

A GUIDE TO BASIC MATH FOR ADULT UPGRADING

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I dedicate this work to
Cynthia Chambers, Ph.D.
my supervisor and friend
who offered me encouragement
and support throughout my
graduate studies.

Abstract

Intended learning outcomes; structured and sequential examination of concepts; examples and applications; guided practice and assignments; and tests are included in the guide. The guide focuses on 4 main components: rationale, curriculum plan, instructional plan, and an evaluation plan which follows Posner and Rudnitsky's (1997) model for curriculum design.

This guide examines researchers and practitioners' insights into the field of adult education presented by Merriam and Caffarella (1991) and Langenbach (1988). The guide provides a brief overview of five educators: Whyte (1986), Collier (1993), Martin (1993), Fraser (1996), and Wiesenburg (1990), who have researched adult aboriginal learners and learning styles. The guide incorporated recommendations for teaching Native students and followed steps to promote success for adult Indians and Metis learners.

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Chapter 1

Background and Rationale

Since 1994, I have been teaching math to adult learners. From 1994 to 1999, I was teaching primarily to First Nations students whereby I have made several observations. My first observation is that the students take upgrading because the regular school system did not work for them, particularly in mathematics. The math curriculum set out for these students is based upon the regular school system where there is a continuous progression from grade to grade and a foundation of concepts is built upon in each grade. Adult students that have been out of school for a while have a gap in their learning; therefore, any curriculum or program must start with the basics. With upgrading students, it is important to aim for mastery of basic concepts. I have observed the aboriginal students' learning style, and I have found a structured presentation of materials that has proven to be most successful. It is essential to make tests relevant to concepts being studied and to test what has been learned. It is important to be aware of the learning styles of the student, to use concrete examples, to make concepts and examples relevant to everyday situations, to use direct instruction of concepts and examples, and to present alternative ways of solving problems. A great deal of one-on-one teaching is needed especially with guided practice and assignments. The teaching strategies that I use are encompassed in my lesson plans.

The format that I have found to be successful in teaching basic mathematics to First Nations upgrading students is as follows:

1. Review
2. Introduce concept

3. Use examples and applications
4. Utilize guided practice (as a group or one-on-one)
5. Give assignments
6. Review concept and assigned questions
7. Do practice test
8. Test.

In 1999, I taught math and physics to a group of aboriginal students in preparation for entrance to the Power Engineering program at Portage College. Portage College offers career and academic upgrading programs in northeastern Alberta. There are thirteen community campuses: Lac La Biche, St. Paul, Bonnyville and Cold Lake that have several instructors and the others are one-room classrooms with a single instructor. There is a great deal of cooperation and sharing of resources and materials among instructors at the various sites. Through this project, I hope to contribute a comprehensive package called *A Guide to Basic Math for Adult Upgrading*, to help the students and the other instructors at the various sites. Eighty percent of the student population at Portage College is aboriginal. Therefore, when I developed this guide I took into consideration the learning styles, the educational, and cultural background of the aboriginal students.

In 2000, I started working at the Cold Lake campus of Portage College where I was teaching math to students in the Academic Upgrading program. The focus was teaching the basic concepts of math. Previously, the Mathematics 300 course was set up for students to work at their own pace while the instructors provided support, administered unit exams, and tracked their progress. The problems I encountered led me to believe that the present curriculum was inadequate. The textbooks used provided a

single approach to master the concepts. My experience suggested that the students needed exposure to different approaches to learn the concepts. In some areas, the textbooks lacked a variety of exercises. There needed to be more worksheets and examples. The students had problems with the tests because parts of the test did not relate to the concepts being learned.

Overall, I felt the contents of the Mathematics 300 curriculum needed improvement. There needed to be a structured approach to instruction that combined whole-class direct instruction and one-on-one teaching using concrete examples. Additional worksheets and tests that were more relevant to the material being learned needed to be developed. Over the next three years, I made such improvements to the curriculum content.

The guide that I prepared for my project will be useful for the students wishing to learn the basics of math, and it can be a resource for the instructors at other community college sites. This guide was designed for adult learners currently enrolled in Mathematics 300 at Portage College's Academic Upgrading program. The Mathematics 300 course is for adult students who have been out of school and wish to return for upgrading. The level of mathematics is equivalent to the junior-high school math specified in the Alberta Program of Studies and the focus of the course is to prepare students for senior-high school mathematics courses.

Over the past years, I have discussed with my students where they are encountering difficulty in the present math curriculum. I have talked to other instructors about their insights into where their students have problems. Based upon the students' and the instructors' feedback, I have modified and made adaptations to the math course.

Through their encouragement, I decided that as my project I would endeavour to make the necessary improvements to the math curriculum in order to give the students a better chance of success in their math studies. I have researched the literature on learning styles of adult learners as well as aboriginal learners. Based upon the readings and my own personal experiences, I designed a package that I hope will be useful to the students. In developing *A Guide to Basic Math for Adult Upgrading*, I have made the following modifications to the curriculum used in Mathematics 300, I have: included the intended outcomes or learning objectives of the different math concepts; designed a structured and sequential examination of the concepts; provided an abundance of examples and applications of the concepts; incorporated a great deal of guided practice and assignments; designed tests to determine how well the students understood the concepts and if they need additional time for review.

Chapter 2

Literature Review

Curriculum Development

In designing *A Guide to Basic Math for Adult Upgrading* I followed closely Posner and Rudnitsky's (1997) model for curriculum design because the framework was appropriate for what I wanted to accomplish. Another source of curriculum development that influenced the approach that I took in preparing the guide was Tyler's classic *Basic Principles of Curriculum and Instruction*. Tyler (1949) suggested that four key elements should be in place: learning objectives, instructional focus, organization, and evaluation. He felt establishing a rationale and goals were necessary. What is needed is a determination of what learning objectives are to be used to reach those goals. Tyler also felt the organization of material was extremely important. Another key element is evaluation. Tyler (1949) stressed that the attention spent on the student is all-important. It is necessary to constantly evaluate what the students are learning and to reflect on which strategy should be used with each student in mind.

A curriculum guide is a support document for the curriculum based on sound curriculum theory. Posner and Rudnitsky (1997) posits that "the educational travel industry is simply intended to help the student-traveler along the educational journey; as much as we want to, we cannot make the journey for the student. We can only act as guides" (p. 210).

A Guide to Basic Math for Adult Upgrading focuses on four main components: a rationale; a curriculum plan describing intended learning outcomes; an instructional plan describing what each unit is about, as well as, what teaching strategies could be used; and an evaluation plan for the course.

Rationale for A Guide to Basic Math for Adult Upgrading

Just as there are basic concepts of math, there are basic concepts to curriculum development as illustrated by Tyler (1949) in his classic *Basic Principles of Curriculum and Instruction*. Tyler states that:

The rationale developed here begins with identifying four fundamental questions, which must be answered in developing any curriculum and plan of instruction.

These are: what educational purposes should the school seek to attain, what educational experiences can be provided that are likely to attain these purposes, how can these experiences be effectively organized and how can we determine whether these purposes are being attained. (p. 1)

The starting point in curriculum development should be to examine the rationale and the goals that we wish to achieve. Tyler (1949) finds that “if efforts for continued improvement are to be made, it is very necessary to have some conception of the goals that are being aimed at. These educational objectives become the criteria by which materials are selected, content is outlined, instructional procedures are developed and tests and examinations are prepared” (p. 3). *A Guide to Basic Math for Adult Upgrading* is designed with continued improvement in mind. In developing *A Guide to Basic Math for Adult Upgrading*, I spent a great deal of effort determining what content should be used and how could it be best presented to the students. As well, I focused on developing tests that were relevant and useful in determining what went well or where the students encountered difficulty. The attention I devoted to the rationale and goals made it easier to establish the learning objectives.

Objectives for A Guide to Basic Math for Adult Upgrading

The learning objectives determine the desirable outcomes expected of the students. Tyler (1949) suggests the ideal number of learning objectives be small rather than many “since it requires time to attain educational objectives” (p. 33). The learning objectives in each section of *A Guide to Basic Math for Adult Upgrading*, are concise and brief. Tyler (1949) added, further “it is essential therefore to select the number of objectives that can actually be attained in significant degree in the time available” (p. 33). Since, the students have to cover the equivalent grades eight and nine mathematics in five short months there is much material to be covered in the Mathematics 300 course; it is necessary desire to choose the learning objectives wisely. Tyler (1949) stressed the importance of the amount of time spent formulating the learning objectives. Tyler’s principles apply to teaching adult upgrading “because they are the most critical criteria for guiding all the other activities of the curriculum-maker” (p. 62).

Learning Experiences for A Guide to Basic Math for Adult Upgrading

It is time well-spent setting up the learning objectives because the learning experiences rely heavily on what we want the students to learn. Tyler (1949) finds that the term ‘learning experience’ refers to interaction between the learner and the external conditions in the environment to which he can react. Learning takes place through the active behavior of the student; it is what he does that he learns, not what the teacher does. (p. 63)

The intentions, in *A Guide to Basic Math for Adult Upgrading*, are to keep the students engaged throughout the course. It is essential that the development of the curriculum focus on the students’ needs and interests. Therefore, the material is organized and

presented to the student in an effective manner that optimizes the learning experience. Tyler (1949) states “organization is thus seen as an important problem in curriculum development because it greatly influences the efficiency of instruction and the degree to which major educational changes are brought about in the learners” (p. 83). The organization of the material in the guide is based upon Tyler’s (1949) three major criteria: continuity, sequence, and integration, which he states are necessary in building an effectively organized group of learning experiences. These criteria determine the effectiveness of the curriculum.

Evaluation for A Guide to Basic Math for Adult Upgrading

There needs to be constant reflection and evaluation of the organization of the material. Tyler (1949) finds that “evaluation can also be used continuously during the year as a basis for identifying particular points needing further attention with particular groups of students and as a basis for giving individual help or planning individual programs” (p. 124). There is a need to be vigilant about each student’s progress and there is a need to develop strategies to assist students either as a group or as individuals. The attention spent on the student is an all-important consideration that Tyler stresses in curriculum development.

Five Conceptions of Curriculum

Tyler’s approach is widely used in the curriculum development field but there is a need to examine other approaches. Eisner and Vallance (1974) suggest there are five conceptions of curriculum guiding most curriculum development. The first conception examines the development of the *cognitive processes*. Eisner and Vallance (1974) find that this approach is aimed at developing a kind of technology of the mind. “It sees the

central problem of curriculum as that of sharpening the intellectual processes and developing a set of cognitive skills that can be applied to learning virtually anything” (p. 1). The main focus is on the development of cognitive skills and less on content. This approach as well as the next approach is process oriented.

The second conception explores curriculum as *technology*. Eisner and Vallance (1974) state:

making little or no reference to content, it is concerned with developing a technology of instruction. The focus is less on the learner or even on his relationship to the material than on the more practical problem of efficiently packaging and presenting the material to him. (p. 2)

This approach is less concerned with the student and more focused on the organization of the material.

The third conception is *self-actualization* or the view that is a consummatory experience. Eisner and Vallance (1974) point out that this approach is “strongly and deliberately value saturated, this approach refers to personal purpose and to the need for personal integration and it views the function of the curriculum as providing personally satisfying consummatory experiences for each individual learner” (p. 3). The main focus is content oriented and emphasizes individual growth.

The fourth conception is *social reconstruction* or relevance. Eisner and Vallance (1974) state that “social reconstructionists typically stress societal needs over individual needs; the overall goals of education are dealt within terms of total experience, rather than using the immediate processes which they imply. Social reform and responsibility to the future of society are primary” (p. 5).

The fifth conception is *academic rationalism*. Eisner and Vallance (1974) state:

Academic rationalism is primarily concerned with enabling the young to acquire the tools to participate in the Western cultural tradition and with providing access to the greatest ideas and objects that man has created. The curriculum, it is argued, should emphasize the classic disciplines. (p. 7)

Application of the Five Conceptions of Curriculum to the Development of the Guide

Eisner and Vallance (1974) discussed the five conceptions of curriculum: cognitive processes, technology of instruction, consummatory experience, social reconstruction, and academic rationalism. I feel that none of these conceptions on their own describe the Mathematics 300 curriculum; therefore, I adopted a holistic approach in designing *A Guide to Basic Math for Adult Upgrading*. For example, I believe, the students' needs, interests, and past experience should be taken into consideration to develop the cognitive processes necessary to learn the concepts. Instead of developing a technology of instruction solely based on the presentation of the material it is important that relationship is established among the materials, the student, and the learning environment. The third concept is developing a consummatory experience or self actualization where the emphasis is on individual growth but I believe there is a need to take it a step further by empowering the students. Teachers can empower of the student by giving them the tools necessary to develop their understanding and skills. When examining the students' needs and interests it is essential that a curriculum must address the mental, emotional, physical, and spiritual needs of the students. The development of the student's self-esteem and self-confidence builds a stronger individual who can contribute to the community and to society as a whole. A holistic approach, which

integrates aspects of all five conceptions of curriculum, can give the students the tools to examine greatest ideas and objects that human societies have created in the past and to apply it to the present and to the future.

Three Curriculum Fallacies

The conceptions of curriculum give an idea of the wide variety of ideas about curriculum development. As well as, Eisner and Vallance (1974) examine three curriculum fallacies. First, the fallacy of *formalism* “encourages the belief that what is really important in educational programs is how children learn, not what they learn” (p. 8). The two orientations that usually fall victim to this fallacy is the educational technologists and the advocates of the cognitive processes. The second fallacy of *content* that is “preoccupied with the importance of what rather than with how students study” (pp. 8-9). The academic rationalist is the one most likely to fall victim to this fallacy. The third fallacy is that of *universalism*, “which rests on the belief that some fundamental content areas or topics are of universal significance regardless of the particular characteristics of the student whom the school is intended to serve” (p. 9-10). Academic rationalism is the tradition that is most likely to be associated with this fallacy.

Application of the Three Curriculum Fallacies to the Development of the Guide

In designing *A Guide to Basic Math for Adult Upgrading*, I wanted to avoid the three curriculum fallacies. Instead, I tried to reach a balance. I examined the fallacy of formalism or how students learn and the fallacy of content or what students learn. I felt it is important that *how* the student is incorporated with *what* they learn which are the basic foundations of math. I disagree with the fallacy of universalism because I felt the characteristics of each individual student need to be addressed when developing the

curriculum. The presentation of the five orientations of curriculum development and the three fallacies related to curriculum by Eisner and Vallance should be of assistance in making decisions in the development of curriculum. When looking at curriculum development, there needs to be an examination of math as a curriculum subject.

Math as a Curriculum Subject

After examining the views on curriculum and curriculum development, we can now look at math as a curriculum subject. In designing the guide, I paid particular attention that the learning objectives matched the general outcomes in the *Mathematics Program of Studies, Western Canadian Protocol* and *Essential Competencies Framework*. The rationale for mathematics as a field of study is that it is relevant to everyday living. The student needs to develop competency in numeracy and competency in problem solving. In 2000, Alberta Learning released a document called *The Alberta Framework for Essential Competencies for Working, Learning and Living* (ECF). “The ECF identifies minimum essential workplace competencies. These include employability, academic and generic occupational competencies stated as a series of performance indicators that can be taught, learned, observed, and measured” (Alberta Learning, 2000, p. 1). The development of the framework was based upon input from various sources: educators from the K-12 and adult learning systems, business people, community members, and government partners. In order to design a mathematics curriculum, it was important that there be an examination of the framework regarding numeracy. There are four categories in numeracy: basic operations, patterns and relations, shape and space, and statistics and probability. Alberta Learning (2000) proposes in the numeracy section

of the framework that there are eight performance indicators that are the criteria used to ascertain numerical competency or math literacy:

1. Demonstrate a number sense for rational numbers including common fractions, integers, and whole numbers.
2. Apply arithmetic operations on rational numbers to solve problems. Apply concepts of rate, ratio, percentage, and proportion to solve problems in a meaningful context.
3. Use patterns with variables, together with their graphs, to solve problems.
4. Solve and verify one-step and two-step linear equations with rational number solutions.
5. Generalize measurement patterns and procedures in both metric and imperial units to solve problems involving area, perimeter, surface area and volume.
6. Link angle measurement and the properties of parallel lines to the classification and properties of quadrilaterals.
7. Develop and implement a plan for the collection, display and analysis of data, using technology as required.
8. Evaluate and use measures of central tendency and variability. (p. 5)

The essential competencies listed in the framework are similar to the student outcomes presented in the *Western Canadian Protocol* (1996). There is an overlap between the grades eight and the grade nine general outcomes and these outcomes are equivalent to the performance indicators for numeracy in the Essential Competencies Framework. Similarly, the general outcomes listed in the *Mathematics Program of*

Studies for Junior High, Alberta Learning (2001) are based upon the general outcomes in the *Western Canadian Protocol* (1996).

In designing *A Guide to Basic Math for Adult Upgrading I* I followed closely the general outcomes listed in the Alberta Program of Studies and the Western Canadian Protocol. I paid particular attention to insure that the learning objectives in the guide match the expected performance indicators outlined in *The Alberta Framework for Essential Competencies for Working, Learning and Living*.

Stein's (1983) *Refresher Mathematics* is the textbook that is being used as a resource for the Mathematics 300 course. Stein (1989) states that, "Refresher Mathematics is a comprehensive program in general mathematics that provides solid skills development with an emphasis on problem solving and critical thinking" (p. 12). How the concepts are presented in the Refresher Mathematics textbook, Stein meets the expected outcomes set out by Alberta Learning. Stein (1989) points out that one of the many features of Refresher Mathematics is "a thorough step-by-step approach to the development of problem solving skills and strategies as well as decision-making, career applications, and calculator and computer activities. Critical thinking questions are included in the development portion of every lesson" (p. 12).

Adult Education and Adult Learners

Adult learning styles are different from children's. It is necessary to examine literature on adult learning styles especially those of aboriginal students. Merriam and Caffarella (1991) discuss the research and theory relating to adult education. Their text *Learning in Adulthood*

is a comprehensive overview of what we know about adult learning including the context in which it takes place, who the participants are, what they learn and why, the nature of the learning process itself, the development of theory in adult learning, and other issues relevant to the practice of adult learning. (p. xii)

Their text provides a wide and varied collection of various researchers' views and theories. The book is divided into five parts which examine: the context and environment of adult learning, the adult learner, the learning process, the building of a theoretical base for adult learning, and challenges in fostering adult learning.

Adult learner. In the past twenty years, the research on adult learning has expanded and flourished. There is a great deal of information that examines the similarities and differences between adult and child learning. Child learning is referred to as pedagogy "the art and science of teaching." The best-known theory of adult learning is andragogy, defined by Knowles (1980, cited in Merriam and Caffarella 1991) as "the art and science of helping adults learn" (p. 43). Andragogy is based upon five assumptions, all of which are characteristics of adult learners:

1. As a person matures, his or her self-concept moves from that of a dependent personality toward one of self-directing human being.
2. An adult accumulates a growing reservoir of experience, which is a rich resource for learning.
3. The readiness of an adult to learn is closely related to the developmental tasks of his or her social role.

4. There is a change in time perspective as people mature from future application of knowledge to immediacy of application. Thus an adult is more problem-centered than subjected-centered in learning.
5. Adults are motivated to learn by internal factors rather than external ones. (p. 49)

Teaching adults. It is important that we examine the characteristics of adult learners in order to design an appropriate curriculum for adults. There is research that offers suggestions of how to teach adults. Merriam and Caffarella (1991) cite Knox (1977) who “offers six suggestions for teaching adults: emphasize abilities, clarify structure, make learning a memorable encounter, and use personal pacing, varied resources, and feed-back” (p. 301). The suggestions show the need to develop strategies that will help adult students to learn.

In the development of teaching strategies, it is essential that adult educators realize the importance of the students’ past experiences. Adult learners’ past experiences can determine how easy or difficult it will be for them to learn different concepts. Smith (1983) writes that “the adult’s fund of past experience brings about a learning process that focuses on modifying, transferring, and reintegrating meanings, values, strategies, and skills, rather than forming and accumulating as in childhood” (p. 41). Past experiences can be beneficial to learning but they can be a hindrance as well. Merriam and Caffarella (1991) suggest “that the adult’s past experiences can become obstacles to new learning. Some may have to unlearn negative attitudes toward learning, old ways of doing things, prejudicial views, and so on” (p. 307). The key to designing curriculum is to develop a positive learning environment by promoting the students’ past experiences and looking for ways to overcome their negative past experiences.

The adult learners' motivation to learn enhances the quality learning environment.

