

MINUTES OF THE SENATE COMMITTEE ON EDUCATION

The meeting was called to order by Chairperson Dave Kerr at 1:30 p.m. on January 23, 1995 in Room 123-S of the Capitol.

All members were present.

Committee staff present: Ben Barrett, Legislative Research Department
Avis Swartzman, Revisor of Statutes
Brenda Dunlap, Committee Secretary

Conferees appearing before the committee: Dr. John Poggio, University of Kansas
Dr. Sharon Freden, State Board of Education

Others attending: See attached list

Dr. Poggio, University of Kansas, reviewed the social studies assessment test. Committee members asked questions regarding the rigor of test questions and there was discussion regarding specific test questions.

Next Dr. Poggio reviewed the mathematics assessment test. He gave a brief review of the history of math exams showing the change from simple literacy to reasoning and problem solving. Committee members asked questions regarding this test and there was discussion regarding specific test questions. (See Attachment 1)

He emphasized that the assessments are to create a blueprint to develop test questions and to guide the development of the curriculum to better teach students what they need to know to be productive workers in the business world.

Dr. Freden, State Board of Education, responded to a claim made by Dr. Dan Hardin, Washburn University, that the social studies assessment was vacuous. She stated that the assessment is being revised with a focus on higher order skills and to include more typical areas of what are typically thought of as social studies. Key concepts from the National Standards for social studies are also being incorporated. (See Attachment 2)

The meeting was adjourned at 2:30 p.m.

The next meeting is scheduled for January 24, 1995.

SENATE EDUCATION COMMITTEE COMMITTEE GUEST LIST

DATE: 1-23-95

NAME	REPRESENTING
John P. G. ...	KU -
Connie Huerf	KSBE
Jim Allen	KFLC
Sharon Axelsen	KSBE
Richard Leighty	KSBE
Jim Edwards	KCCI
Ted Power	H R 81
Karen Humerf	JASB
Sue Chase	KNEA
Diane Gjerstad	USD 259
Mary Myers	
Donna Neufeld	US 373
RUTH ANN LEBERT	✓ ✓
Ken Baker	4th Enrollment USD's
Mark Tallman	KASB

Strategic Directions for Kansas Education

The Kansas State Board of Education is charged with the general supervision of public education and other educational interests in the state. While clearly acknowledging the role and importance of local control, the State Board of Education has the responsibility to provide direction and leadership for the structuring of all state educational institutions under its jurisdiction.

The beginning place for determining the mission for the Kansas State Board of Education is the assumption that all Kansas citizens must be involved in their own learning and the learning of others. It is the combined effort of family, school, and community that makes possible the development of a high quality of life. It is the parent who is the first "teacher" of children. As we grow older, we learn that the school, the workplace, and the community support our lifelong learning and our training and retraining. The Board recognizes the responsibility it holds for Kansas educational systems and promoting quality education programs. The mission for Kansas education is that:

Each person will have the skills and values necessary to contribute to our evolving society.

We believe that the strategic directions for the structuring of Kansas education must be organized to:

- involve parents and support their efforts in the education of their children
- expand learner-focused approaches to curricula and instruction that can amplify the quality and scope of learning
- expand career, lifelong learning, and applied technical preparation which is relevant to the changed nature of work in an information society
- strengthen involvement of business and industry, public and private agencies, and community groups to increase the quality of education and the development of Kansas human resources
- strengthen educational quality and accountability through performance-based curricula and evaluation systems
- develop state and local information systems which may be used for systematic feedback for program improvement, evaluation, and sharing
- strengthen positive environments and develop environments which empower learners and staff
- extend and update the professional and leadership excellence of Kansas educators essential for quality education
- extend and expand the effective utilization of information technology which can increase information access for all learners of the state and productive learning for all Kansas educational institutions
- develop learning communities which involve educational institutions, public and private agencies, and community groups in more effective methods of meeting human resource development needs.



Kansas State Board of Education
Kansas State Education Buildi
120 East 10th Street Topeka, Kansas 66612

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Commissioner of Education

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KANSAS
MATHEMATICS CURRICULUM
STANDARDS

KANSAS STATE BOARD OF EDUCATION

Lee Droegemueller, Commissioner of Education

DIVISION OF EDUCATION SERVICES
Sharon E. Freden, Assistant Commissioner

EDUCATIONAL ASSISTANCE SECTION
(913) 296-4946

WITH THE ASSISTANCE OF:
Sue Neal, Chairman, Writing Committee
Wichita Unified School District

1990

Thanks are extended to the members of the writing team for the Kansas Mathematics Curriculum Standards. They donated weekends and drove many miles in order to contribute their expertise to the creation of this document.

K-4 Team

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Ruth Harbin, Olathe
Tina Hiss, Great Bend
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Ann Manes, Ellsworth
Dorothy Price, Wichita

Sue Neal, Committee Chair
Dick Hoffman, KSDE
Ron Moore, KSDE

5-8 Team

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Barbara Attivo, Wichita State
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Ethel Edwards, Topeka
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9-12 Team

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Josef Dorfmeister, Kansas University
Verl Hester, Garden City
Vicki Jackson, Wichita
Jack Krebs, Oskaloosa
Beverly Nichols, Shawnee Mission
Don Nichols, Wichita

The team wishes to express appreciation to the Kansas State Board of Education and to Commissioner Lee Droegemueller for their concern for Kansas math students and for their confidence in the Kansas Association of Teachers of Mathematics and other math educators who have shared a vision of how to make a better world through mathematics.

Statement of Purpose for Mathematics Education

- *All students can learn mathematics.*
- *Learning to solve real life problems is the principal reason for studying mathematics.*
- *All student should be challenged to attain their highest level of mastery in mathematics.*
- *Teachers are to provide an appropriate atmosphere for learning and then to facilitate the learning process.*

Today's students can expect to change careers many times during their lives. To prepare for this mobility, students must develop a thorough understanding of mathematical concepts and principles. They must reason clearly and communicate effectively. They must recognize mathematical applications in the world around them, and they must approach mathematical problems with confidence. Students need fundamental skills that will enable them to apply their knowledge to new situations and be responsible for their own lifelong learning.

