About the Course and these Materials

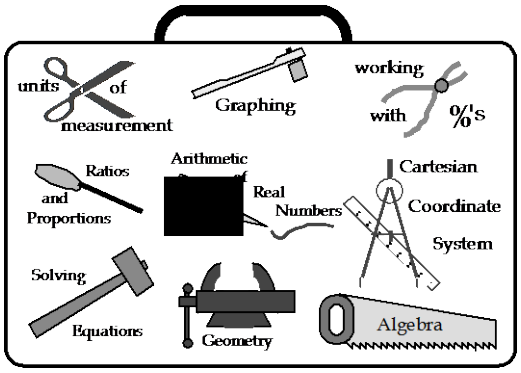
These materials are the result of the need for Professional Technical students to be introduced to and have a working knowledge of a wide range of topics from Algebra I through Precalculus in a short time span.

In this day and age Professional Technical students are expected to perform basic calculations accurately, write reports, become familiar with specialized technology and think for themselves. We incorporate these features into this course.

This course and these materials are designed to help the Professional Technical student develop the skills and insights necessary to approach future problems in the "real world" pro-actively. In their careers as well as in this course they may be expected to tackle problems that seem unworkable at the start. Problems may be poorly defined with misleading or useless data or they may not be solvable. Worse yet, the actual "question" might not even be clear. There won't always be someone with the "answer" or someone to tell us what to do next.

What we hope students get from this course is the ability to tackle future problems systematically and with self-confidence. With a little bit of luck, this course will provide them with the tools necessary to make problem solving exciting rather than intimidating.

People generally excel in problem solving through practice. But all the practice in the world won't be very effective without a good set of mathematical tools. We already have some mathematical tools and perhaps our tool-kit already contains some of these ….....☞



If our tools or skills are rusty, we need to begin reconditioning them **NOW** at the beginning of the course. If they are missing altogether you should consider whether you are ready for this course. See "What You Should Already Know".

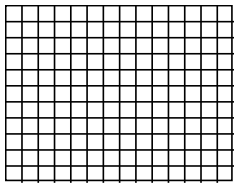
In the long run, to be successful beyond this course, you will need to truly **understand** the concepts and not simply memorize them. You will be expected to see connections and implications beyond the immediate problem. This will be difficult to do if your focus is on catching-up. So, attend class regularly and stay abreast of the homework. A good calculator and thorough familiarity with its arithmetic features is a must. We suggest the TI-83 Plus.

Just as a crowbar is a great tool to help pull a stubborn nail and a wrench helps to loosen tight bolts, mathematics is a great tool to help solve other problems. A course like this is a lot of work and will have some frustrating moments. We cover a wide variety of applications in a short time. But, it can be very rewarding especially when the "light goes on" and we finally see mathematics as a useful tool rather than our nemesis.

We all know someone, perhaps our self, who has used a kitchen knife or maybe a spoon as substitute for a screwdriver. It "worked" but it had its drawbacks. It's the same in mathematics. Sometimes we can get by using some awkward mathematics in a round about way to solve a problem. However, this can be

expensive and/or frustrating. One of our goals is to develop new tools and skills so as to become ever more efficient at solving problems.

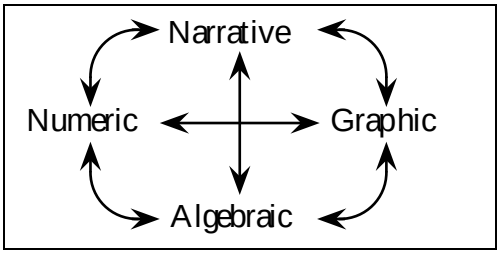
An example: Suppose we need to find the total number of tiles on this floor so we can order a replacement set. We could count them one by one and we would certainly eventually obtain the correct result. Or, we could use our knowledge of multiplication to arrive at the result more efficiently. Which would you do?



The right tool, for the right job!

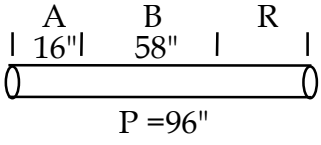
In order to solve problems efficiently, we must understand how mathematics fits together. Just as a ½" wrench **naturally** fits together with a ½" bolt mathematics has its natural fits. For example, repetitive addition fits nicely together with multiplication.

Not surprisingly, if we are to master this aspect of mathematics it is important that we be exposed to these interrelationships as often as possible. To help with this we will apply the **Rule of Four** where possible. The Rule of Four is another way of saying that each problem generally has four interrelated facets. These are a **narrative** formulation, an **algebraic** formulation, a **graphic** formulation and a **numeric** formulation.



The Rule of Four

The following example should help clarify this concept.

Narrative	A pipe is originally 96" long. First a 16" piece is cut off and then a 58" piece is cut off. How much remains?
Graphic	
Algebraic	P – A – B = R (Pipe – Piece A – Piece B = Remainder)
Numeric	96" – 16" – 58" = 22"

For simple problems it might seem ridiculous to get this elaborate. But as the problems get more complicated it will be quite useful to have a working knowledge of these interrelationships. The best way to obtain that working knowledge is to practice it when possible even if it seems like overkill.