Merriam and Caffarella (1991) cite Kidd (1973) who explains:

one of the reasons that adults continue to learn well ... is that they concentrate their learning in the areas of experience in which their interests also lie. Thus their motivation is substantial and, as everyone knows, wanting to learn is the greatest aid to learning. (p. 310)

Merriam and Caffarella's (1991) book that provides a wealth of references to researchers and practitioners in the field of adult education examined a great deal of research on adult learners. Another useful resource for curriculum development is Langenbach's (1988) *Curriculum Models in Adult Education*. There are a number of different models presented in this text which are relevant to curriculum design for adult learners in educational settings. Below, I briefly list the main concepts in each model.

1. Adler (1982) developed the *Paideia Model* which includes goals, means, areas, operations, and activities. The *goals* are the acquisition of organized knowledge, development of intellectual skills, or enlarged understanding of ideas and values. The *means* are didactic instruction, coaching and supervised practice, or Socratic questioning and active participation. The *areas* relate to the subject- matter, and the *operations* and *activities* are the methods used in teaching and learning. Adler (1984) is quoted:

the basic pedagogical precept of the Paideia Program is that all genuine learning arises from the activity of the learner's own mind When the activities performed by the teacher render students passive, the latter cease to be learners - memorizers perhaps, but not learners. (cited in Langenbach, 1988, p. 57)

2. The *Literacy Curriculum Model* designed by Newman and Harste (1976) consists of: an overview, diagnosing learner characteristics, setting objectives, planning assessment, planning strategies, planning organizations, planning use of resources, integrating learning environment, implementing, evaluating, and revising (cited in Langenbach, 1988, p. 82).

3. Tough (1979) outlines *Essential Elements in Self-Directed learning* as an overview, purposes for learning, what is learned, why learning occurs, deciding to begin, preparatory steps, choosing a planner and advantages and disadvantages (cited in Langenbach, 1988, p. 151).

4. A *Generic Curriculum Model* was designed by Houle (1972) and describes the process as follows: a possible activity is identified, a decision is made to proceed, objectives are identified and refined, a suitable format is designed, the format is fitted into larger patterns of life, the plan is put into effect and the results are measured and appraised (cited in Langenbach, 1988, p. 182).

5. Knowles (1975) *Model of Self-Directed Learning* includes the following: definitions, rationale, assumptions and processes. Facilitators or teachers' competencies are: setting an appropriate climate, planning, diagnosing needs, setting goals, designing a learning plan, engaging in learning activities, consulting, and evaluating learning outcomes. Learners' competencies are: relationship with others, translating learning needs into objectives, selecting effective strategies, collecting and evaluating evidence of accomplishment (cited in Langenbach, 1988, p. 164).

The five models have many similarities with each other and with the curriculum design in Possner and Rudnitsky's (1997) model. The models address: establishing the

rationale, setting the objectives, developing the instructional plan, and providing the evaluation process for the curriculum.

Application of Theories on the Adult Learner and Teaching Adults to the Development of the Guide

Adult education and adult learners are examined in Merriam and Cafferalla's (1991) book *Learning in Adulthood*. Merriam and Cafferella presented research on adult development and learning based on various researchers' views and theories. I found that certain theories and views were relevant and influenced my approach in developing the guide. I examined the characteristics of adult learners that Knowles suggests for teaching adults, Smith's importance of students' past experience, and Kidd's students learning experience and motivation. In *A Guide to Basic Math for Adult Upgrading*, I have implemented the suggestions by Knox (1977) in order to make learning a memorable encounter by emphasizing the students' abilities and by giving feedback. The students are encouraged to work at their own pace in a structured manner. In *A Guide to Basic Math for Adult Upgrading*, I try to be aware that students have their own unique way to modify, transfer, and reintegrate meaning as suggested by Smith (1983). I offer the students the opportunity to see different approaches to learn a concept. Kidd (1973) discusses a motivation to learn. The students in Mathematics 300 have the motivation and the desire to learn.

Langenbach's (1988) *Curriculum Models in Adult Education* presented models by Adler, Newman and Hartes, Tough, Houle, and Knowles. Each model has its own merit and I noticed that there were many similarities between each model and Possner and Rudnitsky's Model. In *A Guide to Basic Math for Adult Upgrading*, I have incorporated

goals and means suggested by Adler (1984). I wish to encourage students to develop their intellectual skills through guided practice and by giving the students the opportunity to develop problem-solving skills. Newman and Harste's (1976) *The Literacy Curriculum Model* framework is similar Possner and Rudnitsky (1997) approach to curriculum design. This and other educators' work offers further validation to the design of *A Guide to Basic Math for Adult Upgrading*. I have incorporated Tough's (1979) *Essential Elements in Self-Directed Learning*. I have included the concepts of Houle's (1972) *Generic Curriculum Model*.

I have examined Knowles' (1975) characteristics of adult learners and his *Model of Self-Directed Learning*. Adult learners are self-directed and have a readiness to learn. Adult students bring a wealth of information from their past experiences. The adult students are motivated by an inner desire to learn. From a time perspective, they are more aware of the immediate application of the concepts. Based upon that examination, I felt it influenced my development of *A Guide to Basic Math for Adult Upgrading*.

Adult Aboriginal Learners

The majority of students taking Mathematics 300 are aboriginal. In this section, I have provided a brief overview of five educators who have researched adult aboriginal learners and effective ways of teaching them. *A Guide to Basic Math for Adult Upgrading* is designed for students who were not adequately served by the formal education system. Whyte (1986) examined the failure of the formal education systems for Indians and Metis and he points out steps that can be used to promote success for the adult learner. Collier (1993) made recommendations that she found helpful in teaching Native students. Martin (1993) states, "Instructional methods like small group work and discussions that promote

a supportive environment are an integral part of these programs. This emotionally warm environment promotes continued student attendance and course completion” (p. 171). Fraser (1996) discussed the necessity to be cognizant of Aboriginal student learning styles. Wiesenburg (1990) talks about how cognitive variables affect Native adult learners ability. I wish to use the suggestions offered by other educators to influence me in designing *A Guide to Basic Math for Adult Upgrading*.

It is important to examine the realities of education that adult aboriginal students have encountered in their prior learning experiences. Whyte (1986) reviewed research on methods that are effective in teaching American Indians and Metis Students. He examined cultural barriers and factors inhibiting success in schools. Whyte (1986) points out:

much of the literature on Indian and Metis education has focused on the failure of the formal education system to serve the needs of Indian and Metis students. Concerned educators, researchers, community members, and parents have repeatedly discussed the factors, which inhibit the school success of Indian and Metis students. Among the factors articulated are the following.

1. The students are passive, silent, and withdrawn in the classroom;
2. Students have a poor self-concept and a lack of confidence;
3. Communication problems are both verbal and nonverbal;
4. Many Indian and Metis students ... deprived of experiences conducive to school readiness and success;

5. Self-expression, aggressiveness and working for personal advantage, which run counter to the value placed by most Indian nations on cooperation, group well-being and, when appropriate, silence;
6. Racial discrimination does exist, although most often it is described as being covert;
7. Continued insensitivity to Native cultures ... results in withdrawal from school, parent apathy, and community alienation. (p. 1)

The formal education system may have lessened the aboriginal students' chances to succeed but it is the job of adult educators to examine ways that they can help adult aboriginal students to succeed in academic upgrading. Whyte (1986) examined a number of reports and discussions about the problems that Indian and Metis may have encountered on their educational journey. Whyte (1986) provides his synthesis of tentative steps that can be taken to promote classroom setting and program planning which will enhance the learning of Indian and Metis students:

1. The teacher behaves as an equal to his or her students;
2. Formal lecturing to the whole class is kept to a minimum;
3. Open classroom setting ... encourages dialogue among students and learning from peers;
4. Conversation is free and open ended, student initiated ... and loosely guided but not structured by the teacher;
5. Cooperation and sharing behaviors that are promoted, what they have to say is important ... promote feelings of self worth in pupils. (p. 5)

Collier (1993) was involved in two pilot programs that examined ways to increase the chances for success of Cree and Inuit adult students in Quebec. Based upon her experiences teaching Native students at the college level for several years, Collier (1993) added to Whyte's findings. She (1993) offers a number of recommendations helpful in teaching Native adult students:

1. Never put Native students on the spot, asking them directly by name to answer a question,
2. Use small groups to provide Native (and non Native) students with easier opportunities to speak and go over the material than large class situations,
3. Use humor in the classroom,
4. Develop a personal relationship with students and take the time to get to know them personally. (p. 114)

Whyte and Collier's insights and suggestions are similar to what I have encountered teaching Native adults.

There is a need to provide positive learning environments. Martin (1993) found that there is a need to:

develop educational experiences tailored to individual or collective needs, interests, or learning styles. Students are still able to learn at their own pace, but in the company of others who will be able to enlarge and deepen an individual student's knowledge through their own efforts to master a subject. (p. 171)

It is equally important to consider qualities that instructors need in order to teach Aboriginal students. Martin (1993) made recommendations to non-aboriginal curriculum planners about designing programs for adult aboriginal learners. He stressed the

importance of having warm supportive instructors. Martin (1993) state that “Although instructor mastery of course content and the principles of adult education are extremely important in promoting student success, their qualities cannot overshadow the necessity of having instructors with warm, supportive personalities” (p. 172). The instructor’s personality can help increase the students’ capacity to succeed. Martin (1993) suggests, “The instructor’s attitude toward the students will affect the studies. Instructors with warm, positive attitudes are particularly necessary for Aboriginal students who have often endured hostility, racism, and alienation in previous educational experiences” (p. 172).

It is essential that instructors are cognizant of student learning styles. Fraser (1996) did a comparison of the similarities and differences of the learning styles between multi-cultural immigrants and Canadian Native adults. Fraser (1996), finds that, “the effective adult educator reflects on these similarities and differences in heritage and student learning styles to deliver pragmatic curriculum that achieves outcomes of learning, personal development, and employability to students with mutual trust and respect” (p. 1). Fraser found that there is a need to determine what strategies can be effective with the learning styles predominant in Aboriginal students. Fraser (1996) discussed her findings about a particular mathematics class where aboriginal:

students learned “from the outside in” with successes due to one-on-one tutoring, flexibility of time for instructions, climate of trust and respect and defining how the mathematics course fits into the continuum of necessary components for completion of high school. (p. 7)

Besides learning styles, there is a need to be aware of some cognitive variables that can affect the Native adult learners’ ability to process material. Wiesenberg (1990)

compared the learning outcomes between Native and Non-Native adult learners in Alberta. Wiesenberg (1990) found that:

Text-based, self-instructional materials for pre-college/university adult learners should take into consideration the strength of learners' verbal and spatial cognitive processing skills, as well as, the amount of relevant knowledge that learners bring into the learning situation. Cultural background appears to influence the way learners' process information in terms of the particular set of abilities used to complete tasks of varying difficulty. (p. 88)

Application of Adult Aboriginal Learners to the Development of the Guide

These are some of the many characteristics of adult aboriginal learners that need to be taken into consideration when planning curriculum. Martin (1993) points out that well-planned Aboriginal adult education programs must therefore teach material that is of relevance and interest to their students but must do so in a manner that is culturally appropriate...all courses should incorporate traditional Aboriginal learning styles into the instructional design. Aboriginal adults have traditionally viewed education as an interpersonal process, not an impersonal task. (p. 171)

It is my hope that *A Guide to Basic Math for Adult Upgrading* meets Martin's challenge.

Chapter 3

Design

Research Question

What is an appropriate math curriculum design that will meet the needs and the learning styles of aboriginal students and other adult learners?

Design

I have examined the present math for Math 300 in Adult Upgrading curriculum and I found that in its present form the students encounter difficulties. After three years of teaching Math 300, I felt that it was time to make improvements and revamp the existing curriculum. I felt that the textbook, Stein's *Refresher Mathematics* that was being used could still be used. Some material would be useful while other material needed improvement. Before I modified this text to meet the needs of the adult learners in Math 300, I examined curriculum theory and design. To redesign this course, I followed the model presented in *Course Design: A Guide to Curriculum Development for Teachers* by George Possner and Alan Rudnitsky (1997). This model of curriculum design makes explicit the relationship between the model and components of course design. The model describes how values determine the setting of educational goals (rationale) or the *why* of curriculum development. The development of curriculum is the *what* that goes into the curriculum; it is the intended learning outcomes, the objectives, and the curriculum intentions. An integral part is the instructional plan or the *how* of curriculum development. The instructional plan encompasses the students' needs assessment, a description of the learners, grouped and sequenced units, and the general teaching strategies to assess. These evaluations tell us if the instructional plan is effective and to

discover if the actual learning outcomes are assessed. Finally, this leads us to determine through a evaluation of *A Guide to Basic Math for Adult Upgrading* whether it was it successful and what kind improvements can be made.

Course Outline

. Possner and Rudnitsky (1997) state, “a course outline contains the major ideas, components, or topics of the subject you are planning to teach” (p. 32). The course outline that I developed for Mathematics 300 and the format of this were developed after a close examination of ideas and topics discussed in the *Alberta Program of Studies, The Western Canada Protocol* and the relevant research literature.

I am teaching students math on a daily basis, and I need to constantly look at ways that I can improve upon my effectiveness in teaching the math concepts. This was my motivation when I developed *A Guide to Basic Math for Adult Upgrading*. Possner and Rudnitsky (1997) believe “course planning begins with and is based on three things: (1) a clearly recognized motivation or source; (2) a recognition of the capacities, needs, and interests of the students; and (3) a familiarity with current approaches to the subject matter” (p. 6). Based upon the literature, previous experience, and direct observation, I continually evaluate the needs and interests of my students. I have examined different approaches to teaching. I have thoroughly familiarized myself with the objectives stated in the *Western Canada Protocol* and the *Alberta Program of Studies*. I designed a course outline based on these objectives

Learning Objectives

The course outline is an integral component in the design of a math curriculum. The next important component is the learning objectives. Possner and Rudnitsky (1997)

find that “the primary purpose of this planning phase is a stated set of intended learning outcomes, or learning objectives. An intended outcome is a statement of what the student is to learn” (p. 35). Possner and Rudnitsky (1997) point out “the use of the word *intended* emphasizes control and direction in the educational process” (p. 35). The intended outcomes are the desirable intentions of why we discuss the learning objectives at the beginning of each unit. The learning objective is a guide to what students are to learn. Possner and Rudnitsky (1997) examined student learning:

the word learning is again used advisedly, for it emphasizes that the major purpose of planning a course is to affect student learning. Courses are for students, not for teachers or the testers. A student may learn more or less than a teacher has actually taught. (p. 36)

Prior knowledge will assist a student, if the student can relate what they know to the new material. Possner and Rudnitsky (1997) posit that:

learning is a profoundly relative process. What students learn depends enormously on what they already know. The more one knows and is able to do, the more and more easily one can learn new material. Meaningful learning occurs when new and existing knowledge are related. Instruction, to be successful, depends on having students build on their existing knowledge. (p. 161)

Application of Learning Objectives to the Development of the Guide

An intended learning objective is emphasized heavily in the planning phase of any curriculum guide. The planning for intended learning objectives was an integral component in the development and design of *A Guide to Basic Math for Adult Upgrading*. The intention of *A Guide to Basic Math for Adult Upgrading* is to “act as a

bridge between what students already know and what the course planner wants them to understand” (Possner & Rudnitsky, 1997, p. 58). *A Guide to Basic Math for Adult Upgrading* builds upon their past understanding and skills and teaches new skills and concepts. Sometimes as illustrated by Possner and Rudnitsky (1997) “students base their approach to the learning of new skills on their current repertoire of skills. This fact suggests a view of students’ current skills both as obstacles to learning (things to unlearn) and as foundations of new learning” (p. 59). It is necessary to examine the obstacles presented by previous learning and to discover what we can do to facilitate overcoming these barriers. The learning objectives set out in this guide are designed both (a) to help students to overcome and unlearn obstacles to learning mathematics and (b) to act as a foundation for learning new skills.

Student Evaluation

A Guide to Basic Math for Adult Upgrading is designed with the students’ interests in mind because it is of the utmost importance that the learning objectives address what the students are to get out of the course; testing is meant to be an aid to examine what the students are learning and where the students maybe having difficulty. It is important to keep in mind that “for one reason or another a student may or may not meet the requirements of a certain test and still may have learned what was intended” (Possner & Rudnitsky, 1997, p. 32). There is no definitive way to test what has been learned or not learned. Therefore, testing should be an indication of areas where the students need to spend more time. Through more emphasis, we hope that the students will better understand the concept stated in the learning objective. An understanding of the concept is one of the desired outcomes we plan to achieve. Possner and Rudnitsky (1997) suggest

the use of the word *outcome* “indicates that our major concern is what the student will gain after completing the course” (p. 36). The intended learning outcome (ILO) or learning objective is an integral part of *A Guide to Basic Math for Adult Upgrading*. Possner and Rudnitsky (1997) define that “these ILOs may be facts, ideas, theories, or types of information that the student is expected to learn as a result of the course...ILOs may also be skills, competencies, or values” (p. 36). They go on to say “the first step in the process of selecting intended learnings is to decide which items on the list of initial ideas and in the course outline represent intended learning outcomes” (p. 36).

The learning objectives used in *A Guide to Basic Math for Adult Upgrading* is important because they determine what the students are expected to achieve during the course. The selection of the learning objectives requires grouping them into two categories: skills and understandings.

Generally speaking, understandings comprise the information and beliefs with which we think. Understandings can be thought of as “knowing that” (including “knowing” in a deep sense, not just memorizing). Ideas, concepts, facts, principles, theories and generalizations are some of the things that can be known. Skills can be thought of as “knowing how.” Skills are things students are able to do at the end of a course. Skills include mental abilities, such as problem solving, reading, arithmetic computation, interpretation, analysis, application, and physical abilities. (Possner & Rudnitsky, 1997, p. 39)

Application of Student Evaluation to the Development of the Guide

The development of understanding and skills is an essential element of what *A Guide to Basic Math for Adult Upgrading* is trying to accomplish. In order to accomplish

this task, we need to assess the students' existing understanding and skills. Possner and Rudnitsky (1997) suggest, "Before we can adjust a course's ILOs and instructional method to the students, we must know in fairly specific terms what particular students know or believe about the topics we intend to teach" (p. 58). They observed that:

the fact that students have or have not been exposed to certain ideas does not tell us what they do or do not understand. In fact, students' existing knowledge is not typically an all-or-nothing situation. Students do not come to any of a course's topic completely empty-headed. They may not know the terminology or have a precise understanding of the topic, but they usually have some ideas about it. (p. 57)

To determine what knowledge the students possess a teacher must talk to the student and observe their work. Possner and Rudnitsky (1997) find that "firsthand knowledge of students gained from observations and discussions both inside and outside the classroom" is the most preferable form of student evaluation (p. 58). The discussion and observation reveal the student's past experience and should be part of an ongoing process.

Curriculum Rationale

Already, I have mentioned the importance of stating the learning objectives. Alternately, we need to examine the rationale for designing the course. Possner and Rudnitsky (1997) note that:

logically a rationale comes first in course design, but other considerations may put it in a different position in the actual planning procedure. In the absence of other compelling factors, the rationale should follow the initial thinking about ILOs, which it serves to justify. (p. 73)

Possner and Rudnitsky (1997) offer an example of a rationale for a curriculum design for teaching mathematics that focuses on the needs of the learner:

basic math is intended to help the individual gain self-confidence through success in math and take pride in their ability to meet or exceed societal standards for performance, including job-related uses. Most important, knowledge of mathematics increases an individual's versatility in communicating with others, and in understanding the world through observations and through the media. (p. 68)

Application of the Rationale to the Development of the Guide

In *A Guide to Basic Math for Adult Upgrading* I used the rationale to provide direction for the curriculum design. The rationale addresses the goals a curriculum is trying to achieve. In designing the guide, I followed some guidelines set down by Possner and Rudnitsky (1997):

the following guidelines should help you to state appropriate goals: 1. Educational goals should describe the desired product. What units should be offered, what instructional procedures should be used, and what environmental conditions should be maintained to achieve those results should be determined later. 2. Educational goals should be stated as desirable characteristics attributable to learning. 3. If more than one goal is stated, priorities should be indicated. 4. The goals should indicate what each individual should derive. 5. The scope of educational goals is an important consideration. (pp. 71-72)

The rationale and the educational goals also guide the instructional foci that are used and how the units are organized.