No longer are computational skills alone adequate indicators of mathematical achievement. Students must understand mathematical principles. They must develop proficiency in problem solving and higher-order thinking skills. Additional essential skills needed to function effectively in the next century will include the ability to apply appropriate methods to problem-solving situations by using mental mathematics, estimation, algorithms, and calculating devices; to recognize the reasonableness of results of problem solving; to understand the geometric concepts necessary to function effectively in the three-dimensional world; to utilize the fundamental concepts of measurement and to recognize the basic uses and misuses of probability and statistical inference.

The technological revolution is affecting our current mathematics programs. The major influence of technology in mathematics education is its potential to shift the focus of instruction from an emphasis on learning isolated basic skills to developing concepts, relationships, structures, and problem-solving. Students should learn to use calculators and computers as tools for processing information, for performing calculations, and for investigating and solving problems.

Teachers should create non-threatening learning environments that encourage students to explore, develop, test, discuss and apply their ideas. Students need to be active participants in the learning process from the concrete to abstract levels of mathematical concepts.

Kansas Mathematics Curriculum Standards

On September 13, 1989, the Kansas State Board of Education approved the Mathematics Improvement Plan. A committee of Kansas mathematics educators agreed to write a set of mathematics curricular standards as part of this plan. The following standards and their outcomes are the work of that committee. In April, 1989, the National Council of Teachers of Mathematics (NCTM) published its Curriculum and Evaluation STANDARDS for School Mathematics. The Kansas standards closely parallel the NCTM Standards and in some instances are quotations from that publication. The outcomes identified are those upon which a Kansas mathematics assessment will be based.

The general goals are these:

- All students become mathematical problem solvers.
- All students learn to communicate mathematically.
- All students learn to reason mathematically.
- All students recognize mathematical connections.
- All students learn to value mathematics.
- All students become confident in their own mathematical ability.

The view of instruction in this curriculum includes the following beliefs:

- All students can learn mathematics.
- Each year all students will experience the full range of math content addressed in the standards for their grade level.
- Mathematics will be presented in a format which involves the students as active participants and the teachers as facilitators in the learning process.
- Students will develop the skills to solve problems in both independent and cooperative situations.
- Instructional activities will encompass real-world experiences and interdisciplinary approaches to learning.
- Mathematics instruction will be supported by appropriate technology.

The implementation of the following standards will be based on the assumptions that:

- All classrooms will have ample sets of manipulative materials and supplies.
- All classrooms will have calculators and computers available.
- Resources needed to support appropriate instruction will be available.
- Ongoing teacher training will be provided.

The Need for Change

Mathematics is the key to opportunity. No longer just the language of science, mathematics now contributes in direct and fundamental ways to business, finance, health and defense. For students, it opens doors to careers. For citizens it enables informed decisions. For nations, it provides knowledge to compete in a technological economy. To participate fully in the world of the future, America must tap the power of mathematics.

Communications has created a world economy in which working smarter is more important than merely working harder. Jobs that contribute to this world economy require workers who are mentally fit - workers who are prepared to absorb new ideas, adapt to change, cope with ambiguity, perceive patterns, and to solve unconventional problems. It is these needs, not just the need for calculation (which is done mostly by machines), that makes mathematics a prerequisite to so many jobs. More than ever before, Americans need to think for a living, more than ever before, the need to think mathematically. (Taken from Everybody Counts -- A Report to the Nation on the Future of Mathematics Education.)

Mathematics for All Students

These Kansas Mathematics Curriculum Standards set the vision of mathematical literacy for all students. The National Assessment of Education Progress reported that at age nine, the achievement in math for both sexes were identical. By age thirteen, the situation had drastically changed. At this age, females showed more disinterest, negative attitudes, and lower ability in math than males. Females' achievement levels were lower than males; the gap became more pronounced through high school and beyond. Researchers blame parental expectations and the perception of math as a masculine discipline. Careers and occupations utilizing mathematics extensively are for the most part viewed as male areas. By high school, the average number of years of math taken by girls is one third a year less than boys. Women are seriously underrepresented in high school physics and calculus classes, college majors needing advanced math, and careers in physical science and engineering. Consistently, more males than females enroll in upper level math and science courses.

Similar situations exist for members of various minority groups. Many minority students drop out of the math curriculum early and are therefore limited in their career choices. The number of minorities enrolled in math courses is directly proportional to the number entering math related careers. Mathematics education must involve all areas of our diverse society.

The standards are statements of what is valued in mathematical education in Kansas. All students have the right to receive instruction in the mathematics content necessary to be productive members of a changing society. The expectation is that all students can and will learn mathematics. The curriculum is to be a pump toward mathematical competence for all rather than a filter used to identify an "elite" group of students who are allowed to study higher levels of mathematics.

The Nature of Mathematics, the Nature of Learners, and the Learning Environment

Mathematics is by nature, the study of patterns and relationships - both numeric and geometric. The application of these patterns and relationships to answer questions in everyday living and in vocational and professional settings is an important part of problem solving. Skill in problem solving is the most important contribution that mathematics makes to students' education. Thus, the learning environment should be structured to encourage and enable the development of the problem-solving skills of all students.

Learning mathematics involves much more than the memorization of facts and the mastery of a set of computational skills. Mathematics is a way of thinking about the world in numeric and geometric terms. Mathematics is reasoning about numbers and space. The learning environment should be structured to encourage and enable the development of the reasoning skills of all learners.

Mathematics has played a valuable role in the development of civilization. It has provided a basis for the many technological and scientific advances that surround us today. The learning environment should be structured to encourage and enable students to value the role of mathematics to society as a whole and to them individually.

Mathematics is a medium of communication - a way of describing the world in quantitative and qualitative terms. It provides a common language for individuals in all types of vocations and professions, and for individuals of all educational backgrounds. Thus, the learning environment should encourage and enable all learners to develop the ability to communicate in mathematical terms.