Before we tackle the "problems of the world" we will need a few more tools in our tool-kit. Once we have those we'll be ready to build a house, design a bridge, model a threatened species or pursue some other mathematical adventures... ☺

What You Should Already Know for Technical Mathematics

Whether it be retraining later in life, lack of a technical background or a variety of other reasons, students often begin their study of technical mathematics at this level. Students using this book **should** have a solid proficiency at the pre-algebra level. Typically, this is achieved when a student has recently

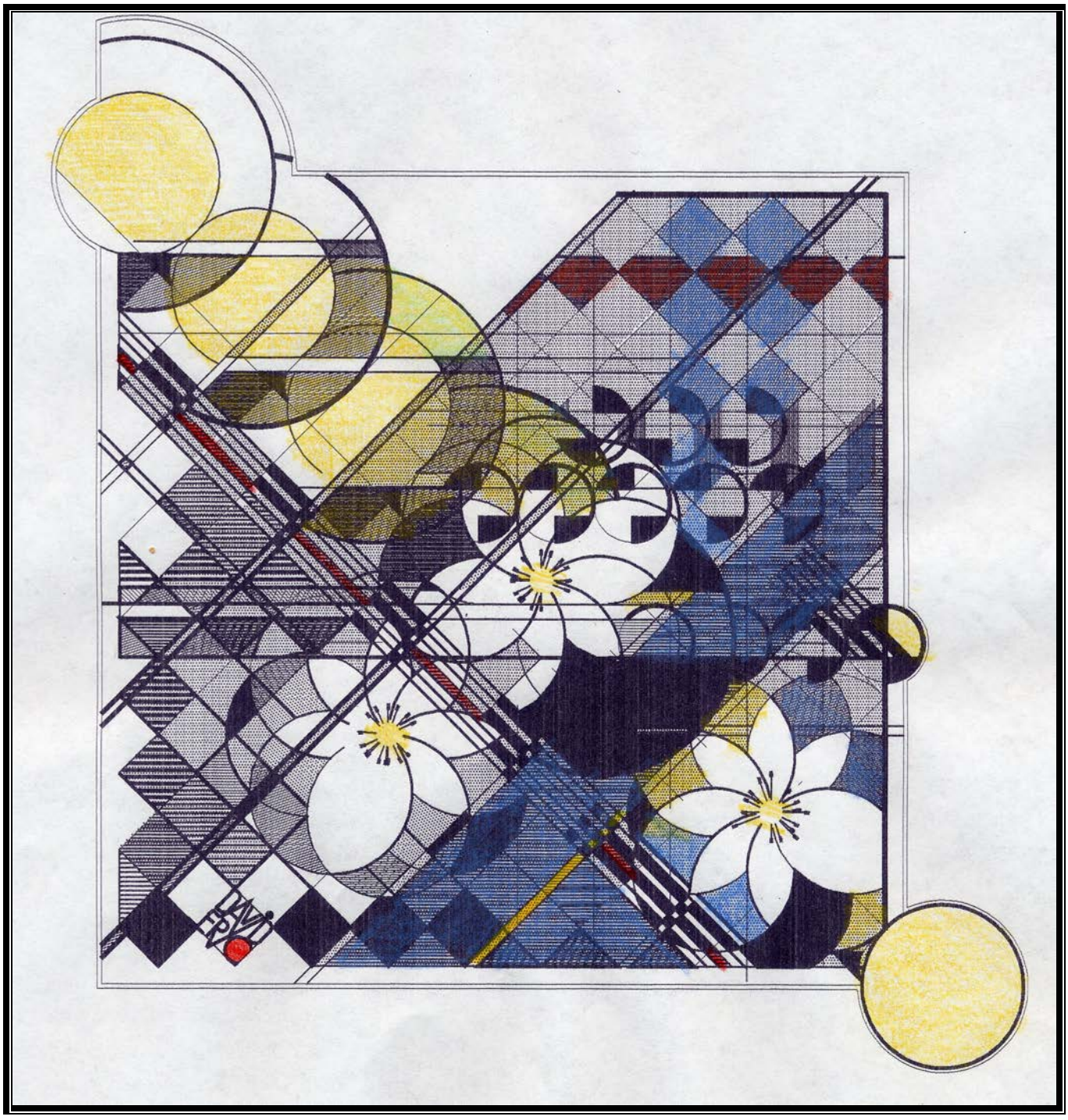
completed a pre-algebra course or its equivalent successfully, i.e. a grade of B or better. In particular, as entrance level skills for this course, the student should be **currently** able to demonstrate:

- Familiarity with common mathematical terminology & notation.
- A conceptual understanding of whole numbers, fractions and decimals.
- A complete proficiency in performing basic arithmetic operations when applied to whole numbers, fractions and decimals.
- A proficiency at simplifying computations that involve multiple operations using standard order of operations.
- A complete proficiency in performing basic arithmetic operations using a calculator of their choice.
- An ability to read, interpret, model, and solve application problems requiring whole numbers, fractions and decimals.
- An ability to model, construct and solve ratio & proportion problems.
- An ability to model, construct and solve percentage problems.
- A proficiency at converting between fractions, decimals and percents.
- The ability to manipulate common USCS and metric units of measurement.
- The ability to model and solve basic geometry problems (perimeter, area, volume, and surface area) that involve rectangles, triangles, parallelograms, trapezoids, circles, common prisms, common pyramids, and cylinders.
- An ability to model and solve problems involving averages and the other measures of central tendency.
- The skills necessary to develop, construct, and analyze some basic mathematical models.

Are You Ready?

At the beginning of each chapter is an *Are You Ready?* quiz. These quizzes are designed to remind the student of the material that should be reviewed prior to beginning that chapter. If a student cannot complete the *Are You Ready?* quiz with reasonable success then they should review that material before continuing onward.

The *Are You Ready?* quiz at the beginning of Chapter 1 is essentially a prerequisite quiz for the course. Chapter 1 is a brief review of many of the prerequisite topics along with natural extensions to associated concepts. Use the quiz results to determine the amount of review and/or additional help you'll need at the beginning of this course.



Do not worry about your difficulties in Mathematics
I can assure you mine are still greater.

Albert Einstein (1879 - 1955)

“Intellectual growth should commence at birth and cease only at death” Albert Einstein (1879 − 1955)