Instructional Focus

Organization of units. *A Guide to Basic Math for Adult Upgrading* is based upon *Refresher Mathematics*. In *Refresher Mathematics*, the instructional focus is designed to meet the learning objectives by giving students the opportunity to practice the assignments that follow each set of learning objectives. The students are given a chance to display their understanding of the concept by referring to the examples and by completing the assignments. The capacity for motivation increases with the sequential nature by which material is presented: the concept, the examples and the practice. For learning mathematics, the resource text is easy to use and demonstrates the material in an orderly manner. The layout of the *Refresher Mathematics* text closely matches the organization of the units in the guide. Possner and Rudnitsky (1997) stated the importance of organizing the units:

organized units are units in the order in which the course's units will be presented to the students taking the course. This organization is expressed in the form of a unit outline. There are three levels of unit organization: (1) the grouping of units, (2) the sequencing of groups, and (3) the sequencing of units within groups. Grouping units consists in clustering units together in a meaningful fashion ... Sequencing groups consists in ordering the grouped units in the way they will be taught. Sequencing units means ordering the units within a group in the way they will be taught. (p. 142)

Application of the Organization of the Units to the Development of the Guide

A Guide to Basic Math for Adult Upgrading is divided into four units: number operations; patterns and relations; shape and space; and statistics and probability. The

four units are sequenced so that the students can build upon the knowledge learned in one unit and apply it to the next. The organization of units facilitates the students learning and aids instruction.

Teaching strategies. A Guide To Basic Math for Adult Upgrading incorporates a variety of teaching strategies. In designing this guide, the development of teaching strategies can be used to complement the organization of units. There can be direct instruction to the students as a group or one-on-one. Possner and Rudnitsky (1997) suggest:

instruction, in our framework, is made up of all the teacher's purposeful activities aimed at producing, stimulating, or facilitating learning by students. Instruction deals with how and what methods, materials, strategies, tasks and incentives can be employed to encourage learning. Instruction planning is a task carried out by teachers. Teachers may set the stage for learning but they share that stage with students, and once instruction begins it are the students who occupy the center of the stage. Learning is an active process and, therefore, requires that students engage in some activity. (p. 157)

Instructors can decide what teaching strategies to use but ultimately students must participate in their learning. There is a need for guided practice as well as interaction with students to prepare them to do the assignments. Possner and Rudnitsky (1997) point out "in teaching a cognitive or psychomotor-perceptual skill, practice is a crucial learning activity. Instruction for skills typically includes a presentation or initial teaching of the skill and then opportunities to practice" (p. 164).

Application of the Teaching Strategies to the Development of the Guide

In the planning of instruction, we need to provide effective learning environments. This can be accomplished by setting clear goals. The goals established in *A Guide to Basic Math for Adult Upgrading* should give clear direction to the students of the destination that they are trying to be reach. At the beginning of the course, there should be clarification of the goals so that the students are on the “same page” as the instructor. Possner and Rudnitsky (1997) state:

that goal may have been like a destination you were trying to reach ... or your goal may have been developing an understanding of a particular topic or an idea ... In fact, your initial goal might be described more as a direction than a destination. Students can begin to learn and teachers can begin to teach once they have some initial direction. As they progress, they will undoubtedly modify and clarify their goals. (p. 159)

Evaluation or Assessment

Feedback or formative assessment. An effective learning environment can be accomplished by providing feedback. This also helps instructors to determine if goals are being met. Possner and Rudnitsky (1997) emphasize the importance of feedback. “Most successful educational experiences also require feedback. Feedback means getting information about progress toward one’s goal. Good instruction includes such feedback. Besides guiding students personally and directly, teachers can set up situations that inherently provide students with feedback” (p. 160). For *A Guide to Basic Math for Adult Upgrading* to be effective, there will need to be constant interaction between the student

and the instructor. Positive feedback and encouragement are an excellent source of motivation.

Application of Feedback or Formative Assessment to the Development of the Guide

In the course syllabus, I stress that learning is the individual student's responsibility. I emphasize four values that I feel are important in order for student to succeed: commitment, perseverance, tolerance, and willpower. When I discuss these four values with the students, I find that it helps motivate them. Possner and Rudnitsky (1997) said it is a "teachers' responsibility is to design environments that are likely to engage students so that students motivate themselves to learn. Among the most powerful instructional factors that teachers can employ is making instruction interesting and relevant to students' lives" (p. 160). During instruction and when I give the students feedback, I try to relate what I am teaching to events in everyday life. Possner and Rudnitsky (1997) discuss risk-taking. "Students learn better when they take reasonable chances and do not restrict their output when they make errors and learn from their mistakes" (p. 161). I strongly believe that one way that students can learn is when they make mistakes doing the work, that the students discover what they did wrong, and that they correct their mistakes. If the student can do that, there is greater chance that they will remember how to do it correctly.

Tests or summative assessment. Meaningful learning is the combination of prior knowledge and the new concepts. Tests are devised as a means of accountability to determine how well the students understand the concepts. Possner and Rudnitsky (1997) view on academic tasks is that:

student accountability is conveyed through tests and other formal methods of evaluation and also through the questions teachers ask, the feedback the teachers give, and all the other cues teachers provide that indicate and emphasize desired learnings. Whenever possible, learners should have a clear idea of the kind of learning for which they are accountable. (p. 162)

Application of Tests or Summative Assessment to the Development of the Guide

A Guide to Basic Math for Adult Upgrading provides instructors with tests and test keys for each section. Each test is designed to determine the understanding and skills that the students possess about the concepts. Part of the test involves computations relating to the concepts and the other part poses word problems. The tests are designed to determine how much material the students absorbed and what problem areas remain. The tests indicate what areas the students need to review and where they need to do more exercises. Possner and Rudnitsky (1997) stress that:

teachers can help students realize that comprehension, understanding, and other high-level outcomes (i.e., cognitions) while difficult, are worth working to achieve. Over time students will realize that understandings require learning strategies that go beyond memorization or narrowly focusing on the acquisition of a specific performance. Learning activities will require that students encounter and use content in many different ways. (p. 163)

Through using the guide and the instructor's assistance, the students need learning strategies that will help them in their present and future study of mathematics. *A Guide to Basic Math for Adult Upgrading* with instructor use is to provide students with these strategies.

Evaluating the Guide

The design of *A Guide to Basic Math for Adult Upgrading* addresses the main components of basic math but there are limitations. Possner and Rudnitsky (1997) find that:

it is not enough for us to want students to learn important ideas and skills; we must also find out whether or not they are achieving these desirable learning outcomes. If we find a discrepancy between what we intend and what students achieve, then we have a basis for course revision. (p. 82)

Each student is unique and has individual needs and interests. The guide can be a useful tool to the individual as well as to a group of students. There is a need to evaluate the strengths and weaknesses of the guide as the course is taught. Possner and Rudnitsky (1997) point out that:

in a sense, course planning never stops but continues to evolve. To some extent, we can know what we want to accomplish only as we try to implement preliminary plans. Thus, ILOs, educational goals, and other course components will be altered as you or others actually teach the course. (p. 206)

As myself and the other Math instructors at Portage College teach the course, we can observe how the students respond to the guide: the exercises, the assignments and the tests. The development of the tests is based upon the concepts that are being taught and the application of those concepts. As students do the tests, it is necessary to evaluate whether the tests are consistent with what we are trying to accomplish in our teaching. Possner and Rudnitsky (1997) state:

evaluation for course improvement involves gathering information that will be useful in deciding which aspects of a course can and should be improved.

Evaluation aimed at decisions about individual students consists in gathering information to be used in assessing student needs or in the grading, grouping, or selection of individual students. (p. 186)

The information that is gathered in evaluating the course and individual students can be of assistance in improving the guide and course delivery. The guide can be made better and that requires future research and curriculum development.

If the adult students in Math 300 are successful, future researchers want to assess the role of the guide played in helping them reach that goal. There is a need to remain vigilant about improvements that can be made to Math 300 and the guide. Possner and Rudnitsky (1997) suggest that

if your high priority ILOs were achieved, and the course went smoothly, but yet the results were disappointing, you will have to ask some questions about whether your intended learnings are as appropriate for your goals as you initially thought.
(p. 157)

If this situation arises, there is a need to examine the appropriateness of the learning objectives, the layout of the units, and the relevance of the tests.

Through reflection and insights gained from evaluation of this guide, the Math instructors at Portage College can improve the effectiveness of the curriculum. As Possner and Rudnitsky (1997) say, “by carefully and systematically making changes and continuing to evaluate the course each time it is taught, the course should become more

and more refined” (p. 206). As I continue to teach adult aboriginal students at Portage College, I will try to find ways to improve *A Guide to Basic Math for Adult Upgrading*.

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Appendix A

Guide: To Basic Math for Adult Upgrading

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Introduction

Students are responsible for their own learning. A positive learning environment can be provided for the students. The instructor is there to act as a guide. *A Guide to Basic Math for Adult Upgrading* is a resource that can provide the students with a means to learn the basics of mathematics. *A Guide to Basic Math for Adult Upgrading* was designed to help students understand the basic foundations of mathematics. Math is part of our everyday lives. Most college students need math courses to meet the requirements of the various programs that they plan to pursue. To succeed in their studies they need to concentrate on learning the basics of math because that basic understanding will make it easier in each subsequent math course.

A Guide to Basic Math for Adult Upgrading was designed for adult students who have returned to school for academic upgrading, the majority of whom are aboriginal. These students have varying proficiency and grade levels. Many students enrolled in Mathematics 300 have taken either junior high school or senior high school entry-level mathematics courses. For some students, Mathematics 300 is a refresher course while for others it covers the basics that they forgot or did not learn in the regular school system. *A Guide to Basic Math for Adult Upgrading* was designed to bridge the gap between students' existing level of proficiency and the tools necessary for them to be successful in grade 10 mathematics.

A Guide to Basic Math for Adult Upgrading offers a structured approach where the students work at their own individual pace, and the instructor provides guidance mostly when the student encounters difficulty. *A Guide to Basic Math for Adult Upgrading* outlines learning objectives, illustrates examples, and provides students with assignments. Once the student has satisfactorily completed one unit, they progress to the next unit.

The purpose of the tests is to determine how well the student understands and can apply concepts. Each test has a similar format. The first part of the test has questions that assess the application of the concepts. The second part evaluates computational skills by testing the use of math operations. The third part assesses the students' problem-solving abilities using word problems. For each word problems, the students need (a) to understand what the question is asking, (b) devise a plan to find the solution, (c) carry out the plan by doing the calculations, and (d) check if the solution answers the question. The method of evaluation helps the student and the instructor to determine how well the student did with each question. With these tests, both the instructor and the student can assess where the student needs to focus their attention if they did not do well in a particular area. If the student has mastered the concept then they progress to the next unit.

Guide: to Basic Math for Adult Upgrading

Unit Learning Objectives

Unit 1: Number Concepts

Section 1A: Decimals Review

Objectives:

1. Read, write, round and compare decimals.
2. Add, subtract, multiply, and divide decimals.
3. Multiply and divide by powers of 10.
4. Write fractions as decimals and decimals as fractions.
5. Solve problems involving decimals.

References:

1. Refresher Math.
Pages: 76 - 129

Student assignment:

Lesson	Decimal Review	Pages	
Lesson 1	Reading decimals	P 79	1-12 A
	Writing decimals	P 82	1-15 A
	Rounding decimals	P 85	1-6, 13-19 A
	Comparing decimals	P 87	1-6 All
Lesson 2	Adding decimals	P 92-94	1-27 A
	Subtracting decimals	P 98-100	1-34 A
Lesson 3	Multiplying decimals	P 106-107	1-31 A
Lesson 4	Dividing decimals	P 112	1-14 A
	Dividing decimals by decimals	P 117-118	1-38 A
	Test – Decimals Review		

Guide: to Basic Math for Adult Upgrading
Unit 1: Number Concepts

Section 1B: Fractions Review

Objectives:

1. Write fractions.
2. Compare fractions.
3. Add, subtract, multiply and divide fractions.
4. Solve word problems involving fractions.

References:

1. Refresher Math
Pages 148 - 199

Student assignment:

Lesson	Fractions Review	Pages	
Lesson 1	Expressing fractions in lowest terms	P 150	1-8
	Simplifying improper fractions and mixed numbers	P 152	1-9
	Expressing fractions in higher terms	P 154	1-6
	Identifying equivalent fractions	P 156	1-5
Lesson 2	Finding multiples	P 158	1-8
	Comparing fractions and rounding mixed numbers	P 161	1-7
	Finding least common denominators	P 163	1-5
Lesson 3	Writing mixed numbers as improper fractions	P 178	1-5 A
	Test – Fractions Test #1		
Lesson 4	Adding fractions	P 168-69	1-29 A
Lesson 5	Subtracting fractions	P 174-75	1-26 A
	Test – Fractions Test #2		
	Multiplying fractions	P 183-85	1-44 A
Lesson 6	Dividing fractions	P 192-93	1-31 A
	Test – Fractions Test #3		

Guide: to Basic Math for Adult Upgrading
Unit 1: Number Concepts

Section 1C: Percents, Decimals, & Fractions

Objectives:

1. Write numbers as percents.
2. Write percents a numbers.
3. Write percents as decimals and fractions.
4. Write decimals as fractions and percents.
5. Write fractions as decimals and percents.

References:

1. Refresher Math
Pages 200 – 205, 224 - 236.

Student assignment:

Lesson	Percent	Pages
Lesson 1	Percent	P 226
	Writing percent as decimals	P 228
Lesson 2	Writing decimals as percent	P 230
Lesson 3	Writing percent as fractions	P 232
	Writing fractions and mixed numbers as percent	P 235
	Test – Percent	

Guide: to Basic Math for Adult Upgrading
Unit 2: Patterns & Relations

Section 2A: Ratio & Proportion

Objectives:

1. Express two quantities as a ratio
2. Express two equal ratios as a proportion.
3. Solve problems involving ratios and proportions.

References:

1. Refresher Math
Pages 210 - 215.
2. Worksheet.

Student assignment:

Lesson	Ratio & Proportion	Pages	
Lesson 1	Ratio	P 211	1-15 A
	Proportion	P 215	1-10 A
Lesson 2	Solving proportion (ask instructor for a worksheet)	P iii	
Lesson 3	Solving word problems (ask instructor for a worksheet)	P vii	
Lesson 4	3 ratio proportions (ask instructor for a worksheet)	P xiii	
	Test – Ratio & Proportion		

Guide: to Basic Math for Adult Upgrading
Unit 2: Patterns & Relations

Section 2B: Percents & Problem Solving

Objectives:

1. Find percent of a number.
2. Find what percent of one number is of another.
3. Find a number when a percent is known.
4. Solve percent problems using proportions.
5. Solve problems involving a percent increase (mark up, profit).
6. Solve problems involving a percent decrease (mark down, discount).

References:

1. Refresher Math:
Pages: 237 - 256
2. Worksheet.

Student assignment:

Lesson	Percent & Problem – Solving	Pages
Lesson 4	Finding percent of a number	P 240
	Finding what percent one number is of another	P 245
Lesson 5	Percent increase or decrease	P 249
	Finding a number when percent is known	P 253-54
Lesson 6	Discounts (ask instructor for a worksheet)	P iii
Lesson 7	Mark-ups and sales tax (ask instructor for a worksheet)	P v
	Test – Percent & Problem - Solving	

Guide: to Basic Math for Adult Upgrading
Unit 2: Patterns & Relations

Section 2C: Integers & Rational Numbers

Objectives:

1. Use order of operations.
2. Recognize the rational numbers.
3. Graph rational numbers on the number line.
4. Compare integers.
5. Add integers and rational numbers.
6. Subtract integers and rational numbers.
7. Multiply integers and rational numbers
8. Divide integers and rational numbers.

References:

1. Refresher Math
Pages: 534 - 555

Student assignment:

Lesson	Integers & Rational Numbers	Pages	
Lesson 1	Rational numbers	P 538	1-13
	Graphing on a number line	P 540	1-5
Lesson 2	Opposite meanings	P 541	1-10
	Comparing integers	P 543	1-10
Lesson 3	Adding integers	P 547	1-11 A
Lesson 4	Subtracting integers	P 550-51	1-16 A
Lesson 5	Multiplying integers	P 553	1-8 All
Lesson 6	Dividing integers	P 555	1-12 All
	Test – Integers & Rational Numbers		

Guide: to Basic Math for Adult Upgrading
Unit 2: Patterns & Relations

Section 2D: Variables and Equations

Objectives:

Write algebraic expressions and sentences.

Use formulas to solve word problems.

Evaluate expressions.

Evaluate formulas.

Solve equations using replacement, properties of equality, and inverse operations.

Solve equations using one operation.

References:

1. Refresher Math:

Pages: 560 - 580

Student assignment:

Lesson	Variables & Equations	Pages
Lesson 1	Algebraic expressions	P 561 ODD
	Algebraic sentences	P 563 ODD
	Formulas	P 565 ODD
Lesson 2	Evaluating expressions	P 567 ODD
	Evaluating formulas	P 568
Lesson 3	Properties of equality	
	Solving equations by subtraction	P 574
	Solving equations by addition	P 575
	Solving equations by multiplication	P 576
	Solving equations by division	P 577
Lesson 4	Solving equations using two operations	P 578
	Test – Variables & Equations	

Guide: to Basic Math for Adult Upgrading
Unit 3: Shape & Space

Section 3A: Geometry & Terminology

Objectives:

1. Distinguish points, lines, segments, rays, parallel lines, intersecting lines, and perpendicular lines.
2. Draw and measure line segments using a ruler or a ruler and a compass.
3. Calculate actual distances from scale.
4. Define plane and space.
5. Define polygon, vertex, diagonal, regular polygon.
6. Identify different kinds of triangles according to the measure of their sides or their angles.
7. Identify different kinds of quadrilaterals.
8. Name the parts of a circle and the line segments associated with it.
9. Distinguish between polyhedron, faces edges, vertices.
10. Identify the six basic, regular solids.

References:

1. Refresher Math
Pages: 428 - 450.

Student assignment:

Lesson	Geometry & Terminology	Pages
Lesson 1	Points, rays, lines	P 429
	Angles	P 432
	Measuring angles	P 434
	Parallel, intersecting, and perpendicular lines	P 436
Lesson 2	Geometric figures – plane	P 446
	Geometric solids	P 450
	Test – Geometry & Terminology	

Guide: to Basic Math for Adult Upgrading
Unit 3: Shape & Space

Section 3B: Angles & Triangles

Objectives:

1. Define and name angles.
2. Identify 5 different kinds of angles
3. Using a protractor, draw and measure angles.
4. Determine the sums of the angles of various types of polygons.
5. Calculate the supplementary and complementary angles.
6. Name the angles of a transversal.
7. Distinguish between similar and congruent triangles.
8. State the properties of congruent triangles.
9. State the properties of similar triangles.

References:

1. Refresher Math
Pages: 433-434, 451- 461

Student assignment:

Lesson	Angles & Triangles	Pages
Lesson 1	Sum – measure of angles	P 452
	Special pairs of angles	P 454-55
Lesson 2	Parallel lines and angle relationships	P 457
Lesson 3	Congruent triangles	P 459
	Similar triangles	P 461
	Test – Angles & Triangles	

Guide: to Basic Math for Adult Upgrading
Unit 3: Shape & Space

Section 3C: Perimeter, Area, & Volume

Objectives:

Calculate the perimeter of various polygons.

$$\begin{aligned} * \text{ square } P &= 4s, & \text{ rectangle } P &= 2l + 2w, & \text{ triangle} \\ & & P &= s + s + s \end{aligned}$$

Calculate the circumference of circles, $C = 2\pi r$.

Calculate the area of any quadrilateral.

$$\begin{aligned} * \text{ rectangle } A &= l \times w, & \text{ square } A &= s^2. \\ * \text{ parallelogram } A &= bh, & \text{ trapezoid } A &= \frac{1}{2}h(b_1 + b_2) \text{ OR} \end{aligned}$$

$$A = h \times \frac{(b_1 + b_2)}{2}.$$

Calculate the area of a triangle, $A = \frac{1}{2}bh$.

Calculate the area of a circle, $A = \pi r^2$.

Calculate the surface area of a rectangular solid and cube,

$$* A = 2lw + 2lh + 2wh \text{ and } A = 6e^2.$$

Calculate the surface area of a cylinder and sphere,

$$* A = 2\pi rh + 2\pi r^2 \text{ and } A = 4\pi r^2.$$

Calculate the volume of a rectangular solid and cube, $V = lwh$ and $V = e^3$.