The nature of learners should also be considered in determining the learning environment. Teachers need to recognize that students learn in a variety of ways and at different rates. Students need to be actively involved in the learning process. They need to have opportunities to investigate data and to make and test conjectures. They need to discuss mathematical ideas. They need to practice skills. They need to experience mathematics in both concrete and abstract ways, in both manipulative and symbolic modes. They need to experience learning mathematics in various individual and cooperative settings, in small group discussions, and through peer teaching.

Opportunities for learning mathematics in a positive, enthusiastic environment will enable students to value mathematics, to use their skills, and to increase their confidence in their ability to use and apply mathematics.

Student Attitudes

To develop positive student attitudes toward mathematics, the curriculum must be developmentally appropriate. When students are asked to understand a concept that requires thinking skills beyond their developmental level, they soon believe that mathematics is for others.

Students need to see themselves as capable of using their mathematical understanding to make sense of new problem situations. Students must learn to trust their own mathematical thinking. They must realize that everyone can do mathematics. Students need to see the use for mathematics in many different contexts and careers.

To ensure that students develop confidence, the learning environment should be one in which the teacher respects the students' ideas and thinking. Teachers can instill confidence by guiding students to respect one another's ideas. A learning environment that encourages thinking must allow the learner time to puzzle, to be stuck, to try alternate approaches, and to confer with one another and the teacher. Teachers must encourage students to persevere. Parents and other adults must believe that mathematics is important for children. The media must be supportive of the efforts of schools through giving positive publicity about math. Students must believe in their mathematical abilities and the importance of mathematical literacy.

Learning to Communicate Mathematically

Mathematics is a language. As such, it is a means of communicating ideas by representing, talking, listening, writing, and reading. The instructional implications are many. Students should be given the opportunity to learn to read mathematics textbooks and other material, and to follow instructions or draw conclusions from their reading. They should practice writing skills in mathematics through such experiences as writing complete sentence answers to word problems, writing their own word problems, keeping mathematics journals, writing reports, or having mathematics pen pals. Oral communication should occur through discussions of mathematics topics, in making oral reports, and when working in cooperative groups. Students should be given the opportunity to learn to construct and interpret graphs, charts and other representation of data.

Mathematical Connections

Historically schools have departmentalized learning. It is important that students see the connections within all aspects of knowledge. Connections must be made within the discipline of mathematics. Connections must be made between mathematics and other disciplines, and between math taught in the classrooms and math used in everyday living. Students must see mathematics as an integrated whole.

Mathematics as Problem Solving

The NCTM recommends that mathematics education focus on the development of the problem solving ability of students. Learning to solve problems is the principal reason for studying and learning mathematics. It is the best preparation students can be given for life. The performance of students in problem solving measures directly the effectiveness and utility of mathematics curriculum and instruction.

Problem solving has been defined as "what we do when we don't know what to do." What usually appears under the guise of "word problems" or "story problems" in mathematics textbooks does not necessarily involve problem solving. In these, students know what to do because such a "problem" appears in the textbook in a context - such as coin problems in algebra, or subtraction of whole numbers in grade two. The type of problem-solving instruction advocated by the Kansas standards is in the context of non-routine problems, those that students do not have routines or algorithms to use in finding answers. Thus, they don't know how to approach the problem except to apply various problem-solving strategies which do not necessarily guarantee a solution readily. Such strategies include trial and error, guess and test, looking at a similar but simpler problem, drawing a diagram, or making a table of values.

Students will learn to solve non-routine problems only when given the opportunity to confront such problems in a supportive environment, one in which they can take risks and make mistakes without negative consequences. Only then will they develop confidence in their abilities to solve problems. Such teaching will develop problem solvers, a primary goal of mathematics education.

Curricular Content

The core curriculum should include topics which will be studied by all students. All students must have the opportunity to achieve the goals of each standard. All students should have access to this core curriculum at an appropriate level of abstraction, and with instructional techniques, appropriate to their development and skills.

Implementation of the standards should be organized so that individual topics are systematically developed in new or advanced contexts as a spiral curriculum. The standards should be integrated so that students regularly work with a variety of interrelated topics, such as arithmetic, algebra, geometry, measurement, and data analysis in a variety of contexts.

Effects of Technology on Mathematics

Technology has heightened the need for mathematical reform in the following ways:

- **Some mathematics becomes more important because technology requires it.**
- **Some mathematics becomes less important because technology replaces it.**
- **Some mathematics becomes possible because technology allows it.**

New mathematical knowledge is being generated because of technology and the recognition of problems not before apparent. The impact of this technological shift is no longer an intellectual abstraction. It has become an economic reality. Calculators and computers must be integrated throughout the curriculum. Calculators, computers, and other technology can be used to help students:

- **To concentrate on the problem-solving process rather than on the calculations associated with problems;**
- **To gain access to mathematics beyond the students' level of computational skills;**
- **To explore, develop, and reinforce concepts including estimation, computation, approximation, and properties;**
- **To perform tedious computations that arise when working with real data in problem-solving situations.**

The National Council of Teachers of Mathematics recommends the integration of the calculator into the school mathematics program at all grade levels in classwork, homework, and evaluation. Although extensively used in society, calculators are used far less in schools, where they could free large amounts of the time that students currently spend practicing computation. The time gained should be spent helping students to understand mathematics, to develop reasoning and problem-solving strategies, and, in general, to use and apply mathematics.

All students should be taught how and when to use the calculator. To use calculators effectively, students must be able to estimate and to judge the reasonableness of results. Consequently, an understanding of operations and a knowledge of basic facts are as important as ever. The evaluation of students' understanding of mathematical concepts and their applications should be designed to allow the use of calculators.

Concrete Learning Experiences, Use of Manipulatives

Manipulatives are concrete objects used to introduce or reinforce concepts. Their use allows students to become actively involved in creating mathematics. This involvement can be used to motivate students, to stimulate them to think mathematically, and to informally introduce them to mathematical concepts.

