Algebra for Algebra Teachers is the first of a 3-course, 9-hour graduate sequence that will assist you in becoming a master Algebra teacher with special strengths in algebraic thinking and knowledge for teaching algebra to middle/high school students. The class will meet each day for two weeks from 8:00 A.M. to 12 P.M.

The main goal of the course is to help you better understand the conceptual underpinnings of school algebra, and how to leverage that understanding into improved classroom practice. **Emphasis will be placed on developing the habits of mind of a mathematical thinker.**

What we ask of you is that you have a well-defined sense of professionalism, that you always give assignments your best effort, and that you develop a sense of responsibility to your educational community (school, district, ESU). For our partnership to work, you must develop into an intellectual leader, strong in mathematics and the teaching of mathematics, and you must mentor your peers as you work together to improve the mathematics learning of Algebra students in Nebraska.

It may be unavoidable that some of you are apprehensive about the rigorous demands that may be placed on you by the mathematics we ask you to learn. We ask only that you give the Nebraska Algebra Institute your best effort and that you exhibit a persistent desire to learn. We intend to provide you with significant support at every step along the way. We are confident in your success.

**Course Description:** The Math 810T course will begin with a review of key facts about the integers, including the Euclidean Algorithm and the Fundamental Theorem of Arithmetic. The course will study the integers modulo \( n \) as a tool to broaden and deepen students’ knowledge of the integers. Questions concerning integers can often be settled by translating and analyzing them within the framework of this allied system. From this foundation, the course will study polynomials, roots, polynomial functions and polynomial rings such as \( k[x] \), where \( k \) is a field. Special attention will be paid to linear and quadratic polynomials/functions in connection to their importance in school algebra. The course will study topics such as the division algorithm, Euclidean algorithm, and applications (remainder theorem, formal derivatives, etc), unique factorization, etc. in the context of \( k[x] \). Other topics will include irreducibility, especially for polynomials whose coefficients are rational, real or complex numbers.

Participants will be assigned **homework problems** and **reading** assignments that reinforce the material studied. In addition, there will be an **extended (two week) group** assignment involving a lesson/unit plan and an in-class presentation (given on the last day of class). The description of this assignment will be given on the first day of class. To bring closure to the course, there will be an **End-of-Course Assessment** (described below). The **totality of this work will determine your final grade in the course** (more about grades will be discussed below).
Participant Expectations: Professionalism is expected. You are expected to attend all class meetings, be curious, ask questions, seek opportunities to learn, and be open and responsive to feedback. In addition:

- display a positive attitude
- be a team player – mathematics need not be a competitive sport
- be an active participant – mathematics should not be a spectator sport
- attend daily, be punctual
- be committed, take your work seriously
- work diligently on homework assignments
- complete assigned readings/writings
- be/become a “risk taker”
- improve yourself as a mathematician
- help others – if you know the mathematics being discussed, practice your mentoring skills
- complete all assignments to the best of your ability
- celebrate your colleagues’ learning
- be patient with yourself – there is a time delay between exposure to new ideas and the ownership of those ideas, and that time will vary from person to person
- complete daily evaluation forms to help us improve the institute

Homework Expectations: Homework will be assigned on Monday through Thursday of each week. You may work on your homework by yourself or with others in the class, but your final write-up of the problems should be in your own words (please include references if applicable). Your 3-ring binder (provided to you on the first day of class) can be used to create a course notebook that includes copies of your work, including both in-class and homework assignments. Your course notebook might include both draft solutions and final solutions to problems you work on throughout the course, as well as the End-of-Course Problem Collection (described below). The goal is to provide documentation of your work and your intellectual growth as a participant in Math 810T, as well as a sense of closure regarding your work in this course. We also encourage you to include personal reflections on the mathematical skills and concepts that are clear to you and those which may still be confusing. This work should have two phases:

1) A preliminary draft of your work on (in-class and homework) problems. We will want to see evidence that you have worked on a problem – you don’t need an exact or complete answer to include a problem in your notebook – and your comments on successes or difficulties.