Calculate the volume of a cylinder, $V = \pi r^2 h$

Calculate the volume of a sphere, cone or pyramid,

$$* \text{ sphere } V = \frac{4}{3}\pi r^3, \quad \text{cone } V = \frac{1}{3}\pi r^2 h, \quad \text{pyramid } V = \frac{1}{3}Bh$$

References:

1. Refresher Math

Pages:498 - 519

2. Worksheet

Student assignment:

Lesson	Perimeter, Area, & Volume	Pages
Lesson 1	Perimeter of a rectangle	P 498
	Perimeter of a square	P 499
	Perimeter of a triangle	P 500
	Circumference of a circle	P 502
Lesson 2	Area of a rectangle	P 503
	Area of a square	P 504
	Area of a parallelogram	P 505
	Area of a triangle	P 506
	Area of a trapezoid	P 507
	Area of a circle	P 509
Lesson 3	Total area of a rectangular solid	P 510
	Total area of a cube	P 511
	Area of a cylinder and sphere	P 514
Lesson 4	Volume of a rectangular solid, cube, & cylinder	P 515-17
	Volume of a sphere, cone, & pyramid	P 519
	Test – Perimeter, Area, & Volume	

Guide: to Basic Math for Adult Upgrading
Unit 4: Statistics & Probability

SECTION 4A: DATA ANALYSIS

Objectives:

1. Construct vertical and horizontal bar graphs.
2. Identify and interpret pictographs.
3. Construct line graphs.
4. Calculate table of degrees and construct circle graphs.
5. Organize data and display using frequency distribution, histograms, frequency polygons.
6. Find the measures of central tendencies: mean, median, and mode.
7. Find possible outcomes of activities or experiments.
8. Find the probability of an event, either independent or dependent.

References:

Refresher Math

Pages: 394 - 413.

Student assignment:

Lesson	Data Analysis	Pages
Lesson 1	Bar graphs	P 395
	Broken line graphs	P 397
	Circle graphs	P 399
Lesson 2	Organizing data	P 401
	Range and measures of central tendency	P 404
Lesson 3	Possible outcomes	P 407
	Probability	P 411
	Test – Data Analysis	

Guide: To Basic Math for Adult Upgrading
Decimals Review Test

Name: _____

1. Write the following decimals in word form. (Value: 3)
- 0.5
 - 17.028
 - 1.604

2. Round off each of the following to the nearest ten, tenth, and hundredth. (Value: 9)

Number	Tens	Tenths	Hundredths
10.0752			
53.3125			
321.9896			

3. Which is greater? (Value: 3)
- 17.9 or 17.953
 - 24.8 or 31.72
 - 0.8 or 0.183
4. Which is less? (Value: 3)
- 0.06 or 0.006
 - 0.23 or 0.088
 - 0.02019 or 0.020019
5. Write the following in order from least to greatest. (Value: 3)
- 0.98, 0.918, 0.098, 1.98
 - 2.09, 2.19, 2.18, 2.9
 - 23.87, 412.802, 311.88, 84.399, 9.98

6. Add the following decimals. (Value: 5)
- $0.6 + 0.2 + 0.1$
 - $55.0 + 109.6 + 3.07$
 - $0.6 + 0.09 + 83.168 + 0.543$
 - $3.6 + 12.51 + 21.0$
 - $42.194 + 8.0 + 3.85$
7. Subtract the following decimals. (Value: 5)
- $0.59 - 0.37$
 - $0.8377 - 0.0739$
 - $105.0 - 83.612$
 - $25.0 - 17.08$
 - $20.6 - 5.772$
8. Multiply the following decimals. (Value: 5)
- 0.4×7.0
 - 0.245×2.4
 - 0.00125×0.0144
 - 3.2×0.35
 - 0.8242×9.0
9. Divide the following decimals. (Value: 5)
- $4 \overline{)378.0}$
 - $66 \overline{)70.554}$
 - $0.3 \overline{)81}$
 - $0.05 \overline{)0.00085}$
 - $5.246 \overline{)35.6728}$

Word Problem. Show all of your calculations.

1. Gene drove 31.6 kilometers on Monday, 110.5 kilometers on Tuesday, 56.8 kilometers on Wednesday, 157.1 kilometers on Thursday, 96.3 kilometers on Friday, and 55.7 kilometers on Saturday. How many kilometers did he drive for the week? (Value: 3)
2. Charles lost 2.165 kilograms during the week. Karla lost 2.203 kilograms. Who lost the most weight that week? (Value: 2)
3. At the beginning of a chemistry experiment Ross had 10.3 cubic centimeters of a solution. He used 7.6 cubic centimeters. How much of the solution did he have left? (Value: 3)
4. A monthly mortgage payment is \$623.89. How much is paid in one year? (Value: 3)
5. If you drove a car 1363.2 kilometers on 32 liters of gas, what was the average number of kilometers per liter? (Value: 3)
6. What is the cost per kilogram of a 5 kilograms box of candy that costs \$12.45? (Value: 3)

BONUS QUESTION: (Value: 2)

Eighty alumni of the University of Lethbridge donated \$3561.60 to the university. What was the average donation?

Guide: To Basic Math for Adult Upgrading
Decimals Test KEY

Name: _____

1. Write the following decimals in word form. (Value: 5)

f. 0.5

g. 17.028

h. 1.604

a. 0.5 – five tenths

b. 17.028 – seventeen and twenty-eight thousandths

c. 1.604 – one and six hundred four thousandths

2. Round off each of the following to the nearest ten, tenth, and thousandth. (Value: 9)

Number	Ten	Tenth	Hundredth
10.0752	10	10.1	10.08
53.3125	50	53.3	53.31
321.9896	320	322.0	322.00

3. Which is greater? (Value: 3)

a. 17.9 or 17.953

b. 24.8 or 31.72

c. 0.8 or 0.183

4. Which is less? (Value: 3)

a. 0.06 or 0.006

b. 0.23 or 0.088

c. 0.02019 or 0.020019

5. Write the following in order from least to greatest. (Value: 3)

a. 0.98, 0.918, 0.098, 1.98

0.098, 0.918, 0.98, 1.98

b. 2.09, 2.19, 2.18, 2.9

2.09, 2.18, 2.19, 2.9

c. 23.87, 412.802, 311.88, 84.399, 9.98

9.98, 23.87, 84.399, 311.88, 412.802

6. Add the following decimals. (Value: 5)
- | | |
|----------------------------------|---------------|
| a. $0.6 + 0.2 + 0.1$ | 0.9 |
| b. $55 + 109.6 + 3.07$ | 167.67 |
| c. $0.6 + 0.09 + 83.168 + 0.543$ | 84.401 |
| d. $3.6 + 12.51 + 21$ | 37.11 |
| e. $42.194 + 8 + 3.85$ | 54.044 |
7. Subtract the following decimals. (Value: 5)
- | | |
|----------------------|---------------|
| a. $0.59 - 0.37$ | 0.22 |
| b. $0.8377 - 0.0739$ | 0.7638 |
| c. $105 - 83.612$ | 21.388 |
| d. $25 - 17.08$ | 7.92 |
| e. $20.6 - 5.772$ | 14.828 |
8. Multiply the following decimals. (Value: 5)
- | | |
|----------------------------|-----------------|
| a. 0.4×7 | 2.8 |
| b. 0.245×2.4 | 0.588 |
| c. 0.00125×0.0144 | 0.000018 |
| d. 3.2×0.35 | 1.12 |
| e. 0.8242×9 | 7.4178 |
9. Divide the following decimals. (Value: 5)
- | | |
|--------------------------------|--------------|
| a. $4 \overline{)378.0}$ | 94.5 |
| b. $66 \overline{)70.554}$ | 1.069 |
| c. $0.3 \overline{)81}$ | 270 |
| d. $0.05 \overline{)0.00085}$ | 0.017 |
| e. $5.246 \overline{)35.6728}$ | 6.8 |

Word Problem. Show all of your calculations.

1. Gene drove 31.6 kilometers on Monday, 110.5 kilometers on Tuesday, 56.8 kilometers on Wednesday, 157.1 kilometers on Thursday, 96.3 kilometers on Friday, and 55.7 kilometers on Saturday. How many kilometers did he drive for the week? (Value: 3) **508**
2. Charles lost 2.165 kilograms during the week. Karla lost 2.203 kilograms. Who lost the most weight that week? (Value: 2) **Karla**
3. At the beginning of a chemistry experiment Ross had 10.3 cubic centimeters of a solution. He used 7.6 cubic centimeters. How much of the solution did he have left? (Value: 3) **2.7**
4. A monthly mortgage payment is \$623.89. How much is paid in one year? (Value: 3) **\$7486.68**
5. If you drove a car 1363.2 kilometers on 32 liters of gas, what was the average number of kilometers per liter? (Value: 3) **42.6**
6. What is the cost per kilogram of a 5 kilogram box of candy that costs \$12.45? (Value: 3) **\$2.49**

BONUS QUESTION: (Value: 2)

Eighty alumni of the University of Lethbridge donated \$3561.60 to the university. What was the average donation? **44.52**

Guide: To Basic Math for Adult Upgrading
Fractions Test #1

Name: _____

1. Express the following fractions in lowest terms. (Value: 10)

a. $\frac{2}{16}$

b. $\frac{7}{42}$

c. $\frac{64}{80}$

d. $\frac{30}{72}$

e. $\frac{27}{30}$

f. $\frac{5}{10}$

g. $\frac{10}{15}$

h. $\frac{12}{18}$

i. $\frac{14}{22}$

j. $\frac{45}{25}$

2. Express each of the following improper fractions as a mixed number in simplest form.
(Value: 10)

a. $\frac{11}{9}$

b. $\frac{14}{5}$

c. $\frac{22}{5}$

d. $\frac{25}{11}$

e. $\frac{49}{15}$

f. $\frac{17}{4}$

g. $\frac{17}{5}$

h. $\frac{9}{2}$

i. $\frac{11}{5}$

j. $\frac{19}{4}$

3. Choose the equivalent fraction with the specified denominator. (Value: 3)

- | | | | |
|---------------------------|--------------------|--------------------|--------------------|
| a. $\frac{2}{3}$ in 12ths | a. $\frac{2}{12}$ | b. $\frac{4}{12}$ | c. $\frac{8}{12}$ |
| b. $\frac{5}{8}$ in 16ths | a. $\frac{10}{16}$ | b. $\frac{5}{16}$ | c. $\frac{13}{16}$ |
| c. $\frac{1}{2}$ in 24ths | a. $\frac{1}{24}$ | b. $\frac{12}{24}$ | c. $\frac{3}{24}$ |

4. Circle the fractions that are proper. (Value: 3)

- a. $\frac{10}{11}$, $\frac{11}{12}$, $\frac{12}{10}$, $\frac{11}{10}$, $\frac{12}{11}$, $\frac{10}{12}$, $\frac{11}{11}$

5. Write these numbers as improper fractions. (Value: 5)

- a. $4\frac{5}{6}$
 b. $7\frac{1}{6}$
 c. $10\frac{7}{8}$
 d. $8\frac{2}{5}$
 e. $8\frac{7}{9}$

6. Circle the larger fractions in each question below. (Value: 3)

- a. $\frac{6}{11}$ or $\frac{8}{11}$
 b. $\frac{8}{15}$ or $\frac{10}{15}$
 c. $\frac{6}{11}$ or $\frac{1}{2}$

7. List the fractions $\frac{2}{3}$, $\frac{3}{8}$, and $\frac{3}{4}$ from the smallest to the largest. (Value: 3)

8. List the fractions $\frac{5}{6}$, $\frac{7}{8}$, and $\frac{4}{5}$ from the smallest to the largest. (Value: 3)

9. Find the lowest common denominator of $\frac{1}{7}$ and $\frac{5}{11}$. (Value: 1)

Word Problems.

1. In a case of 15 students there are 8 women. What fraction represents the part of the class that is female? (Value: 2)
2. In a certain mathematics class there are 40 students; 19 of them are male. What fraction represents the part of the class that is male? (Value: 2)
3. The float on a tank registers 8 meters. If the tank if full when it registers 12 meters, what fractional part of the tank is filled? Reduce to lowest terms. (Value: 3)
4. A local basketball team won 25 games and lost 35. What fractional part of the games did the team win? Reduce to lowest terms. (Value: 2)

Bonus Question. Be sure and show all of your work.

A container of a chemical was weighed by three people. Mary recorded the weight as $3\frac{1}{8}$ kg

George read the weight as $3\frac{3}{16}$ kg Charley read the weight as $3\frac{1}{4}$ kg Whose measurement was the heaviest? (Value: 2)

Guide: To Basic Math for Adult Upgrading
Fractions Test #1 Key

1. Express the following fractions in lowest terms. (Value: 10)

a. $\frac{2}{16} = \frac{1}{8}$

b. $\frac{7}{42} = \frac{1}{6}$

c. $\frac{64}{80} = \frac{4}{5}$

d. $\frac{30}{72} = \frac{5}{12}$

e. $\frac{27}{30} = \frac{9}{10}$

f. $\frac{5}{10} = \frac{1}{2}$

g. $\frac{10}{15} = \frac{2}{3}$

h. $\frac{12}{18} = \frac{2}{3}$

i. $\frac{14}{22} = \frac{7}{11}$

j. $\frac{45}{25} = \frac{9}{5}$

2. Express each of the following improper fractions as a mixed number in simplest form.
(Value: 10)

a. $\frac{11}{9} = 1\frac{2}{9}$

b. $\frac{14}{5} = 2\frac{4}{5}$

c. $\frac{22}{5} = 4\frac{2}{5}$

d. $\frac{25}{11} = 2\frac{3}{11}$

e. $\frac{49}{15} = 3\frac{4}{15}$

f. $\frac{17}{4} = 4\frac{1}{4}$

g. $\frac{17}{5} = 3\frac{2}{5}$

h. $\frac{9}{2} = 4\frac{1}{2}$

i. $\frac{11}{5} = 2\frac{1}{5}$

j. $\frac{19}{4} = 4\frac{3}{4}$

3. Choose the equivalent fraction with the specified denominator. (Value: 3)

- a. $\frac{2}{3}$ in 12ths a. $\frac{2}{12}$ b. $\frac{4}{12}$ c. $\frac{8}{12}$
- b.
- c. $\frac{5}{8}$ in 16ths a. $\frac{10}{16}$ b. $\frac{5}{16}$ c. $\frac{13}{16}$
- d.
- e. $\frac{1}{2}$ in 24ths a. $\frac{1}{24}$ b. $\frac{12}{24}$ c. $\frac{3}{24}$

4. Circle the fractions that are proper. (Value: 3)

- a. $\frac{10}{11}$, $\frac{11}{12}$, $\frac{10}{12}$

5. Write these numbers as improper fractions. (Value: 10)

a. $4\frac{5}{6} = \frac{29}{6}$

b. $7\frac{1}{6} = \frac{43}{6}$

c. $10\frac{7}{8} = \frac{87}{8}$

d. $8\frac{2}{5} = \frac{42}{5}$

e. $8\frac{7}{9} = \frac{79}{9}$

6. Circle the larger fraction in each question below.

a. $\frac{8}{11}$

b. $\frac{10}{15}$

c. $\frac{6}{11}$

7. List the fractions in order from smallest to largest. (Value: 3)

$$\frac{3}{8} < \frac{2}{3} < \frac{3}{4}$$

8. List the fractions in order from smallest to largest. (Value: 3)

$$\frac{4}{5} < \frac{5}{6} < \frac{7}{8}$$

9. Find the LCD of $\frac{1}{7}$ and $\frac{5}{11}$. The LCD is 77. (Value: 1)

Word Problems.

1. $\frac{8}{15}$

2. $\frac{19}{40}$

3. $\frac{8}{12} = \frac{2}{3}$

4. $\frac{25}{60} = \frac{5}{12}$

BONUS QUESTION:

Charley's measurement was the heaviest.

Guide: To Basic Math for Adult Upgrading
Fractions Review Test #2

Name: _____

1. Add the following fractions. (Value: 12)

a. $\frac{4}{5} + \frac{3}{5}$

b. $\frac{11}{16} + \frac{13}{16}$

c. $\frac{5}{12} + \frac{3}{4}$

d. $\frac{1}{4} + \frac{2}{5}$

e. $\frac{3}{8} + \frac{5}{12}$

f. $\frac{3}{4} + \frac{1}{2}$

g. $\frac{7}{18} + \frac{1}{6}$

h. $\frac{3}{4} + \frac{2}{5}$

i. $3\frac{1}{2} + 9\frac{2}{5}$

j. $7 + \frac{6}{11}$

k. $5\frac{2}{3} + 7\frac{7}{8}$

l. $51\frac{7}{11} + 48\frac{1}{3}$

2. Subtract the following fractions. (Value: 12)

a. $\frac{5}{8} - \frac{1}{8}$

b. $\frac{5}{8} - \frac{1}{4}$

c. $\frac{5}{6} - \frac{3}{4}$

d. $8\frac{7}{4} - \frac{1}{3}$

e. $4\frac{7}{12} - 1\frac{5}{12}$

f. $3\frac{2}{5} - 1\frac{3}{5}$

g. $6\frac{5}{9} - \frac{1}{18}$

h. $5\frac{15}{16} - 5\frac{3}{16}$

i. $6\frac{1}{2} - 2\frac{9}{10}$

j. $3\frac{1}{2} - 1\frac{2}{3}$

k. $21\frac{5}{16} - 15\frac{11}{32}$

l. $11\frac{1}{3} - \frac{7}{9}$

Word Problems.

1. The stock of the Eastern Corporation rose $\frac{5}{8}$ of a point on Monday, $\frac{7}{8}$ on Tuesday, $\frac{3}{8}$ on Wednesday, $\frac{5}{8}$ on Thursday, and $\frac{7}{8}$ on Friday. What was the total rise for the week? (Value: 2)
2. A nail must reach through three thicknesses of wood and penetrate the fourth thickness $\frac{1}{4}$ decimeter. If the first piece of wood is $\frac{5}{16}$ decimeter, the second is $\frac{3}{8}$ inch, and the third is $\frac{9}{16}$ decimeter, how long must the nail be? (Value: 3)
3. Jim ran $\frac{7}{8}$ of a kilometer on Monday, $\frac{11}{12}$ of a kilometer on Tuesday, and $\frac{5}{6}$ of a kilometer each on Wednesday and Thursday. What was total distance he ran? (Value: 3)
4. Mary fills a pitcher with $\frac{11}{4}$ decimeters of milk. Due to a small leak, she loses $\frac{3}{16}$ decimeters. How much milk is left? (Value: 2)
5. Anne requested $\frac{5}{8}$ meter of fabric from each of her students. John brought in $\frac{11}{16}$ meter. How much more or less does he have? (Value: 3)
6. Jack bought a roast for Sunday dinner that weighed 7 kilograms. He cut off some fat and took out a bone. The meat left weighed $4\frac{1}{3}$ kilograms. How many kilograms of bone and fat did he turn off? (Value: 3)

Guide: To Basic Math for Adult Upgrading
Fractions Test #2 Key

Name: _____

1. Add the following fractions. (Value: 12)

a. $\frac{4}{5} + \frac{3}{5}$ **1 2/5**

b. $\frac{11}{16} + \frac{13}{16}$ **1 1/2**

c. $\frac{5}{12} + \frac{3}{4}$ **1 1/6**

d. $\frac{1}{4} + \frac{2}{5}$ **13/20**

e. $\frac{3}{8} + \frac{5}{12}$ **19/24**

f. $\frac{3}{4} + \frac{1}{2}$ **1 1/4**

g. $\frac{7}{18} + \frac{1}{6}$ **5/9**

h. $\frac{3}{4} + \frac{2}{5}$ **1 3/20**

i. $3\frac{1}{2} + 9\frac{2}{5}$ **12 9/10**

j. $7 + \frac{6}{11}$ **7 6/11**

k. $5\frac{2}{3} + 7\frac{7}{8}$ **13 13/24**

l. $51\frac{7}{11} + 48\frac{1}{3}$ **99 32/33**

2. Subtract the following fractions. (Value: 12)

a. $\frac{5}{8} - \frac{1}{8}$ **1/2**

b. $\frac{5}{8} - \frac{1}{4}$ **3/8**

c. $\frac{5}{6} - \frac{3}{4}$ **1/12**

d. $8\frac{7}{4} - \frac{1}{3}$ **9 5/12**

e. $4\frac{7}{12} - 1\frac{5}{12}$ **3 1/6**

f. $3\frac{2}{5} - 1\frac{3}{5}$ **1 4/5**

g. $6\frac{5}{9} - \frac{1}{18}$ **6 1/2**

h. $5\frac{15}{16} - 5\frac{3}{16}$ **3/4**

i. $6\frac{1}{2} - 2\frac{9}{10}$ **3 3/5**

j. $3\frac{1}{2} - 1\frac{2}{3}$ **1 5/6**

k. $21\frac{5}{16} - 15\frac{11}{32}$ **5 31/32**

l. $11\frac{1}{3} - \frac{7}{9}$ **10 5/9**

Word Problems.