The classroom needs to be equipped with a wide variety of physical materials and supplies. Classrooms should have ample quantities of such materials as counters, interlocking cubes, connecting links, base-ten blocks, attribute blocks and pattern blocks, tiles, geometric models, rulers, spinners, number cubes, and colored rods. Other manipulatives needed are geoboards, tangrams, fraction pieces, metric and English measuring devices, as well as graph, grid, and dot paper, algebra tiles, graduated beakers, protractors and compasses. Simple household objects, such as buttons, dried beans, straws, shells, egg and milk cartons also can be used. The supply of materials is limited only by teachers' and students' creativity.

The curriculum should actively involve students in doing mathematics. Students will construct, modify, and integrate ideas by interacting with the physical world, materials and each other. Teachers need to create an environment that encourages students to explore, develop, test, discuss, and apply ideas using manipulative materials to foster learning of abstract ideas.

Mathematics as Reasoning

Curriculum at all levels should include experiences in which students reason mathematically. Both inductive reasoning (making a conjecture, based on generalization of an observed pattern) and deductive reasoning (verifying the conjecture) are required for extending logical reasoning skills. Reasoning can be formal or informal. Informal reasoning can be developed at all grade levels. For example, students in middle school classes can infer characteristics of a population from a set of data, and students in a high school class can infer the properties of a triangle through the use of computer software. Students should be able to apply these forms of reasoning in both mathematical and non-mathematical situations.

Assessment

The concept of assessment is much broader than the common practice of testing for the purpose of assigning student grades. The major educational purpose of assessment must be to ascertain what students in a given class or group have learned as a result of instruction. With this knowledge, the teachers or school system can adjust instruction accordingly. Assessment should focus on both the process and the result. How a student arrives at a conclusion may be even more important than the conclusion itself.

Teachers' assessment of students should include a variety of techniques. Traditional paper-and-pencil testing is only one of many approaches. Others include written narratives, oral work, and portfolios of student work. Also to be included are observations, class presentations, group work and extended problem-solving projects. Appropriate problem situations that combine a broad range of mathematical tasks and concepts should be developed and used at all levels. Teachers should be assisted in developing these broader forms of assessment.

GRADES K-4

MATHEMATICS STANDARDS

Grades K-4

On completion of mathematics studies in grades K-4, the students will demonstrate mathematics skills in the following areas according to these standards:

***I&III. Mathematics as Problem Solving and Reasoning**

The students will solve problems and apply problem solving strategies, including those from real life problems. Students will use problem-solving strategies of:

- constructing diagrams, pictures, figures, or models.
- acting out situations (role playing)
- guessing and checking.
- looking for patterns.
- utilizing charts, tables, or graphs

Students will use calculators when working with problem solving activities.

II. Mathematics as Communication

The students will communicate an understanding of mathematics concretely, verbally, and in a written form. The student will realize that representing, discussing, reading, writing, and listening to mathematics are a vital part of learning and using mathematics.

IV. Mathematical Connections

The students will make connections between conceptual and procedural knowledge and between the topics of mathematics and other curriculum areas. The use of concrete and real-life experiences to develop concepts will assist the students in understanding the procedure and processes.

V. Estimation

The students will show knowledge of estimation strategies. Students are to apply estimation in working with measurement, area, problem solving, and computation.

* Standards are numbered to be consistent with the NCTM Standards.

011-1

VI. Number Sense and Numeration

The students will show an understanding of numeration systems by relating counting, grouping, and place value concepts. Real-life situations, concrete materials, and pictures will be used to develop this understanding.

VII. Concepts of Whole Number Operations

The students will demonstrate an understanding of the operations of addition, subtraction, multiplication, and division in concrete, pictorial, and computational forms. The students will relate these operations to the solution of real-life problems.

VIII. Whole Number Computation

The students will have quick recall of the basic addition, subtraction, multiplication, and division facts. The students will be able to add and subtract whole numbers, multiply a two-digit number by a one-digit number and divide a two-digit number by a one digit number. Increased emphasis will be placed upon the use of mental computation, reasonableness of results and the use of calculators for lengthy computation.

IX. Geometry and Spatial Sense

The students will demonstrate spatial sense and identify/name and draw/sketch geometric shapes, congruent figures, points, lines, and line segments.

X. Measurement

The students will demonstrate an understanding of the concepts of length, capacity, weight, area, volume, time, temperature and angle. The students will also demonstrate an understanding of the process of measuring and concepts related to units of measurement.

The use of concrete instructional materials applied to real-life situations is essential for student understanding of measurement concepts. Students must be involved in a variety of measuring activities. These activities should include estimation strategies and applications to other curriculum areas.

1-17

XI. Statistics and Probability

The students will collect, organize, and describe data using words and pictorial, bar and line graphs. The students will construct, read, and interpret displays of data as well as formulate and solve problems that involve collecting and analyzing data. The students will explore concepts of chance.

XII. Fractions and Decimals

The students will demonstrate an understanding of the concepts of fractions, mixed numbers, and decimals as parts of sets and regions in concrete, pictorial, and computational forms.

Models will be used to:

- develop concepts and number sense of fractions, mixed numbers and decimals.
- relate fractions to decimals.
- explore operations of fractions and decimals.

XIII. Patterns and Relationships

The students will recognize, describe, extend and create a wide variety of patterns and be able to use patterns to represent and describe mathematical relationships.

MATHEMATICS STANDARDS

Grades K-4 Core Curriculum

STANDARDS 1 AND 3 Problem Solving and Reasoning

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<p>1) solve routine story problems.</p> <p>2) solve realistic story problems.</p> <p>3) solve non-routine story problems.</p> <p>4) apply problem solving strategies.</p>	<p>1) apply computational skill algorithms to solve story problems.</p> <p>2) use problem solving skills to solve problems from real-life applications.</p> <p>3) select and apply problem-solving strategies when a solution process is not readily apparent.</p> <p>4) apply the following problem solving strategies in the solution of routine, realistic, and non-routine problems:</p> <ul style="list-style-type: none"> • constructing diagrams, pictures, figures, and models. • looking for patterns • acting out situations (role playing) • utilizing charts, tables, or graphs • guessing and checking. <p>Note: The students will use calculators when working with the problem-solving activities described above.</p>	

b1-1

STANDARDS 1 & 3
Problem Solving and Reasoning
Examples

1) There are 530 students in one school. Of the 530 students, 435 have math books. How many more math books are needed?