2) A final version of your work on a problem (sometimes a draft is good enough to be a final solution). This should be a complete solution that you can read and understand a year later. We also encourage your reflections in which you identify what you have learned and what you are still working on understanding.

Daily Homework Assessments: Each morning will begin with the work groups of participants meeting with members of the instructional team. The teams will circulate throughout the room meeting with each group in an effort to assist the participants with their homework or any questions they might have concerning the course material. This will be a quick check, taking no more than 30 minutes (probably closer to 20 minutes). After these meetings, you will hand-in
your homework assignments and the graduate student members of the instructional team will assess selected problems from the assignment and return the assignments with feedback by the end of class. This daily activity will enable us to make a quick assessment of the progress each participant is making. These morning meetings will also give you an opportunity to schedule a time later in the day (most likely after dinner) to meet with members of the instructional team to ask for assistance, to discuss questions you may have, and to discuss your progress in Math 810T.

Our quick assessments will usually involve an inspection of your solutions to a few selected homework problems assigned the previous day. If your draft solution for an assigned problem is satisfactory, the problem will be marked “OK.” Particularly impressive solutions will be assessed as “superb” and if we believe it is important for you to rework the problem; we will indicate, “please revise.” Revisions may be submitted either as part of a subsequent day’s homework or as part of your End-of-Course Problem Collection. The accumulated marks provide a rough assessment of your work during the Summer Institute but will have only a partial impact on your final course grade. If you would like a personal assessment of your work or your progress towards earning a particular grade, please ask and we will be happy to meet with you privately.

**End-of-Course Assessment:** To bring Math 810T to a close, you will prepare an End-of-Course Problem Collection that includes a selection of problems you have worked during the two-week period, and an End-of-Course Assignment. The instructional team will collaborate on grading all of the assessments. More specifically, the End-of-Course Assessment will include:

- **End-of-Course Problem Collection:** You will provide a “final solution” for five different problems that you worked on during the two weeks of class. You will select problems that you are proud of or “like best.” (Perhaps they help demonstrate what you have accomplished). These may be either problems worked on in class or homework problems.

- **End-of-Course Assignment:** This assessment will be prepared by the instructional team and be handed out to the participants on the last day of class. The problems on this assessment will reflect the material covered during the two-week period of the course. At least one of the problems on this assessment will involve an essay question related to the readings associated to the course. You may work on this assessment by yourself or with others in the class, but your final write-up of the problems should be in your own words.

The **End-of-Course Assessment will be due no later than two weeks after the last class.** The completed assessments should be returned to the Center for Science, Mathematics and Computer Education, 251 Avery Hall, UNL.

**Grades Expectations and typical characteristics of achievement at that level**

A+ The grade of A+ is truly exemplary and will be fairly rare. It is evidence that the instructors have special admiration for the participant’s achievements in the course.
A

Achievement beyond the level needed to earn the grade of A-. Especially important will be evidence that the teacher has a good command of the mathematics studied in the course.

A-

Achievement beyond the level needed to earn a grade of B+. In particular, there should be clear evidence of significant progress in learning mathematics. Activities that can contribute to earning the grade of A- will include going beyond the minimum expectations for homework during the summer institute.

B+

Regular class attendance, active participation, assignments submitted on-time, supportive and helpful to peers, admirable effort to complete assignments, evidence of good progress in learning mathematics.

B

Regular class attendance, reasonable participation, most assignments submitted on-time, cooperative with peers, good effort to complete assignments and to learn mathematics.

B-

A grade below B is a statement that the instructors do not believe that the teacher made a reasonable effort to use the opportunity provided by the Math in the Middle Institute to develop into a stronger teacher. Evidence may include one or more of the following traits: attendance problems, uncooperative behavior, failure to submit assignment, habitual tendency to submit assignments late, or performance on assignments that indicate an inadequate effort to learn mathematics.

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