1. The stock of the Eastern Corporation rose $\frac{5}{8}$ of a point on Monday, $\frac{7}{8}$ on Tuesday, $\frac{3}{8}$ on Wednesday, $\frac{5}{8}$ on Thursday, and $\frac{7}{8}$ on Friday. What was the total rise for the week?
(Value: 2) **3 3/8**
2. A nail reaches through three thicknesses of wood and penetrates the fourth thickness $\frac{1}{4}$ decimeter. If the first piece of wood is $\frac{5}{16}$ decimeter, the second is $\frac{3}{8}$ decimeter, and the third is $\frac{9}{16}$ decimeter, how long must the nail be? (Value: 3) **1 1/2**
3. Jim ran $\frac{7}{8}$ of a kilometer on Monday, $\frac{11}{12}$ of a kilometer on Tuesday, and $\frac{5}{6}$ of a kilometer each on Wednesday and Thursday. What was total distance he ran? (Value: 3) **3 11/24**
4. Mary fills a pitcher with $\frac{11}{4}$ decimeters of milk. Due to a small leak, she loses $\frac{3}{16}$ decimeters. How much milk is left? (Value: 2) **2 9/16**
5. Anne requested $\frac{5}{8}$ meter of fabric from each of her students. John brought in $\frac{11}{16}$ meter. How much more or less does he have? (Value: 3) **1/16**
6. Jack bought a roast for Sunday dinner that weighed 7 kilograms. He cut off some fat and took out a bone. The meat left weighed $4\frac{1}{3}$ kilograms. How many kilograms of bone and fat did he turn off? (Value: 3) **2 2/3**

Guide: To Basic Math for Adult Upgrading
Fractions Review Test #3

Name: _____

1 Multiply the following. Reduce to lowest terms. (Value: 10)

$$\frac{1}{2} \times \frac{3}{4}$$

$$\frac{1}{2} \times \frac{3}{14}$$

$$\frac{1}{3} \times \frac{2}{3}$$

$$g. 5 \times 2\frac{1}{4}$$

$$\frac{7}{8} \times \frac{5}{6}$$

$$h. 3\frac{3}{4} \times 2\frac{2}{5}$$

$$\frac{7}{5} \times \frac{6}{11}$$

$$i. 2\frac{2}{3} \times 2\frac{1}{4}$$

$$\frac{2}{3} \times \frac{2}{5}$$

$$j. 6\frac{3}{4} \times 2\frac{1}{3}$$

2. Divide. Reduce to the lowest terms. (Value: 10)

$$a. \frac{3}{7} \div \frac{5}{6}$$

$$g. 4\frac{5}{6} \div 2\frac{11}{12}$$

$$b. \frac{9}{8} \div \frac{3}{4}$$

$$h. 4 \div 3\frac{1}{3}$$

$$c. \frac{7}{10} \div \frac{14}{15}$$

$$i. 7\frac{3}{4} \div 5$$

$$d. \frac{8}{9} \div \frac{2}{9}$$

$$j. 4\frac{1}{5} \div 2\frac{1}{5}$$

$$e. \frac{2}{5} \div \frac{3}{5}$$

$$f. 3\frac{1}{3} \div 6\frac{7}{8}$$

3. What is the reciprocal of each of the following? (Value: 4)

a. $\frac{3}{4}$

b. $\frac{9}{7}$

c. 5

d. $1\frac{1}{2}$

Word Problems.

1. As part of her job at a pet store, Becky feeds each gerbil $\frac{1}{8}$ of a cup of seeds each day. If the seeds come in packages of $\frac{3}{4}$ cup, how many gerbils can be fed from one package? (Value: 3)
2. A machinist takes $74\frac{1}{2}$ minutes to make 5 pins. How long will it take him to make one pin? (Value: 3)
3. Debbie has $\frac{7}{8}$ kilogram of cheese. If an omelet recipe calls for $\frac{1}{4}$ of a kilogram of cheese, how many omelets can he make? (Value: 3)
4. An article was priced to sell for \$6.00. During a sale the price was reduced $\frac{1}{3}$. By how many dollars was the price reduced? (Value: 3)
5. Lois spends $\frac{1}{2}$ of the family income on rent, utilities, and food. She pays $\frac{3}{7}$ of this amount for rent. What fraction of the family income goes for rent? (Value: 3)
6. The gasoline tank of an automobile holds 52 liters. The gauge registers full at the beginning of a trip, and at the end of the trip it indicates that $\frac{1}{4}$ tank was used. How many liters of gasoline were used on the trip? (Value: 3)

Guide: To Basic Math for Adult Upgrading
Fractions Test #3 Key

Name: _____

1. Multiply the following. Reduce to lowest terms. (Value: 10)

- | | |
|---|---|
| <p>a. $\frac{1}{2} \times \frac{3}{4}$ <u>3/8</u></p> | <p>f. $\frac{1}{2} \times \frac{3}{14}$ <u>3/28</u></p> |
| <p>b. $\frac{1}{3} \times \frac{2}{3}$ <u>2/9</u></p> | <p>g. $5 \times 2\frac{1}{4}$ <u>11 1/4</u></p> |
| <p>c. $\frac{7}{8} \times \frac{5}{6}$ <u>35/48</u></p> | <p>h. $3\frac{3}{4} \times 2\frac{2}{5}$ <u>9</u></p> |
| <p>d. $\frac{7}{5} \times \frac{6}{11}$ <u>42/55</u></p> | <p>i. $2\frac{2}{3} \times 2\frac{1}{4}$ <u>6</u></p> |
| <p>e. $\frac{2}{3} \times \frac{2}{5}$ <u>4/15</u></p> | <p>j. $6\frac{3}{4} \times 2\frac{1}{3}$ <u>15 3/4</u></p> |

2. Divide. Reduce to the lowest terms. (Value: 10)

- | | |
|--|--|
| <p>a. $\frac{3}{7} \div \frac{5}{6}$ <u>18/35</u></p> | <p>g. $4\frac{5}{6} \div 2\frac{11}{12}$ <u>1 23/35</u></p> |
| <p>b. $\frac{9}{8} \div \frac{3}{4}$ <u>1 1/2</u></p> | <p>h. $4 \div 3\frac{1}{3}$ <u>1 1/5</u></p> |
| <p>c. $\frac{7}{10} \div \frac{14}{15}$ <u>3/4</u></p> | <p>i. $7\frac{3}{4} \div 5$ <u>1 11/20</u></p> |
| <p>d. $\frac{8}{9} \div \frac{2}{9}$ <u>4</u></p> | <p>j. $4\frac{1}{5} \div 2\frac{1}{5}$ <u>1 10/11</u></p> |
| <p>e. $\frac{2}{5} \div \frac{3}{5}$ <u>2/3</u></p> | |
| <p>f. $3\frac{1}{3} \div 6\frac{7}{8}$ <u>16/33</u></p> | |

Guide: To Basic Math for Adult Upgrading
Percent, Decimals, and Fractions Test

Name: _____

1. Express each of the following as a percent. (Value: 3)
 - a. 45 hundredths _____%
 - b. 125 hundredths _____%
 - c. $6\frac{1}{2}$ hundredths _____%
2. Write each of the following as a percent, a decimal, and a fraction. (Value: 6)
 - a. Twenty-three hundredths
 - b. 89 hundredths
3. Write each percent as a decimal. (Value: 5)
 - a. 8% _____
 - b. 50% _____
 - c. 108% _____
 - d. $62\frac{1}{2}\%$ _____
 - e. $4\frac{3}{4}\%$ _____
4. Complete the following statements about customers at Wal-Mart. (Value: 3)
 - a. 34% use credit cards, _____% do not.
 - b. 58% are female, _____% are male.
 - c. 49% shop with someone, _____% shop alone.
5. Write each decimal as a percent. (Value: 5)
 - a. 0.04
 - b. 0.4
 - c. 1.8
 - d. 7
 - e. 0.004

6. Write each percent as a fraction or mixed number in lowest terms. (Value: 8)

a. 35%

b. 8%

c. 12%

d. 120%

e. 25%

f. 209%

g. 50%

h. 200%

7. Write each fraction or mixed number as a percent. (Value: 9)

a. $\frac{5}{8}$

b. $\frac{8}{25}$

c. $\frac{4}{25}$

d. $1\frac{5}{8}$

e. $\frac{3}{30}$

f. $\frac{2}{3}$

g. $\frac{60}{300}$

h. $\frac{40}{40}$

i. $3\frac{1}{5}$

Guide: To Basic Math for Adult Upgrading
Percent, Decimals, and Fractions Test Key

Name: _____

1. Express each of the following as a percent. (Value: 3)
 - a. 45 hundredths 45 %
 - b. 125 hundredths 125 %
 - c. $6\frac{1}{2}$ hundredths 6.5 %

2. Write each of the following as a percent, a decimal, and a fraction. (Value: 6)
 - a. Twenty-three hundredths 23%, 0.23, 23/100
 - b. 89 hundredths 89%, 0.89, 89/100

3. Write each percent as a decimal. (Value: 5)
 - a. 8% 0.08
 - b. 50% 0.5
 - c. 108% 1.08
 - d. $62\frac{1}{2}$ % 0.625
 - e. $4\frac{3}{4}$ % 0.0475

4. Complete the following statements about customers at Wal-Mart. (Value: 3)
 - a. 34% use credit cards, 66 % do not.
 - b. 58% are female, 42 % are male.
 - c. 49% shop with someone, 51 % shop alone.

5. Write each decimal as a percent. (Value: 5)
 - a. 0.04 4%
 - b. 0.4 40%
 - c. 1.8 180%
 - d. 7 700%
 - e. 0.004 0.4%

6. Write each percent as a fraction or mixed number in lowest terms. (Value: 10)

- a. 35% $\frac{7}{20}$
- b. 8% $\frac{2}{25}$
- c. 12% $\frac{3}{25}$
- d. 120% $1\frac{1}{5}$
- e. 25% $\frac{1}{4}$
- f. 209% $2\frac{9}{100}$
- g. 50% $\frac{1}{2}$
- h. 200% 2

7. Write each fraction or mixed number as a percent. (Value: 0)

- a. $\frac{5}{8}$ **62.5%**
- b. $\frac{8}{25}$ **32%**
- c. $\frac{4}{25}$ **16%**
- d. $1\frac{5}{8}$ **162.5%**
- e. $\frac{3}{30}$ **10%**
- f. $\frac{2}{3}$ **66 $\frac{2}{3}$ %**
- g. $\frac{60}{300}$ **20%**
- h. $\frac{40}{40}$ **100%**
- i. $3\frac{1}{5}$ **320%**

Guide: To Basic Math for Adult Upgrading
Ratio and Proportion Test

Name: _____

1. Express the following ratios in lowest terms. (Value: 3)
 - a. 8 tables to 11 tables
 - b. 15 people to 8 tables
 - c. The width of a room to its length, if the room measures 24 feet by 18 feet

2. Are the following proportions true or false? (Value: 5)
 - a. $\frac{2}{4} = \frac{12}{24}$
 - b. $\frac{6}{8} = \frac{9}{12}$
 - c. $\frac{4}{5} = \frac{5}{6}$
 - d. $\frac{4}{6} = \frac{7}{10}$
 - e. $\frac{4}{10} = \frac{20}{50}$

3. A parking lot has 18 spaces for compact cars and 24 spaces for larger cars. (Value: 4)
 - a. What is the ratio of compact spaces to larger spaces?
 - b. What is the ratio of compact spaces to the total number of spaces?

4. On a road map, $\frac{1}{4}$ inch represents 50 miles. How many miles are represented by $1\frac{1}{2}$ inches? (Value: 3)

5. Paula decided to start a savings account. Her weekly take-home pay without overtime is \$278. She decides to save \$13.90 of this each week. One week she works overtime and her take-home pay is \$320. If she wants to save from this check in the same ratio, how much should she save? (Value: 3)

6. If a fir tree that is 20 meter tall casts a shadow of 12 meter, how tall is a tree that casts a shadow of 18 meter at the same time and location? (Value: 3)

7. It takes 50 hours of work to pay the tuition for 4 college credits. If John is going to take 15 credits in the fall, how many hours will he need to work to pay for his tuition? (Value: 3)

8. If 16 kilograms of fertilizer will cover 1500 square meters of lawn, how much fertilizer is needed to cover 2500 square meters? (Value: 3)

9. If 18 grams of soap powder costs \$3.50, what will 45 grams cost? (Value: 3)

10. Marcia's cereal mix has nuts to cereal in a ratio of 2 to 5. If she uses 98 grams of mix, how many grams of nuts will she need? (Value: 4)

11. A concrete mix takes 3 bags of cement for every 2 bags of sand and every 2 bags of gravel. How many bags of cement are necessary if 70 bags of concrete are needed? (Value: 4)

12. Martha makes her own glue by mixing 5 parts flour with 2 parts water. How much flour will she need for 3 quarts of glue? (Value: 4)

BONUS QUESTION

When \$1 was worth 1874 lire (Italian currency) and a pair of shoes cost 89,952 lire, what was the cost in dollars? (Value: 2)

Guide: To Basic Math for Adult Upgrading
Ratio and Proportion Test Key

Name: _____

1. Express the following ratios in lowest terms. (Value: 3)
 - a. 8 tables to 11 tables 8/11
 - b. 15 people to 8 tables 15/8
 - c. The width of a room to its length, if the room measures 24 feet by 18 feet
4/3

2. Are the following proportions true or false? (Value: 5)
 - a. $\frac{2}{4} = \frac{12}{24}$ T
 - b. $\frac{6}{8} = \frac{9}{12}$ T
 - c. $\frac{4}{5} = \frac{5}{6}$ F
 - d. $\frac{4}{6} = \frac{7}{10}$ F
 - e. $\frac{4}{10} = \frac{20}{50}$ T

3. The parking lot has 18 spaces for compact cars and 24 spaces for larger cars. (Value: 4)
 - a. What is the ratio of compact spaces to larger spaces? 3/4
 - b. What is the ratio of compact spaces to the total number of spaces? 3/7

4. On a road map, $\frac{1}{4}$ inch represents 50 miles. How many miles are represented by 1 $\frac{1}{2}$ inches? (Value: 3) 300

5. Paula decided to start a savings account. Her weekly take-home pay without overtime is \$278. She decides to save \$13.90 of this each week. One week she works overtime and her take-home pay is \$320. If she wants to save from this check in the same ratio, how much should she save? (Value: 3)
\$16.00

6. If a tree that is 20 meter tall casts a shadow of 12 meter, how tall is a tree that casts a shadow of 18 meter at the same time and location? (Value: 3) 30

7. It takes 50 hours of work to pay the tuition for 4 college credits. If John is going to take 15 credits in the fall, how many hours will he need to work to pay for his tuition? (Value: 3) 187.5

8. If 16 kilograms of fertilizer will cover 1500 square meter of lawn, how much fertilizer is needed to cover 2500 square meter? (Value: 3) 26.7
9. If 18 grams of soap powder costs \$3.50, what will 45 grams cost? (Value: 3) \$8.75
10. Marcia's cereal mix has nuts to cereal in a ratio of 2 to 5. If she uses 98 grams of mix, how many grams of nuts will she need? (Value: 4) 39.2
11. A concrete mix takes 3 bags of cement for every 2 bags of sand and every 2 bags of gravel. How many bags of cement are necessary if 70 bags of concrete are needed? (Value: 4) 30
12. Martha makes her own glue by mixing 5 parts flour with 2 parts water. How much flour will she need for 3 quarts of glue? (Value: 4) 2.5

BONUS QUESTION

When \$1 was worth 1874 lire (Italian currency) and a pair of shoes cost 89,952 lire, what was the cost in dollars? (Value: 2) \$48.00

Guide: To Basic Math for Adult Upgrading
Percents and Problem Solving Test

Name: _____

1. Solve the following. (Value: 10)
 - a. 25% of 50.2
 - b. 20% of 606
 - c. 10% of 6465
 - d. 75% of 470
 - e. $87\frac{1}{2}\%$ of 737.28

2. Solve. (Value: 10)
 - a. 4 is what percent of 16?
 - b. What percent of 50 is 6?
 - c. 85 is what percent of 100?
 - d. What percent of 140 is 21?
 - e. 66 is what percent of 88?
 - f. 7 is what percent of 10?
 - g. 377 is what percent of 580?
 - h. What percent of 10 is 5?
 - i. What percent of 40 is 80?
 - j. 484 is what percent of 605?

3. Jeff must pay 20% annual interest on his charge account purchases. He charged two airplane tickets costing \$450 each and four snow tires costing \$59 each. How much is the annual interest charges on these purchases? (Value: 3)
4. In a recent survey it was found that, of the 285 people surveyed, 114 people preferred eating whole wheat bread. What percent of the people surveyed preferred eating whole wheat bread? (Value: 2)
5. If there is a 4% sales tax on a television set costing \$379.99, how much is the tax? (Value: 3)
6. James bought a new van for \$15,980. He paid 12% down. How much does she still owe? (Value: 3)
7. John got 26 problems correct on a 30-problem test. What was his percent score (to the nearest whole number percent)? (Value: 2)
8. The population of Cold Lake increased 15% since the last census. If the former population was 12 400, what is the present population? (Value: 2)
9. In preparing a mixture of concrete, Susan uses 300 pounds of gravel, 100 pounds of cement, and 200 pounds of sand. What percent of the mixture is gravel? (Value: 3)
10. A screwdriver that costs the merchant \$8.40 is to be marked up 30% of the cost. What is the selling price? (Value: 2)

Guide: To Basic Math for Adult Upgrading
Integers and Rational Numbers Test

Name: _____

1. Write the following using symbols. (Value: 3)
 - a. Negative three
 - b. Negative one-third
 - c. Positive fourteen

2. What number is opposite of each of the following? (Value: 3)
 - a. -5.45
 - b. -0.005
 - c. $+\frac{2}{9}$

3. Find the absolute value of each of the following. (Value: 3)
 - i. $|\frac{8}{5}|$
 - b. $|-15|$
 - c. $|-0.0024|$

4. Complete the following. (Value: 3)
 - a. If +\$6 means \$6 found, how can a loss of \$3 be shown?
 - b. If +520 feet represents the height of a building, how can the depth of a well 30 feet deep be represented?
 - c. If a withdrawal of \$15 from the bank is indicated by -\$15, how is a deposit of \$18 indicated?