2) **SANDWICHES**
Peanut Butter.....\$.65
with Jelly.....\$.75

DRINKS
Milk.....\$.70
Juice.....\$.60

FRUIT
Orange....\$.60
Apple.....\$.50

SOUP
Chicken.....\$1.25
Vegetable.....\$1.25

CHIPS
Small.....\$.59
Large.....\$.69

DESSERTS
Cookie.....\$.70
Cake.....\$.60

Annie had a \$5.00 bill. She bought a peanut butter and jelly sandwich, an apple, and a carton of milk. How much change did she receive?

3) Joe and Tina are playing a game. At the end of each game, the loser gives the winner a chip. After a while, Joe has won 3 games and Tina has 3 more chips than she had when she began playing. How many games did they play?

4) **A. (Constructing diagrams)**
What is the fewest number of lines you need to make exactly five equilateral triangles?

B. (Looking for Patterns)
Sally is having a party. The first time the doorbell rings one guest enters. If on each successive ring a group enters that has 2 more persons than the group that entered on the previous ring, how many guests will have arrived after the 20th ring?

C. (Role Playing)
Pistol Pete buys a horse for \$50.00, sells it for \$60.00, buys it back for \$70.00, and sells it again for \$80.00. How much money did he gain or lose on these deals?

D. (Use charts, tables)
How many different ways can you make change for a 50 cent coin without using pennies?

E. (Guessing and Checking)
What is the smallest counting number you can find that has 6 different factors?

STANDARD 2 Mathematics as Communication

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) use varied means of communicating mathematical ideas.	1-a) translate mathematical ideas from one form to another (e.g. concretely, pictorially, verbally, and in written form). 1 - b) listen to, represent, discuss, read, and write mathematical ideas and concepts.	

STANDARD 2
Mathematics as Communication
Examples

- 1 - a) **Maria had some pencils in her desk. She put 5 more in her desk. Then she had 14. How many pencils did she have to start with?**

Demonstrate to a classmate how counters may be used to represent the problem, draw a picture to represent the pencils, tell how you would find the solution. Write an open sentence for this problem and find its solution. Verify your results with other students.

- 1 - b) **Discuss and write about your approaches to the solutions problems posed to you. Note: Have students work in cooperative groups to discuss possible solutions to problems.**

STANDARD 4 Mathematical Connections

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<ul style="list-style-type: none">1) make connections between conceptual and procedural knowledge.2) make connections of mathematical topics in other curriculum areas.	<ul style="list-style-type: none">1) apply mathematical concepts in the solution of real life problems.2) solve mathematical problems within the environment of other curriculum areas.	

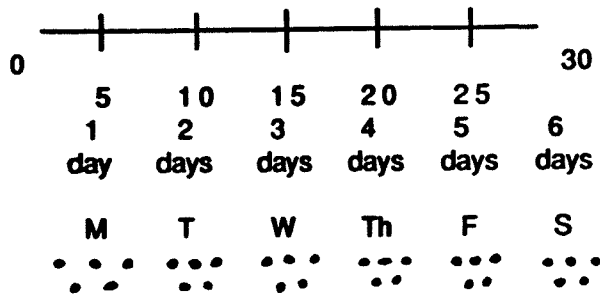
STANDARD 4
Mathematical Connections
Examples

- 1) **Peggy must swim 30 kilometers in 6 days to practice for the team. If she swims the same distance each day, how far must she swim each day?**

Note: Students need to see the connection of a variety of solutions.

$$6 \times n = 30$$

$$30 \div 6 = \square$$



- 2) **Compute your pulse rate by counting the number of heartbeats for 10 seconds and then multiply by 6. Repeat by counting the heartbeat for 15 seconds and multiply by 4.**

Given a map of Kansas and the chosen route, compute the mileage between Kansas City and Dodge City.

STANDARD 5

Estimation

Examples

1) Apply estimation strategies to the following problems:

A. (Front-end with adjustment)

\$ 1.26

4.79 Add whole number part (left-most digit)

.99 $1+4+0+1+2=8$

1.37 Adjust by looking at decimal parts

2.58 $.26 + .79 = 1$
 $.99 = 1$
 $.37 + .58 = 1$
3

Therefore, the estimate is $8 + 3 = 11$

B. (Rounding)

\$4.78

2.93 Round number to nearest whole number

1.25

3.12 $5 + 3 + 1 + 3$

Therefore, the estimate is 12

C. (Special Numbers)

Examples of special numbers are 1, 10, 100, 1000, 1/2, 0
 Estimate by rounding to one of these numbers.

67×102 Estimate 67×100 or 6700

$5421 + 9.87$ Estimate $5421 + 10$ or 542.1

$\frac{4}{7} + \frac{12}{13}$ Estimate $1 + \frac{1}{2}$ or $1 \frac{1}{2}$

$4805 \times \frac{11}{21}$ Estimate $4805 \times \frac{1}{2}$ or 2400

D. (Clustering)

Clustering can be used as an estimation strategy when you have a group of numbers that cluster common value.

7225

6734 This set of numbers clusters around 7000.

6829 A good estimate would be 7000×6 or 42000.

7295

7101

+ 6642

E. (Compatible "nice" Numbers)

Compatible (nice) numbers are numbers that can easily "fit together" and are easy to manipulate mentally. Take a global look at all numbers, look for numbers that can be paired for easy computation.

27		
49	}	$27 + 81 = 100$
38	}	$49 + 56 = 100$
56	}	$38 + 65 = 100$
81	}	
<u>+ 65</u>		

Therefore, the estimate is 300.