5. Match each idea with its opposite. (Value: 5)

1. \$5 loss	_____	a. 8 pounds underweight
2. 45 m below sea level	_____	b. 8° below normal
3. 8 pounds overweight	_____	c. tail wind of 15 m/hour
4. head wind of 15 m/hour	_____	d. 45 m above sea level
5. 8° above normal	_____	e. \$5 gain

6. Circle the number that is greater. (Value: 3)
 - a. -3 or 12
 - b. -2 or -4
 - c. 32 or -40

7. Circle the number that is less. (Value: 3)
 - a. -6 or -8
 - b. 0 or -3
 - c. -5 or -3

8. Add the following integers. (Value: 4)
- $+14) + (+9)$
 - $-4) + (-7)$
 - $(-5) + (+17)$
 - $(+6) + (-16)$
9. Subtract the following integers. (Value: 4)
- $(+78) - (+2)$
 - $(-45) - (-7)$
 - $(-13) - (-51)$
 - $(-11) - (+8)$
10. Multiply the following integers. (Value: 4)
- $(-6)(+5)$
 - $(-10)(-5)$
 - $(+5)(-9)$
 - $(-2)(+8)(+3)$
11. Divide the following integers. (Value: 4)
- $(+24) \div (+2)$
 - $(-84) \div (-4)$
 - $(+54) \div (-6)$
 - $(-8) \div (+8)$
12. Draw a number line. Locate each of the following numbers on the number line. (Value: 4)
 $-4, +8, -6.5, +9$
13. Last month the balance in Martha's savings account was \$435.42. She made a deposit of \$50.00. She made two withdrawals of \$125.50 and \$37.75. Her account earned \$1.81 in interest. What is her new balance? (Value: 3)
14. Solve the following by performing the indicated operations. (Value: 4)
- $$\frac{(-24) - (+6)}{(-18) + (+3)}$$
 - $$\frac{|-12|x| + 5|}{|-10|}$$

Guide: To Basic Math for Adult Upgrading
Integers and Rational Numbers Test Key

Name: _____

1. Write the following using symbols. (Value: 3)

a.	Negative three	-3
b.	Negative one-third	-1/3
c.	Positive fourteen	+14

2. What number is opposite of each of the following? (Value: 3)

a.	-5.45	+5.45
b.	-0.005	+0.005
c.	$+\frac{2}{9}$	-2/9

3. Find the absolute value of each of the following. (Value: 3)

a.	+ $\frac{8}{5}$	8/5
b.	-15	15
c.	-0.0024	0.0024

4. Complete the following. (Value: 3)

a.	If +\$6 means \$6 found, how can a loss of \$3 be shown?	<u>-3</u>
b.	If +520 feet represents the height of a building, how can the depth of a well 30 feet deep be represented?	<u>-30</u>
c.	If a withdrawal of \$15 from the bank is indicated by -\$15, how is a deposit of \$18 indicated?	<u>+18</u>

5. Match each idea with its opposite. (Value: 5)

1. \$5 loss	<u>e</u>	a. 8 pounds underweight
2. 45 m below sea level	<u>d</u>	b. 8° below normal
3. 8 pounds overweight	<u>a</u>	c. tail wind of 15 m/hour
4. head wind of 15 m/hour	<u>c</u>	d. 45 m above sea level
5. 8° above normal	<u>b</u>	e. \$5 gain

6. Circle the number that is greater. (Value: 3)

a.	-3 or <u>12</u>
b.	<u>-2</u> or -4
c.	<u>32</u> or -40

7. Circle the number that is less. (Value: 3)

a.	-6 or <u>-8</u>
b.	0 or <u>-3</u>
c.	<u>-5</u> or -3

Guide: To Basic Math for Adult Upgrading
Variables and Equations Test

Name: _____

1. Write each of the following as an algebraic expression. (Value: 3)
 - a. The difference between 5 and k
 - b. The sum of b squared and h
 - c. One-fifth the sum of g and k

2. Match each of the following to its algebraic expression. (Value: 5)

a. $m(n \div 8)$	_____	1. Six times the sum of five and three
b. $m \div (7 + a)$	_____	2. Four times the difference between eighteen and thirteen
c. $2(c-d)$	_____	3. The product of m and n divided by eight
d. $4(18-13)$	_____	4. The quotient of m divided by seven + a
e. $6(5 + 3)$	_____	5. Two times the difference between c and d

3. Express each of the following as a formula. (Value: 5)
 - a. The area of a square (A) is equal to the length of a side (s) squared.
 - b. The area of a parallelogram (A) is equal to the product of the base (b) and the height (h).
 - c. The distance traveled (d) is equal to the speed (s) times the time (t).
 - d. The area of a triangle (A) is equal to $\frac{1}{2}$ the product of the base (b) and the height (h).
 - e. The sum of the measures of the three angles of a triangle (A, B, and C) is 180° .

4. Find the value of each of the following algebraic expressions when:
 $a = 16, b = 52, c = 32, d = 8,$ and $e = 12$ (Value: 10)
 - a. $a + b + c$
 - b. $3ae$
 - c. ad
 - d. $12(b-c)$
 - e. $\frac{abd}{c}$

5. Using each of the following formulas, find the value of the unknown variable.
(Value: 10)

a. Formula $A = bh$; Find A when $b = 37$ and $h = 13$

b. Formula $A = \frac{m+n}{2}$; Find A when $m = 479$ and $n = 245$

c. Formula $C = 2\pi r$; Find C when $\pi = \frac{22}{7}$ and $r = 77$

d. Formula $V = lwh$; Find V when $l = 13$, $w = 7$, and $h = 4$

e. Formula $D = \frac{1}{2}gt^2$; Find D when $g = 2$ and $t = 19$

6. Solve each of the following. (Value: 12)

a. $d + 9 = 20$

b. $k + 6 = 11$

c. $a + 18 = 51$

d. $a - 5 = 25$

e. $c - 11 = 35$

f. $50 = f - 8$

g. $4m = 20$

h. $7y = 56$

i. $6z = 54$

j. $10n = 6$

k. $\frac{y}{4} = 13$

l. $\frac{c}{3} = 7$

Guide: To Basic Math for Adult
Upgrading
Variables and Equations Test Key

Name: _____

1. Write each of the following as an algebraic expression. (Value: 3)
 - a. The difference between 5 and k $5 - k$
 - b. The sum of b squared and h $b^2 + h$
 - c. One-fifth the sum of g and k $1/5(g + k)$

2. Match each of the following to its algebraic expression. (Value: 5)

a. $m(n \div 8)$	___e___	1. Six times the sum of five and three
b. $m \div (7 + a)$	___d___	2. Four times the difference of eight and three
c. $2(c-d)$	___a___	3. The product of m and n divided by eight
d. $4(8-3)$	___b___	4. The quotient of m divided by seven + a
e. $6(5 + 3)$	___c___	5. Two times the difference between c and d

3. Express each of the following as a formula. (Value: 5)
 - a. The area of a square (A) is equal to the length of a side (s) squared.
 $A = s^2$
 - b. The area of a parallelogram (A) is equal to the product of the base (b) and the height (h).
 $A = bh$
 - c. The distance traveled (d) is equal to the speed (s) times the time (t).
 $d = st$
 - d. The area of a triangle (A) is equal to $\frac{1}{2}$ the product of the base (b) and the height (h).
 $A = \frac{1}{2}bh$
 - e. The sum of the measures of the three angles of a triangle (A, B, and C) is 180° .
 $\angle's A + B + C = 180^\circ$

4. Find the value of each of the following algebraic expressions when: $a = 16$, $b = 52$, $c = 32$, $d = 8$, and $e = 12$ (Value: 10)
 - a. $a + b + c$ 100
 - b. $3ae$ 576
 - c. ad 128
 - d. $12(b-c)$ 240
 - e. $\frac{abd}{c}$ 208

5. Using each of the following formulas, find the value of the unknown variable.
(Value: 10)

a. Formula $A = bh$; Find A when $b = 37$ and $h = 13$ 481

b. Formula $A = \frac{m+n}{2}$; Find A when $m = 479$ and $n = 245$ 362

c. Formula $C = 2\pi r$; Find C when $\pi = \frac{22}{7}$ and $r = 77$ 484

d. Formula $V = lwh$; Find V when $l = 13$, $w = 7$, and $h = 4$ 364

e. Formula $D = \frac{1}{2}gt^2$; Find D when $g = 2$ and $t = 19$ 361

6. Solve each of the following. (Value: 20)

a. $d + 9 = 20$ 11

b. $k + 6 = 11$ 5

c. $a + 18 = 51$ 33

d. $a - 5 = 25$ 30

e. $c - 11 = 35$ 46

f. $50 = f - 8$ 58

g. $4m = 20$ 5

h. $7y = 56$ 8

i. $6z = 54$ 9

j. $10n = 6$.6

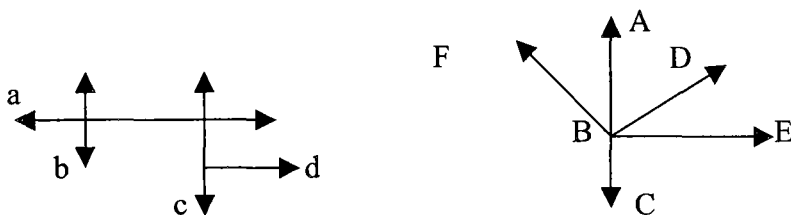
k. $\frac{y}{4} = 13$ 52

l. $\frac{c}{3} = 7$ 21

Guide: To Basic Math for Adult Upgrading
Geometry and Terminology Test

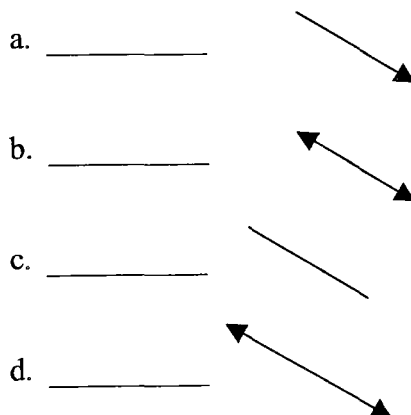
Name: _____

1. Use the diagrams below to answer questions a – f. (Value: 6)



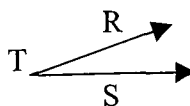
- a. _____ Name a line or ray that intersects line b.
- b. _____ Name a line or ray that is parallel to line c.
- c. _____ Name a line or ray that is perpendicular to line c.
- d. _____ Which ray is perpendicular to AC?
- e. _____ Which ray is perpendicular to BF?
- f. _____ Where do rays BD and BA intersect?

2. Name each of the following. (Value: 4)



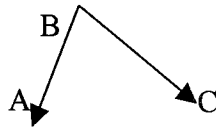
3. Choose the correct name or names for each angle. (Value: 2)

- a. $\angle RTS$
- b. $\angle RST$
- c. $\angle T$



4. Choose the correct name or names for each angle. (Value: 2)

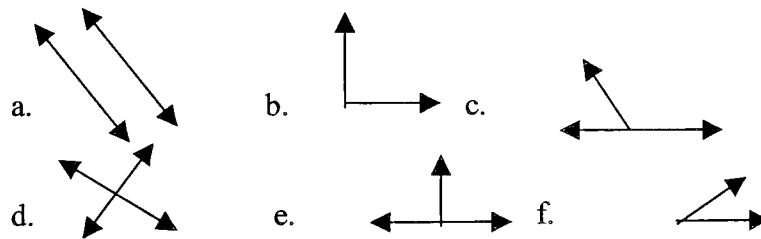
- a. $\angle BCA$
- b. $\angle ABC$
- c. $\angle B$



5. Determine whether the angle formed by the sweep of the minute hand of the clock is **acute**, **right**, **obtuse**, or **straight**. (Value: 4)

- a. 30 minutes _____
- b. 20 minutes _____
- c. 10 minutes _____
- d. 15 minutes _____

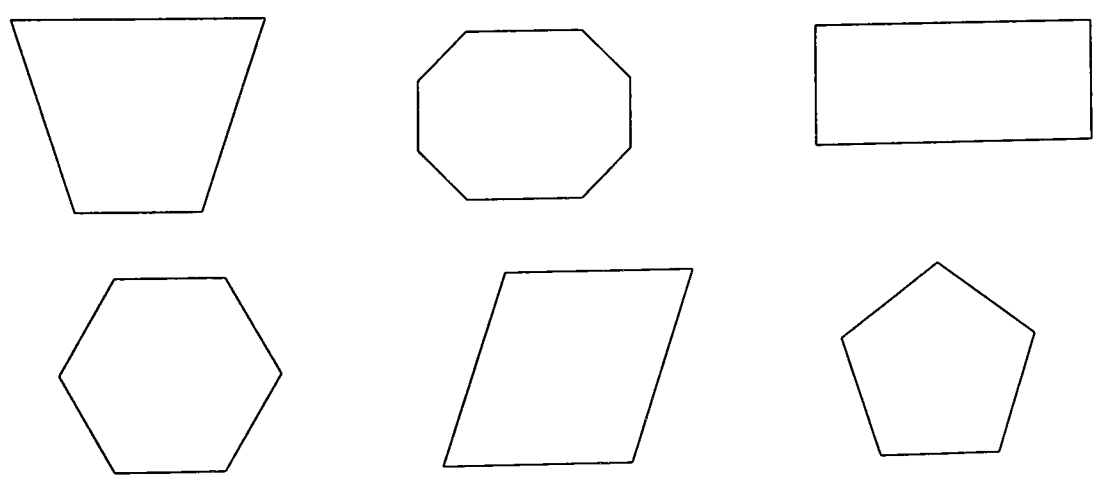
6. Tell which figure shows each of the following. (Value: 6)



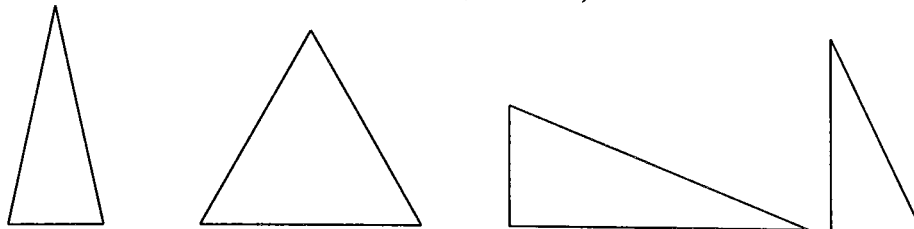
- a. Intersecting lines _____
- b. Parallel lines _____
- c. Perpendicular rays _____
- d. Intersecting rays _____
- e. Intersecting line and ray _____
- f. Perpendicular line and ray _____

7. Name each figure below using the following word list. You will not use all of the words listed. (Value: 6)

Circle, hexagon, trapezoid, octagon, quadrilateral, rectangle, pentagon, isosceles, parallelogram



8. What kind of triangle is each of the following? Use the following word list: **right, isosceles, scalene, equilateral.** (Value: 4)

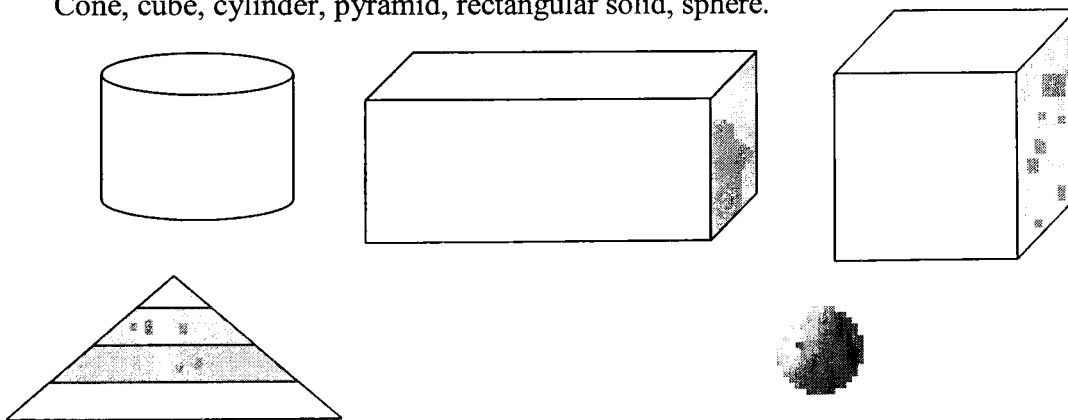


9. How many sides do each of the following polygons have? (Value: 5)

Polygon	Number of Sides
Quadrilateral	
Triangle	
Hexagon	
Pentagon	
Heptagon	

10. Name each figure below using the following word list. (Value: 5)

Cone, cube, cylinder, pyramid, rectangular solid, sphere.

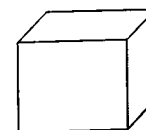


11. Write true or false for each of the following statements. (Value: 3)

- a. A triangular pyramid has 4 faces. _____
 b. A triangular pyramid has 8 edges. _____
 c. A triangular pyramid has 4 vertices. _____

12. Write the correct answer on each of the following blanks. (Value: 3)

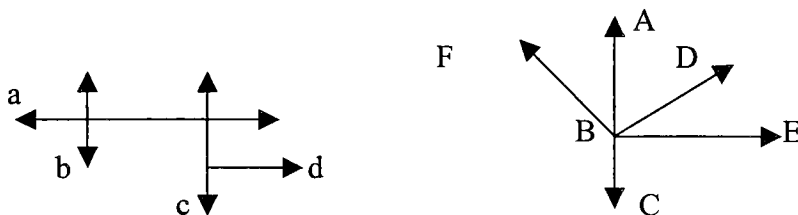
- a. How many faces does a cube have? _____
 b. How many vertices does a cube have? _____
 c. How many edges does a cube have? _____



Guide: To Basic Math for Adult Upgrading
Geometry and Terminology Test Key

Name: _____

1. Use the diagrams below to answer questions a – f. (Value: 6)



- a. Line a Name a line or ray that intersects line b.
- b. Line b Name a line or ray that is parallel to line c.
- c. Line c Name a line or ray that is perpendicular to line c.
- d. E Which ray is perpendicular to AC?
- e. D Which ray is perpendicular to BF?
- f. B Where do rays BD and BA intersect?

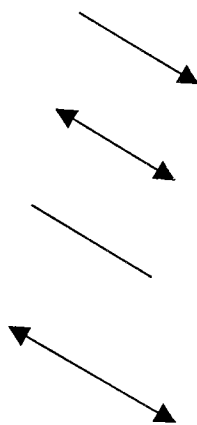
2. Name each of the following. (Value: 4)

a. ray

b. line

c. segment

d. line

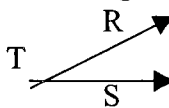


3. Choose the correct name or names for each angle. (Value: 2)

a. $\angle \underline{RTS}$

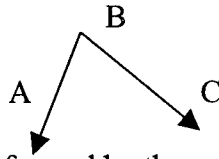
b. $\angle \underline{RST}$

c. $\angle \underline{T}$



4. Choose the correct name or names for each angle. (Value: 2)

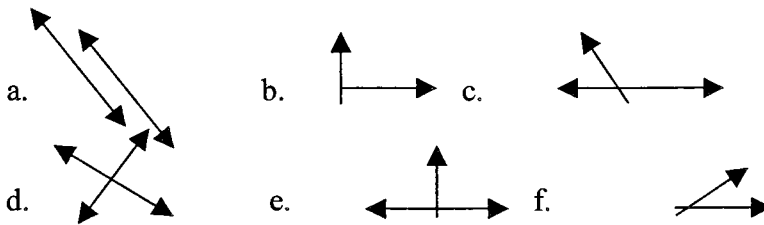
- a. $\angle BCA$
- b. $\angle \underline{ABC}$
- c. $\angle \underline{B}$



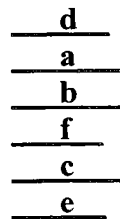
5. Determine whether the angle formed by the sweep of the minute hand of the clock is acute, right, obtuse, or straight. (Value: 4)

- a. 30 minutes straight
- b. 20 minutes obtuse
- c. 10 minutes acute
- d. 15 minutes right

6. Tell which figure shows each of the following. (Value: 6)



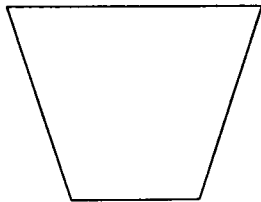
- a. Intersecting lines
- b. Parallel lines
- c. Perpendicular rays
- d. Intersecting rays
- d. Intersecting line and ray
- e. Perpendicular line and ray



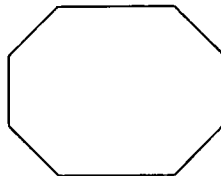
7. Name each figure below using the following word list. You will not use all of the words listed. (Value: 6)

Circle, hexagon, trapezoid, octagon, quadrilateral, rectangle, pentagon, isosceles, parallelogram

TRAPEZOID



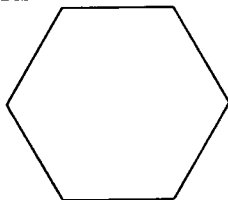
OCTAGON



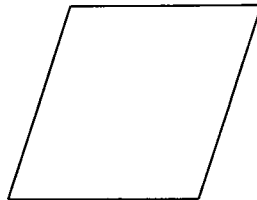
RECTANGLE



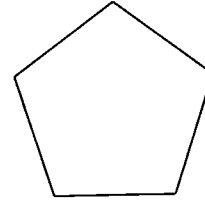
HEXAGON



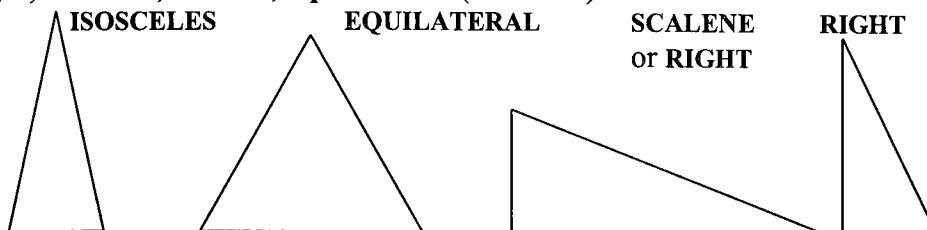
PARALLELOGRAM



PENTAGON



8. What kind of triangle is each of the following? Use the following word list: **right, isosceles, scalene, equilateral.** (Value: 4)

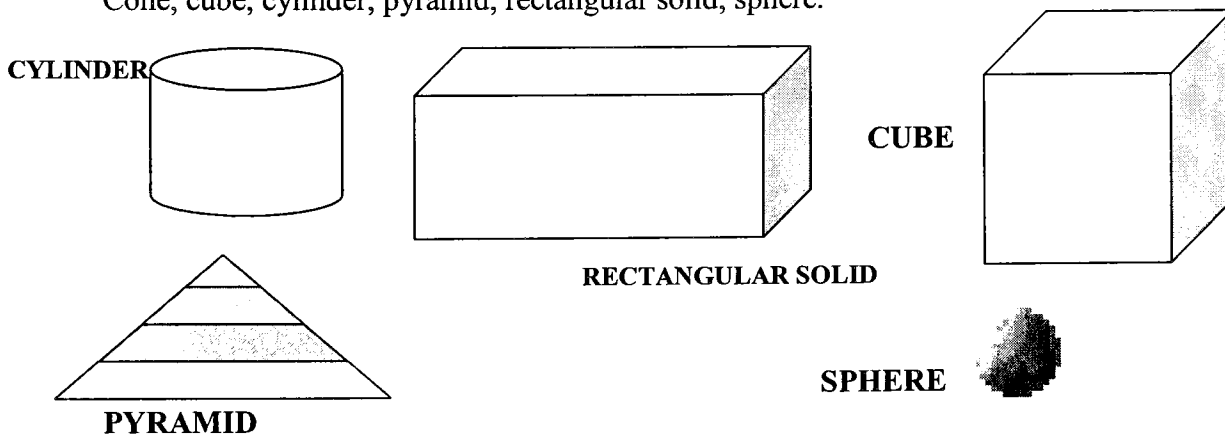


9. How many sides do each of the following polygons have? (Value: 5)

Polygon	Number of Sides
Quadrilateral	4
Triangle	3
Hexagon	6
Pentagon	5
Heptagon	7

10. Name each figure below using the following word list. (Value: 5)

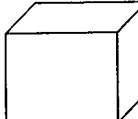
Cone, cube, cylinder, pyramid, rectangular solid, sphere.



11. Write true or false for each of the following statements. (Value: 3)

- a. A triangular pyramid has 4 faces. T
- b. A triangular pyramid has 8 edges. F
- c. A triangular pyramid has 4 vertices. T

12. Write the correct answer on each of the following blanks. (Value: 3)

- a. How many faces does a cube have? 6
 - b. How many vertices does a cube have? 8
 - c. How many edges does a cube have? 12
- 

Guide: To Basic Math for Adult Upgrading
Angles & Triangles Test

Name: _____

1. Find the measure of the fourth angle of a quadrilateral when the other three angles have the following measures. (Value: 4)

- a. $98^\circ, 112^\circ, 96^\circ$ _____
- b. $77^\circ, 37^\circ, 88^\circ$ _____
- c. $119^\circ, 49^\circ, 69^\circ$ _____
- d. $146^\circ, 59^\circ, 118^\circ$ _____

2. Find the number of degrees in each polygon using the following formula:
 $180^\circ(n - 2)$ where $n =$ number of sides. (Value: 4)

- a. Hexagon _____
- b. Pentagon _____
- c. Nonagon (9 sides) _____
- d. 13-sided polygon _____

3. Choose the correct answer. (Value: 4)

- a. How many sides does a pentagon have?
 - i. 5
 - ii. 10
 - iii. 8

- b. How many sides does a decagon have?
 - i. 5
 - ii. 10
 - iii. 8

- c. What is the sum of the measures of a triangle?
 - i. 360°
 - ii. 90°
 - iii. 180°

- d. What is the sum of the measures of a quadrilateral?
 - i. 360°
 - ii. 180°
 - iii. 540°

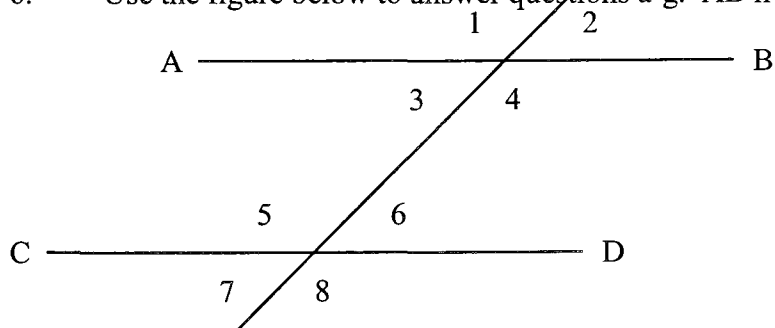
4. Find the measure of the angle that is the complement of each of the following angles. (Value: 5)

- a. 19° _____
- b. 64° _____
- c. 38° _____
- d. $81\frac{1}{2}^\circ$ _____
- e. 31° _____

5. Find the measure of the angle that is the supplement of each of the following angles. (Value: 5)

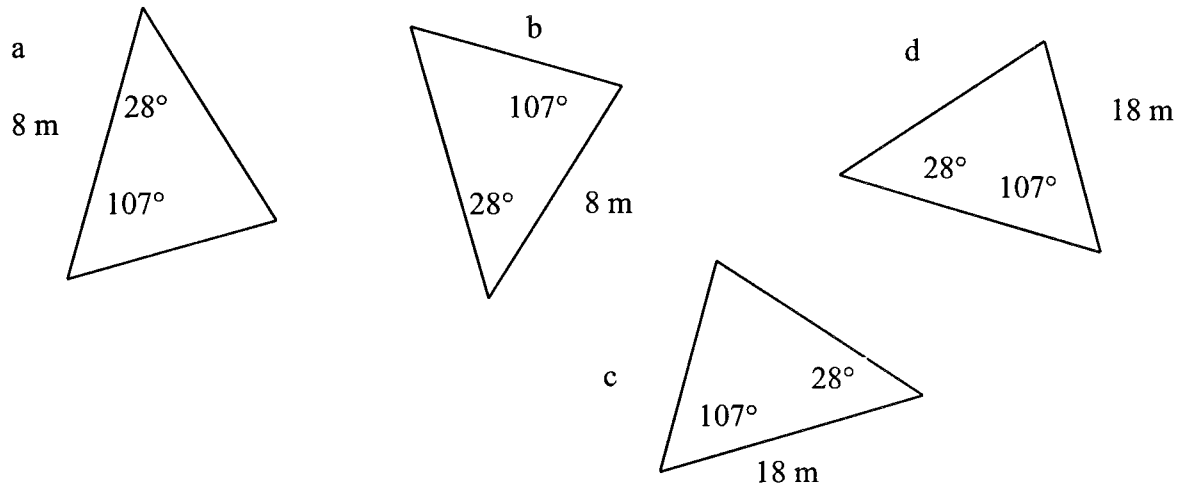
- a. 150° _____
- b. 120° _____
- c. 71° _____
- d. 95° _____
- e. 1° _____

6. Use the figure below to answer questions a-g. $AB \parallel CD$. (Value: 7)

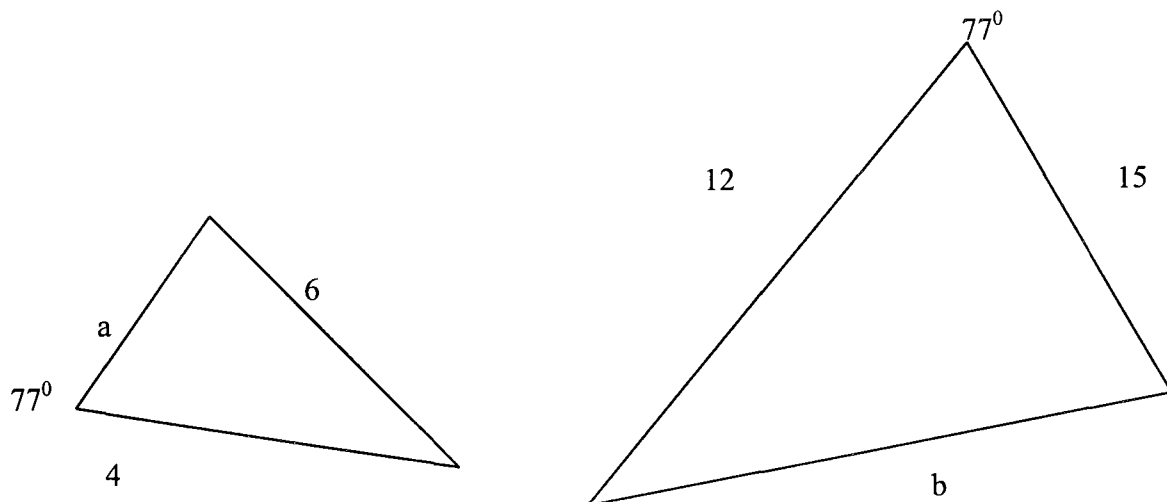


- a. Two vertical angles are $\angle 8$ and \angle _____.
- b. Two corresponding angles are $\angle 5$ and \angle _____.
- c. Two vertical angles are $\angle 1$ and \angle _____.
- d. Find the measure of $\angle 5$ if $\angle 6 = 58^\circ$. _____
- e. Find the measure of $\angle 7$ if $\angle 3 = 12^\circ$. _____
- f. If the measure of $\angle 8 = 86^\circ$, then $\angle 5 =$ _____.
- g. $\angle 4$ and \angle _____ are alternate interior angles.

7. In the set of triangles below, two of the triangles are congruent. Identify them.
(Value: 2)



8. The triangles below are similar. Find the measures of side A and side B. (Value: 4)



Guide: To Basic Math for Adult Upgrading
Angles & Triangles Test Key

Name: _____

1. Find the measure of the fourth angle of a quadrilateral when the other three angles have the following measures. (Value: 4)
 - a. $98^\circ, 112^\circ, 96^\circ$ **54°**
 - b. $77^\circ, 37^\circ, 88^\circ$ **158°**
 - c. $119^\circ, 49^\circ, 69^\circ$ **123°**
 - d. $146^\circ, 59^\circ, 118^\circ$ **37°**

2. Find the number of degrees in each polygon using the following formula: $180^\circ(n - 2)$ where $n =$ number of sides. (Value: 4)
 - a. Hexagon **720°**
 - b. Pentagon **540°**
 - c. Nonagon (9 sides) **1260°**
 - d. 13-sided polygon **1980°**

3. Choose the correct answer. (Value: 4)
 - a. How many sides does a pentagon have?
 - i. 5
 - ii. 10
 - iii. 8

 - b. How many sides does a decagon have?
 - i. 5
 - ii. 10
 - iii. 8

 - c. What is the sum of the measures of a triangle?
 - i. 360°
 - ii. 90°
 - iii. 180°

 - d. What is the sum of the measures of a quadrilateral?
 - i. 360°
 - ii. 180°
 - iii. 540°

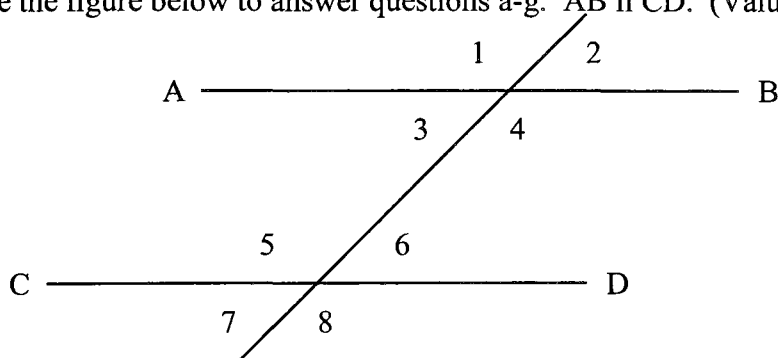
4. Find the measure of the angle that is the complement of each of the following angles. (Value: 5)

- a. 19° 71°
 b. 64° 26°
 c. 38° 52°
 d. $81\frac{1}{2}^\circ$ 8.5°
 e. 31° 59°

5. Find the measure of the angle that is the supplement of each of the following angles. (Value: 5)

- a. 150° 30°
 b. 120° 60°
 c. 71° 109°
 d. 95° 85°
 e. 1° 179°

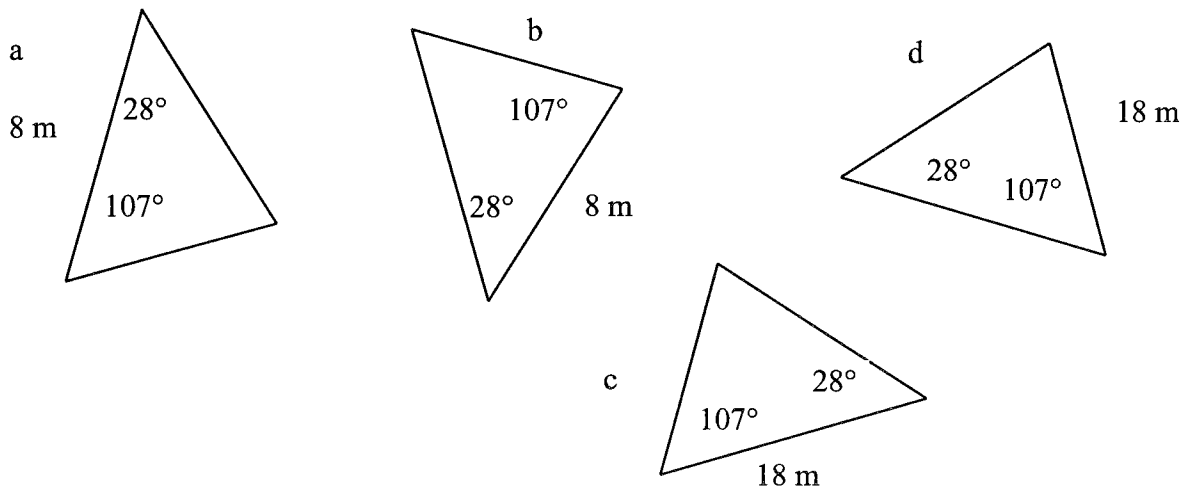
6. Use the figure below to answer questions a-g. $AB \parallel CD$. (Value: 7)



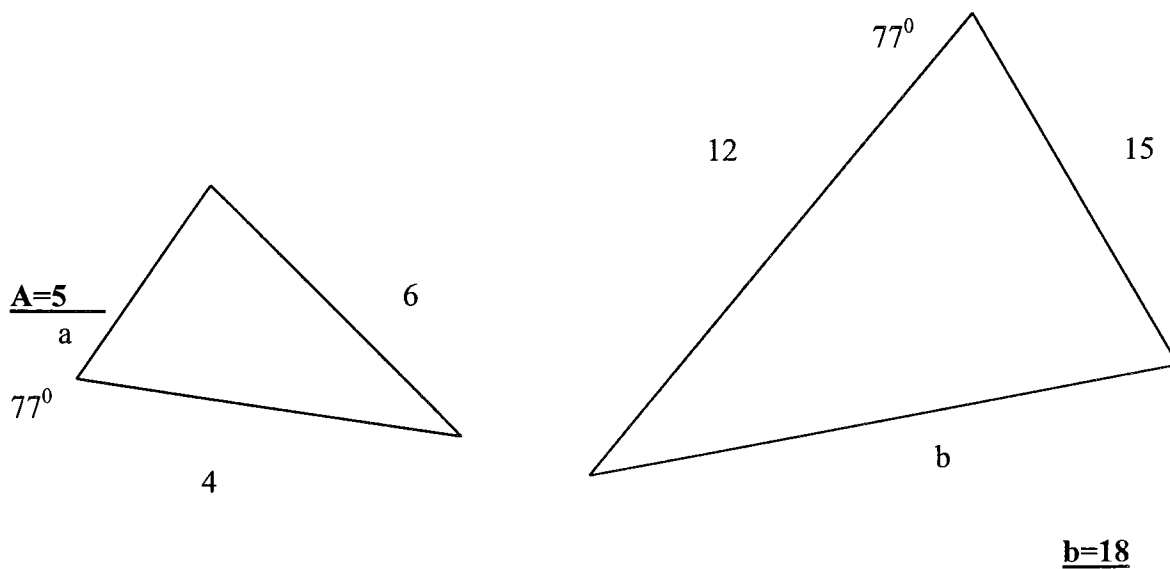
- a. Two vertical angles are $\angle 8$ and $\angle \underline{5}$.
 b. Two corresponding angles are $\angle 5$ and $\angle \underline{1}$.
 c. Two vertical angles are $\angle 1$ and $\angle \underline{4}$.
 d. Find the measure of $\angle 5$ if $\angle 6 = 58^\circ$. 122°
 e. If the measure of $\angle 8 = 86^\circ$, then $\angle 5 = \underline{86^\circ}$.
 f. $\angle 4$ and $\angle \underline{5}$ are alternate interior angles.

7. In the set of triangles below, two of the triangles are congruent. Identify them.
(Value: 2)

(1) **A & B**



8. The triangles below are similar. Find the measures of side A and side B. (Value: 4)



6. Find the area of a trapezoid with bases of 98 meters and 57 meters and a height of 42 meters. (Value: 2)

7. Find the area of a circle with a radius of 18 meters. (Value: 2)

8. Find the total area of a rectangular solid with a length of 6 meters, a width of 9 meters, and a height of 4 meters. (Value: 2)

9. Find the total area of a cube whose edge measures 14 meters. (Value: 2)

10. Find the lateral area of a cylinder 12 meters tall and 4 meters in radius. (Value: 2)

11. Find the volume of a rectangular solid 4.8 centimeters by 9 centimeters by 16 centimeters. (Value: 2)

12. Find the volume of a cube with a side of 4 meters. (Value: 2)

13. Find the volume of a cylinder whose base has a diameter of 28 meters and whose height is 12 meters. (Value: 2)

14. Find the volume of a square pyramid whose side is 15 centimeters and whose height is 8 centimeters. (Value: 2)
15. A fence costing \$3 per meter is to be built around a yard 32 meters long by 21 meters wide. How much will the fence cost? (Value: 2)

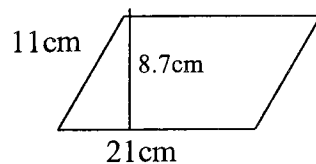
Part II – Multiple Choice. Circle the letter of the correct answer. (Value: 12)

1. Find the perimeter of a rectangle with a width of 82 mm and a length of 106 mm.
- $3(82 + 106)$
 - $2(82 + 106)$
 - $2 \times 82 \times 106$
2. Find the perimeter of a rectangle with a width of $4 \frac{1}{2}$ centimeters and a length of $5 \frac{11}{16}$ centimeters.
- $2(4 \frac{1}{2} + 5 \frac{11}{16})$
 - $2 + 4 \frac{1}{2} + 5 \frac{11}{16}$
 - $2 \times 4 \frac{1}{2} \times 5 \frac{11}{16}$
3. Find the perimeter of a square whose sides are 5 meters long.
- $5 + 5$
 - $4 + 5$
 - 4×5
4. Find the perimeter of a square whose sides are 4 cm long.
- 4×4
 - $4 + 4$
 - $4 + 4 + 4$
5. Find the perimeter of an equilateral triangle with sides of $14 \frac{1}{2}$ meters.
- $2 \times 14 \frac{1}{2}$
 - $3 \times 14 \frac{1}{2}$
 - $3 + 14 \frac{1}{2}$

6. Find the perimeter of an isosceles triangle with equal sides 21.6 meters and base 18.4 meters.
- $2(21.6) + 18.4$
 - $2(18.4) + 21.6$
 - $21.6 + 18.4$
7. What is the circumference of a circle with a radius of 15?
- $3.14 + 15$
 - 3.14×15
 - $2 \times 3.14 \times 15$
8. Choose the correct area of a rectangle with the given dimensions.
 $l = 7 \text{ cm}$, $w = 3 \frac{1}{2} \text{ cm}$.
- $2 \times 7 \times 3 \frac{1}{2}$
 - $7 \times 3 \frac{1}{2}$
 - $7 + 3 \frac{1}{2}$
9. Choose the correct area of a triangle with the given dimensions $b = 21 \text{ m}$, $h = 16 \text{ m}$.
- 21×16
 - $2(21) + 2(16)$
 - $\frac{1}{2} \times 21 \times 16$
10. Choose the correct area of a square with a side measuring 8.2 cm.
- 8.2
 - $(8.2)^2$
 - 8.2×2

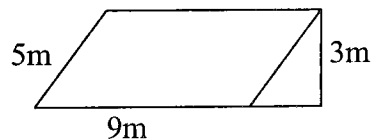
11. Choose the correct height of the parallelogram shown below.

- 11 cm
- 21 cm
- 8.7 cm



12. Choose the correct height of the parallelogram shown below.

- 5 m
- 9 m
- 3 m



Mathematics 300 Part A
Perimeter, Area, and Volume Test Key

Name: _____

Part I – Problem Solving. Be sure and write out the formula and show all of your calculations. Include the units in your final response.