2) Find Good Estimates

When shopping you have selected items that cost \$3.29, \$1.42, \$3.12 and \$3.69. You have \$10 in your pocket. How can you tell at a glance if you have enough money?

1-26

STANDARD 6 Number Sense and Numeration

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<p>1) relate counting, grouping, and place value concepts.</p>	<p>1-a) link written symbols with physical models and oral names. (e.g., "25" and "twenty five" to a set of objects)</p> <p>1 - b) count to find the number of objects in a set, count on to a given number, count backwards, and skip count with and without manipulatives.</p> <p>1-c) demonstrate knowledge of place value and regrouping with and without manipulatives.</p> <p>1-d) demonstrate understanding of number meanings with cardinal and ordinal numbers.</p> <p>Note: The students will use concrete materials, real-life situations, and pictures to develop mathematical relations.</p>	

1-217

STANDARD 6
Number Sense and Numeration
Examples

1 - a) 25 and "twenty-five" to



1 - b) Count a given set of objects.

Start with 25 and count to 40 by ones.

Start with 18 and count backwards to 0.

Start with 0 and count by 2's, 5's, etc.

1 - c) (Place Value)

If you had 256 beans, how many piles of 10 beans could you make?

Using place value materials (i.e., popcicle sticks, place value blocks, place value grid, etc.), show the numeral 179.

(Regrouping)

What is another name for 5 tens and 12 ones?

1 - d) (Cardinal number)

Identify the number associated with a set of objects (e.g., the number four).



(Ordinal number)

When children are in line, ask questions about their positions. Who is third in line? Who is eleventh in line, etc..

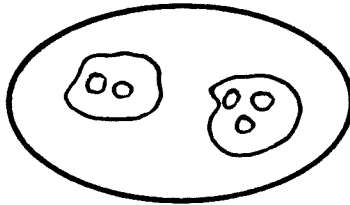
STANDARD 7 Concepts of Whole Number Operations

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) demonstrate an understanding of the concepts of the computational skills.	1) represent the operations of addition, subtraction, multiplication, and division using models, manipulatives, and other devices.	

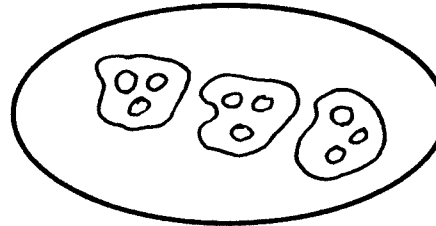
STANDARD 7
Concepts of Whole Number Operations
Examples

- 1) Use manipulative materials (sticks, toothpicks, straws, counters, base ten blocks) to represent the operations of addition, subtraction, multiplication and division.

$2 + 3$

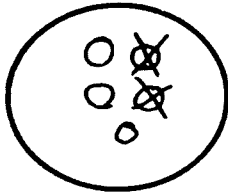


addition

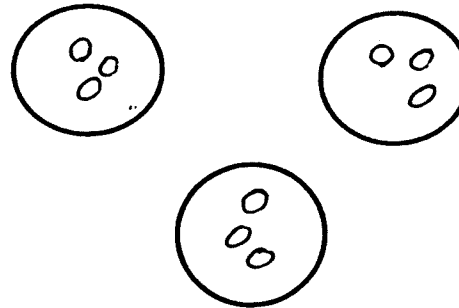


multiplication 3 X 3

$5 - 2$



subtraction



division 9 ÷ 3

STANDARD 8 Whole Number Computation

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) compute with whole numbers.	1-a) have quick recall of the basic facts of addition, subtraction, multiplication, and division. 1-b) add, subtract, multiply, and divide whole numbers. Note: Multiplication and division should be limited to one digit multipliers and divisors.	

STANDARD 8
Whole Number Computation
Examples

1 - a) Solve addition problems whose addends are single digits:

$$\begin{array}{r} 0 \\ + 0 \\ \hline \end{array} \quad \text{through} \quad \begin{array}{r} 9 \\ + 9 \\ \hline \end{array}$$

Solve subtraction problems where the minuends are between 0 and 18 and the subtrahends are single digit numerals:

$$\begin{array}{r} 0 \\ - 0 \\ \hline \end{array} \quad \text{through} \quad \begin{array}{r} 18 \\ - 9 \\ \hline \end{array}$$

Solve single digit multiplication problems from:

$$\begin{array}{r} 0 \\ \times 0 \\ \hline \end{array} \quad \text{through} \quad \begin{array}{r} 9 \\ \times 9 \\ \hline \end{array}$$

Solve division problems using the basic division facts.

$$1 \overline{)1} \quad \text{through} \quad 9 \overline{)81}$$

1 - b) Add: $\begin{array}{r} 5637 \\ + 8994 \\ \hline \end{array}$ Multiply: $\begin{array}{r} 719 \\ \times 8 \\ \hline \end{array}$

Subtract: $\begin{array}{r} 7020 \\ - 3641 \\ \hline \end{array}$ Divide: $6 \overline{)5918}$


Note: For multi-digit multipliers and divisors, use a calculator.

STANDARD 9 Geometry and Spatial Sense

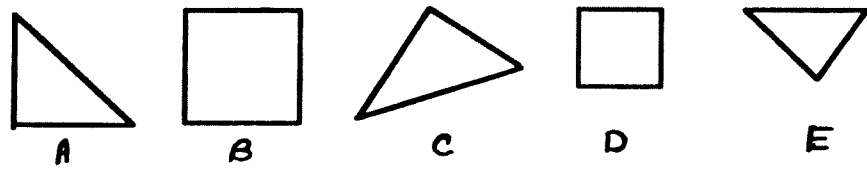
GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<p>1) demonstrate spatial sense.</p> <p>2) identify, describe compare and classify geometric figures.</p> <p>3) visualize and represent geometric figures.</p> <p>4) understand and apply geometric properties and relationships.</p>	<p>1) relate the direction, orientation and perspective of objects in space as well as the relative shapes and sizes of figures and objects.</p> <p>2 - a) describe and classify geometric shapes, points, lines and line segments.</p> <p>2 - b) describe relationships among geometric shapes, points, lines and line segments including congruence and similarity.</p> <p>3) draw/sketch geometric figures.</p> <p>4-a) use geometric properties and relationships to solve real-world and mathematical problems (e.g., perimeter, area)</p> <p>4-b) use manipulatives such as geoboards, tangrams, and pattern blocks to demonstrate geometric concepts.</p>	

Standard 9
Geometry and Spatial Sense
Examples

1) What would be the next shape in the following pattern. 