1. Find the perimeter of a rectangle 37.6 meters long and 24.9 meters wide. (Value: 2)

$$\begin{aligned} P &= 2(l + w) \\ &= 2(37.6 + 24.9) \\ &= \underline{125 \text{ m}} \end{aligned}$$

2. Find the perimeter of a triangle whose sides measure 4 centimeters, 2.625 centimeters, and 3.5 centimeters. (Value: 2)

$$\begin{aligned} P &= s + s + s \\ &= 4 + 2\frac{5}{8} + 3\frac{1}{2} \\ &= \underline{10 \frac{1}{8} \text{ centimeters}} \end{aligned}$$

3. Find the circumference of a circle whose radius is 21 meters. (Value: 2)

$$\begin{aligned} C &= 2\pi r \\ &= 2(3.14)(21) \\ &= \underline{133.88 \text{ meters}} \end{aligned}$$

4. Find the area of a square whose side measures 2.75 meters. (Value: 2)

$$\begin{aligned} A &= s \times s \\ &= 2.75(2.75) \\ &= \underline{7.56 \text{ m}^2} \end{aligned}$$

5. Find the area of a triangle with a base of 126 millimeters and a height of 85 millimeters. (Value: 2)

$$\begin{aligned} A &= \frac{1}{2}bh \\ &= (126)(85)/2 \\ &= \underline{5355 \text{ m}^2} \end{aligned}$$

6. Find the area of a trapezoid with bases of 98 meters and 57 meters and a height of 42 meters. (Value: 2)

$$\begin{aligned} A &= \frac{b_1 + b_2}{2} (h) \\ &= \frac{(98 + 57)}{2} (42) \\ &= \underline{\underline{3255 \text{ meters}^2}} \end{aligned}$$

7. Find the area of a circle with a radius of 18 meters. (Value: 2)

$$\begin{aligned} A &= \pi r^2 \\ &= 3.14(18)^2 \\ &= \underline{\underline{1017.36 \text{ m}^2}} \end{aligned}$$

8. Find the total area of a rectangular solid with a length of 6 meters, a width of 9 meters, and a height of 4 meters. (Value: 2)

$$\begin{aligned} A &= 2(lw) + 2(wh) + 2(lh) \\ &= 2(6 \times 9) + 2(9 \times 4) + 2(6 \times 4) \\ &= \underline{\underline{228 \text{ m}^2}} \end{aligned}$$

9. Find the total area of a cube whose edge measures 14 meters. (Value: 2)

$$\begin{aligned} A &= 6e^2 \\ &= 6(14)^2 \\ &= \underline{\underline{1176 \text{ m}^2}} \end{aligned}$$

10. Find the lateral area of a cylinder 12 meters tall and 4 meters in radius. (Value: 2)

$$\begin{aligned} \text{Lateral Area} &= 2\pi rh \\ &= 2(3.14)(4)(12) \\ &= \underline{\underline{301.44 \text{ m}^2}} \end{aligned}$$

11. Find the volume of a rectangular solid 4.8 centimeters by 9 centimeters by 16 centimeters. (Value: 2)

$$\begin{aligned} V &= lwh \\ &= (4.8)(9)(16) \\ &= \underline{\underline{691.2 \text{ cm}^3}} \end{aligned}$$

12. Find the volume of a cube with a side of 4 meters. (Value: 2)

$$V = (e)^3 = (4)^3 = \underline{\underline{64 \text{ m}^3}}$$

13. Find the volume of a cylinder whose base has a diameter of 28 meters and whose height is 12 meters. (Value: 2)

$$\begin{aligned} V &= \pi r^2 h \\ &= (3.14)(14)^2 (12) \\ &= \underline{7385.28 \text{ m}^3} \end{aligned}$$

14. Find the volume of a square pyramid whose side is 15 centimeters and whose height is 8 centimeters. (Value: 2)

$$\begin{aligned} V &= Bh \\ &= lwh \\ &= (15)(15)(8) \\ &= \underline{1800 \text{ cm}^3} \end{aligned}$$

15. A fence costing \$3 per meter is to be built around a yard 32 meters long by 21 meters wide. How much will the fence cost? (Value: 2)

$$\begin{aligned} P &= 2(l + w) \\ &= 106 \text{ m} \\ &= (106)(\$3) = \underline{\$318} \end{aligned}$$

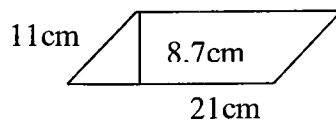
Part II – Multiple Choice. Circle the letter of the correct answer. (Value: 12)

- Find the perimeter of a rectangle with a width of 82 mm and a length of 106 mm.
 - $3(82 + 106)$
 - $2(82 + 106)$
 - $2 \times 82 \times 106$
- Find the perimeter of a rectangle with a width of $4 \frac{1}{2}$ centimeters and a length of $5 \frac{11}{16}$ centimeters.
 - $2(4 \frac{1}{2} + 5 \frac{11}{16})$
 - $2 + 4 \frac{1}{2} + 5 \frac{11}{16}$
 - $2 \times 4 \frac{1}{2} \times 5 \frac{11}{16}$
- Find the perimeter of a square whose sides are 5 meters long.
 - $5 + 5$
 - $4 + 5$
 - 4×5
- Find the perimeter of a square whose sides are 4 cm long.
 - 4×4
 - $4 + 4$
 - $4 + 4 + 4$

5. Find the perimeter of an equilateral triangle with sides of $14\frac{1}{2}$ meters.
- $2 \times 14\frac{1}{2}$
 - $3 \times 14\frac{1}{2}$**
 - $3 + 14\frac{1}{2}$
6. Find the perimeter of an isosceles triangle with equal sides 21.6 meters and base 18.4 meters.
- $2(21.6) + 18.4$**
 - $2(18.4) + 21.6$
 - $21.6 + 18.4$
7. What is the circumference of a circle with a radius of 15?
- $3.14 + 15$
 - 3.14×15
 - $2 \times 3.14 \times 15$**
8. Choose the correct area of a rectangle with the given dimensions.
l = 7 cm, w = $3\frac{1}{2}$ cm.
- $2 \times 7 \times 3\frac{1}{2}$
 - $7 \times 3\frac{1}{2}$**
 - $7 + 3\frac{1}{2}$
9. Choose the correct area of a triangle with the given dimensions b = 21 m, h = 16 m.
- 21×16
 - $2(21) + 2(16)$
 - $\frac{1}{2} \times 21 \times 16$**
10. Choose the correct area of a square with a side measuring 8.2 cm.
- 8.2
 - $(8.2)^2$**
 - $.8.2 \times 2$

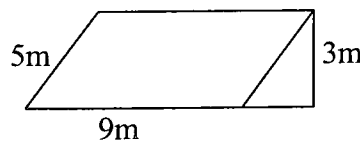
11. Choose the correct height of the parallelogram shown below.

- 11 cm
- 21 cm
- 8.7 cm**



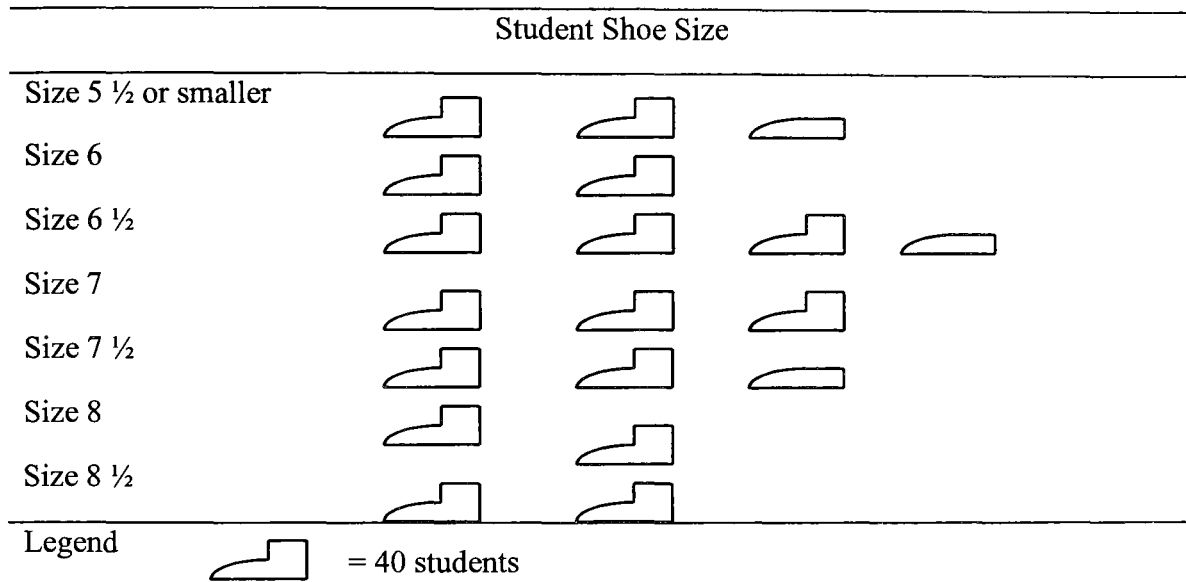
12. Choose the correct height of the parallelogram shown below.

- 5 m
- 9 m
- 3 m**



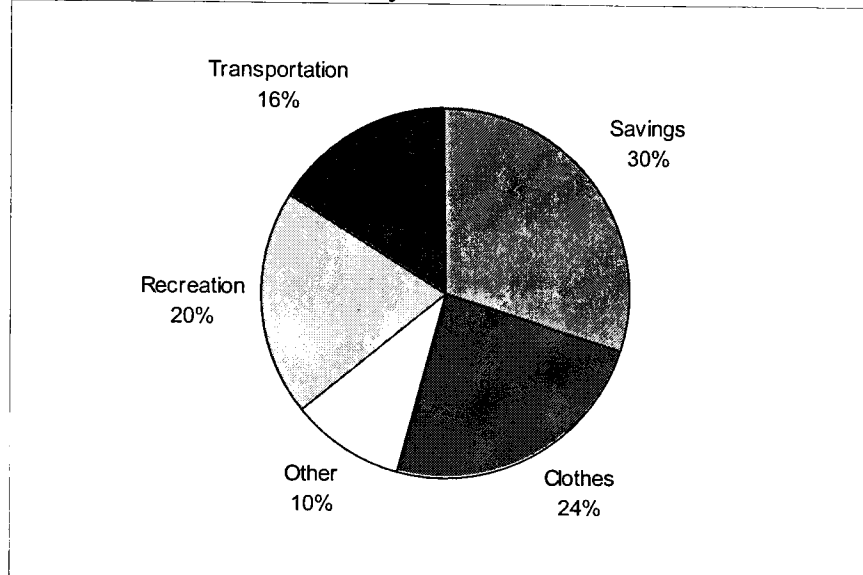
Guide: To Basic Math for Adult Upgrading
Statistics &: Data Analysis Test

1. Questions A, B, C, and D are based on the following pictograph which shows the shoe sizes of the pupils of St. Margaret's School for Girls. (Value: 10)



- A. How many students does the symbol represent?
 B. How many students wear each size?
 (i) 6
 (ii) 8
 (iii) 8 ½ or larger
 C. What is the most common shoe size?
 D. What percentage of the girls wear the following sizes?
 (i) 7 or smaller
 (ii) 6 or 6 ½
 (iii) 8 or larger
 (iv) 7 ½ or larger
 (v) 7 ½

2. Answer the questions below based on the circle graph. (Value: 6)
- Which category did she spend the most on?
 - Which category did she spend the least on?
- C. Her earnings for one year were \$3000.00.
- How much did she spend on clothes?
 - How much did she spend on recreation?
 - How much did she spend on transportation?
 - How much did she save that year?



3. Construct a circle graph to show the data below. (Value: 10)

Causes of Forest Fires in Canada	Percentage of total forest fires	Number of Fires	Calculations to make the circle graph
Lightning	27.5	2141	
Recreation	20.6	1600	
Miscellaneous	14.6	1133	
Settlement	9.4	732	
Woods Operations	7.6	591	
Railways	6.4	494	
Incendiary	5.2	405	
Unknown Causes	4.7	369	
Other industries	4.0	312	
TOTAL:	100.0	7777	

4. A family has the following monthly financial commitments identified in the table below. Construct **both** a vertical and horizontal bar graph showing these expenditures. (Value: 10)

Mortgage	\$520.00
Food	\$300.00
Savings	\$250.00
Clothes	\$100.00
Car	\$310.00
Miscellaneous	\$200.00

5. Bonnie, Harvey, and Monica are competing for the top student award. Here are their monthly averages for the year. Construct a line graph comparing the three sets of marks. (Value: 15)

Month	Bonnie	Harvey	Monica
September	72	83	79
October	61	64	82
November	58	71	74
December	70	72	68
January	82	87	71
February	55	68	71
March	66	63	77
April	69	75	84
May	71	70	83
June	76	67	81
Overall	68	72	77

6. Find the **mean** for each list of scores. (Value: 4)

a. 61, 50, 47, 54

b. 87, 48, 96, 77, 50, 75, 71

c. 75, 68, 77, 70, 80

d. 64, 59, 69, 53, 62, 46, 53

7. Find the **median** for each list of scores. (Value: 3)

a. 35, 32, 41, 44, 28, 34, 30

b. 75, 76, 67, 65, 70, 77, 73, 63, 79

c. 41, 46, 64, 54, 25, 68, 37, 29, 61, 75, 57

8. Find the **range** for each list of scores. (Value: 2)

a. 80, 79, 85, 75, 84, 76, 88, 80

b. 37, 39, 36, 40, 42, 37, 51, 39, 45, 54, 36, 44, 41, 50

Guide: To Basic Math for Adult Upgrading
Statistics - Data Analysis Key

(10) 1. a)40 b) 80,80,80 c)6 ½

(11) d) i. $440/700 = 63\%$

ii. $220/700 = 31\%$

iii. $160/700 = 23\%$

iv. $250/700 = 36\%$

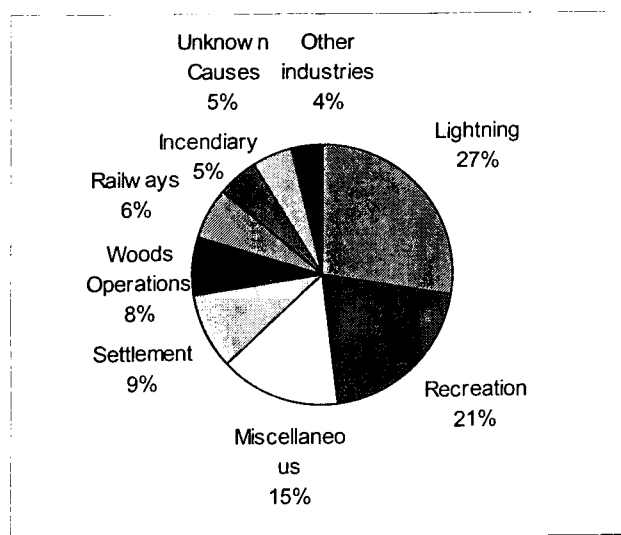
v. $100/700 = 14\%$

2. a) clothes 24% b) other 10% c) \$720, \$600,\$480,\$900

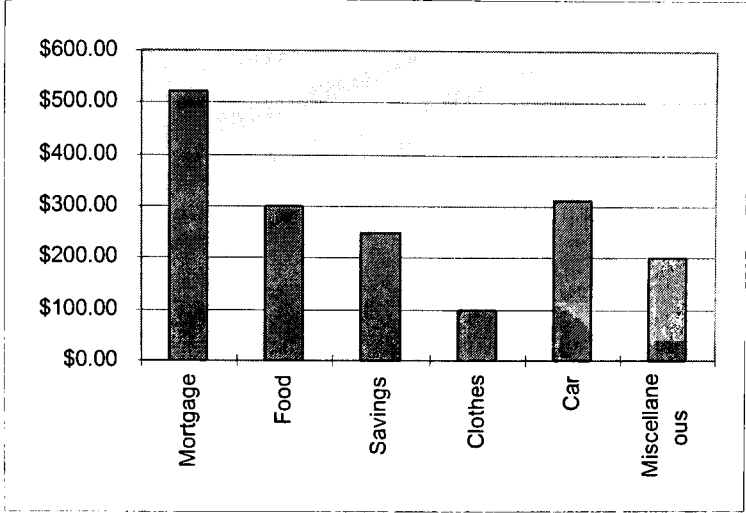
3.

Causes of Forest Fires in Canada	Percentage of total forest fires	Number of Fires	Calculations to make the circle graph
Lightning	27.5	2141	99
Recreation	20.6	1600	74.16
Miscellaneous	14.6	1133	52.56
Settlement	9.4	732	33.84
Woods Operations	7.6	591	27.36
Railways	6.4	494	23.04
Incendiary	5.2	405	18.72
Unknown Causes	4.7	369	16.92
Other industries	4.0	312	14.4
TOTAL:	100.0	7777	360

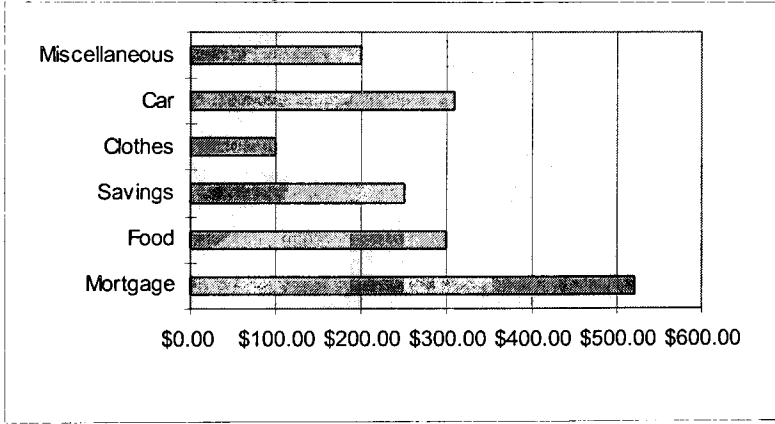
Causes of Forest Fires in Canada



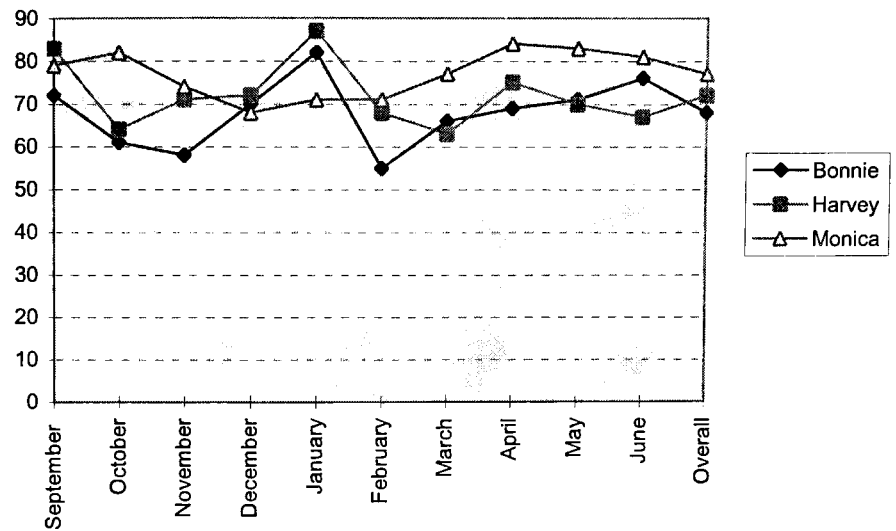
4. Family Financial Commitments



Family Financial Commitments



5. Averages of Three Students



5. Find the **mean** for each list of scores. (Value: 4)

6. 61, 50, 47, 54

$$\frac{53}{4}$$

7. 87, 48, 96, 77, 50, 75, 71

$$\frac{72}{7}$$

8. 75, 68, 77, 70, 80

$$\frac{74}{5}$$

9. 64, 59, 69, 53, 62, 46, 53

$$\frac{58}{7}$$

10. Find the **median** for each list of scores. (Value: 3)

11. 35, 32, 41, 44, 28, 34, 30

$$\frac{34}{7}$$

12. 75, 76, 67, 65, 70, 77, 73, 63, 79

$$\frac{73}{9}$$

13. 41, 46, 64, 54, 25, 68, 37, 29, 61, 75, 57

$$\frac{54}{11}$$

14. Find the **mode** for each list of scores. (Value: 2)

15. 80, 79, 85, 75, 84, 76, 88, 80

$$\frac{80}{8}$$

16. 37, 39, 36, 40, 42, 39, 51, 39, 45, 54, 36, 44, 41, 50

$$\frac{39}{14}$$