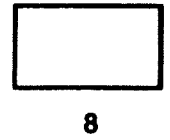
2-a) Given the figures 

- Which figure is a square?
- Which figure is a line segment?
- Which figure is a triangle?

2-b) Given the figures 

- Which figures are similar?
- Which figures are congruent?

3) Draw a sketch of a right triangle. Draw a sketch of a parallelogram.

4) Find the perimeter of a rectangle that has 6 inches and 8 inches for the length of its sides. 

What is the area of the rectangle below. 

STANDARD 10 Measurement

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<p>1) describe an object or event according to its measurement attributes.</p> <p>2) estimate and measure a quantity appropriately.</p> <p>3) apply measurement concepts.</p>	<p>1) describe an object or event according to one or more of the following attributes:</p> <ul style="list-style-type: none"> • length • capacity • weight (mass) • area • volume • temperature <p>2) measure a quantity in the metric or customary units, select the appropriate measuring instrument and label the answer correctly.</p> <p>Note: Separate units will be presented utilizing the metric and customary units. Discourage conversion.</p> <p>3 - a) identify appropriate measurement units, convert from one unit to another in the same measurement system and solve problems involving measurement.</p> <p>3 - b) measure concrete materials from real-life situations and applications in other curriculum areas.</p>	

1-35

**Standard 10
Measurement
Examples**



1) Examine a rectangular box.

- How tall is the box?
- How wide is the box?
- What is the area of the top of the box? (Hint: use grid paper)
- How much will it hold (volume)? (Hint: use cubes)

2) Measure the length of a given object in inches. (to nearest inch)
Or, measure the length of it in centimeters. (to nearest centimeter)

Note: Instruction on metric and English systems of measurement should be presented as separate units.
Discourage conversion!

3 - a) Identify the metric unit of measure that you would use to measure the following:

- A persons' weight.
- The distance between towns.
- The width of a student desk.
- The weight (mass) of a penny.

Convert the following measurement units to the designated unit.

- One meter = _____ centimeters.
- 2 feet = _____ inches.

3 - b) Find the length in centimeters of one of your steps.

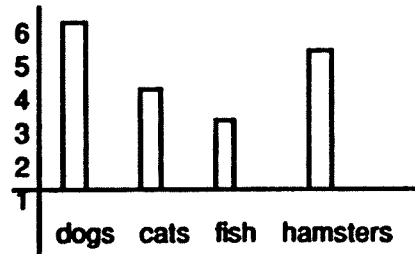
STANDARD 11 Statistics and Probability

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<p>1) understand and apply statistics.</p> <p>2) understand the concept of chance.</p>	<p>1 - a) collect, organize, and describe data.</p> <p>1 - b) construct, read, and interpret displays of data including pictorial, bar and line graphs.</p> <p>1 - c) formulate and solve problems that involve collecting and analyzing data.</p> <p>2) determine the probability of a given outcome for rolling a cube, flipping a coin, or spinning a spinner.</p>	

Standard 11
Statistics and Probability
Examples

- 1 - a) Find the length of each of five of your classmates shoes. Make a chart of this data. Find the average length of the shoes.
- 1 - b) Survey the class to determine the favorite pet of the students. Make a chart of the results. Construct a graph of the data (pictorial, bar or line).

Dogs	6
Cats	4
Fish	3
Hamsters	5



- 1 - c) You are planning a party. In order to determine what kind of soft drinks to buy you decide to conduct a survey of the students in your class to determine their favorite soft drink. Conduct the survey and analyze the data to determine the most popular soft drinks.
- 2) Number the sides of a cube with the numbers 1-6. Roll the cube 50 times and record the number from the top face. Based upon these data, what is the probability that a three would be rolled on the next toss of the cube.

STANDARD 12 Fractions and Decimals

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) demonstrate an understanding of the concepts and number sense of fractions and decimals.	1 - a) use models and manipulative materials to represent and develop concepts/number sense, of fractions, mixed numbers and decimals. 1-b) relate fractions to decimals and decimals to fractions. 1-c) explore the computational skills of fractions and decimals. Note: Students will use manipulative materials such as pattern blocks, fraction bars, Cuisenaire rods, and place value blocks to demonstrate the concepts of fractions and decimals.	

STANDARD 12
Fractions and Decimals
Examples

- 1 - a) Given a set of place value (base 10) blocks. Assign the value 1 to the flat (piece divided into 100 parts). The rods (piece divided in 10 parts) would represent $\frac{1}{10}$ and the small cube would represent $\frac{1}{100}$. The decimal .23 would be represented by 2 rods and 3 cubes.
- 1 - b) Divide congruent shapes into halves, thirds, fourths, fifths, sixths, eighths. Compare the congruent parts of different shapes to determine the family of equivalent fractions.
- 1 - c) Mark off a 10 x 10 grid on a sheet of paper. Fold the paper in half. Compare the fraction $\frac{1}{2}$ and the decimal .50. Do the same for $\frac{1}{4}$ and .25.

STANDARD 13 Patterns and Relationships

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) understand patterns. 2) use patterns.	1) recognize, describe, extend and create a wide variety of patterns. 2) utilize patterns to represent and describe mathematical relationships. Note: Students should utilize manipulatives including colored discs and pattern blocks to create and extend concepts of patterning.	

STANDARD 13
Patterns and Relationships
Examples

1) Complete these patterns

2, 4, 6, 8 _____

△ □ △ □ _____

□ □ □ □ _____

1, 4, 9, 16, 25 _____

1, 1, 2, 3, 5, 8 _____

2) Use the chart of data to write a mathematical relationship between X and Y for the data.

X	Y
1	4
3	6
7	10
8	11
2	5

1) Make a color pattern (red, green, yellow) using colored links.

1) Create a pattern using the shapes in pattern blocks. Explain your pattern to a classmate.

2) Using your geoboard, form a square having 2 pegs on a side. How many pegs are there enclosed? Form a square by using 3 pegs on a side. How many pegs are now enclosed? Continue this until you can recognize a pattern between the number of pegs on the side and the number of pegs enclosed.

1-42

Notes: K-4 Standards

GRADES 5-8

144

MATHEMATICS STANDARDS

Grades 5-8

On completion of mathematics studies in grades 5-8, the students will demonstrate mathematics skills in the following areas according to these standards:

I. Mathematics as Problem Solving

The students will apply problem-solving strategies to solve routine and non-routine problems, both numerical and non-numerical. The student will verify and interpret solutions to problems and be able to extend problem solutions to new situations.

II. Mathematics as Communication

The students will develop skills in using mathematical language as a means of communicating ideas in a variety of ways. The students will understand the role of mathematical definitions and will use symbols to express mathematical ideas.

III. Mathematics as Reasoning

The students will recognize and apply deductive and inductive reasoning in mathematical and real-world contexts. The students will formulate and validate conjectures and arguments.

IV. Mathematical Connections

The students will make appropriate connections in order to see mathematics as an integrated whole. The students will recognize the historical role of mathematics and will use mathematics to model situations in other disciplines.

1-45

V. *Number and Number Relationships*

The students will use numbers and number relationships in a variety of forms while developing an understanding of the concepts and patterns of number systems.

VI. *Number Systems and Number Theory*

The students will use number systems and number theory in a variety of forms while developing an understanding of concepts and patterns. The student will perform operations with various forms of numbers and will apply number theory concepts including the unique roles of 0 and 1 as numbers.

VII. *Computation and Estimation*

The students will understand and apply techniques of computation and estimation using the rational number system.

VIII. *Patterns and Functions*

The student will recognize, describe, explore and create patterns using mathematics. The students will analyze and use functional relations.

IX. *Algebra*

The students will use fundamental algebraic concepts including the uses of variables and variable expressions. The students will solve simple linear equations and inequalities.

X. *Statistics*

The students will apply statistical techniques in real-world situations. The students will collect, organize, describe, and use techniques of statistical analysis to draw inferences from real-world data.

1-416

XI. Probability

The students will apply principles of probability to mathematical and real-world situations. The students will compare experimental results and mathematical expectations and will apply probability in the real world to predict outcomes and evaluate results.

XII. Geometry

The students will use geometric concepts and relations and apply them in solving problems. The students will identify, describe, compare and classify geometric figures. The student will visualize, represent, and apply transformations to geometric figures. The student will apply geometric properties and relationships in problem solving.

XIII. Measurement

The students will estimate and measure using appropriate measuring instruments and units when solving problems. The students will understand the structure and use of a measurement system.

1-47

MATHEMATICS STANDARDS
Grades 5-8 Core Curriculum

STANDARD 1 Problem Solving

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) solve non-routine problems. 2) formulate numeric and non-numeric problems. 3) verify and interpret solutions to problems. 4) extend problem solutions to new situations.	1) * solve multi-step and non-routine problems in a variety of contexts (e.g., number relationships, geometry, probability, statistics, wise consumerism, leisure, and vocational activities). 2) formulate and solve problems in a given situation. 3 - a) verify whether or not a given solution is a good or viable solution to a stated problem. 3 - b) interpret the meaning of a solution in terms of the situation describing the problem. 4) generalize solutions and strategies and be able to transfer those to new problem situations.	

- * Note: Students will apply problem-solving strategies including those developed in the K-4 Standards as well as:
- Working backwards
 - Solving a simpler problem
 - Applying proportional reasoning
 - Breaking a mind set
 - Conjecturing and testing

STANDARD 1 Problem Solving Examples

- 1) Sharon wants to buy a used car for \$6,800. The car dealer gave Sharon two options for buying the car. She could pay the full amount in cash, or she could pay \$2,000 down and \$230 a month for 24 months on the installment plan. How much more would Sharon pay for the car on the installment plan?
- 2) Brian is ordering photocopying paper. He can purchase a 10-pack box with 200 sheets in a pack for \$18, or he can get a 5-pack box with 500 sheets per pack for \$20. Which is the better buy?

Plan a hypothetical fund-raising activity to collect as much money as possible. The plan is to have people lay a line of coins side to side. Determine which way the fund-raiser would raise the most money, pennies laid end to end in the longest school hallway or nickels laid end to end in the shortest hallway. What is the difference in the amount that would be collected?

Play DJ! You are going to be DJ's and must work in groups to generate a list of any ten songs you like. Determine the playing time for each song to the nearest second. Select nine commercials and time each one. Put these together to form a segment of a radio show. Write any dialogue necessary and time it. Submit a request for the total air time needed.

- 3 - a) This problem has data missing. Make up appropriate data. Then solve the problem using your data.
Problem: Seventy-two students signed up for track intramurals. Each team is to compete in 3 track meets.
How many meets should be scheduled?
- 3-b) Determine whether the answer given for this problem is reasonable. If the answer is not reasonable, explain why not.
Problem: During the regular season 14,079 fans attended Chanute's home games. The away games were attended by 9,759 fans. How many more fans went to the home games? Answer: 6,278 more fans went to the home games.
- 4) One million candies need to be packed in boxes placed in cartons loaded on a truck. How many trucks are needed if 60 candies are placed in each bag, 24 bags are in each carton and the cartons are stacked 6 across, 10 deep, and 5 high in the truck?
(Hint: Try working backwards from the problem in Standard 5.4.)

STANDARD 2 Communication

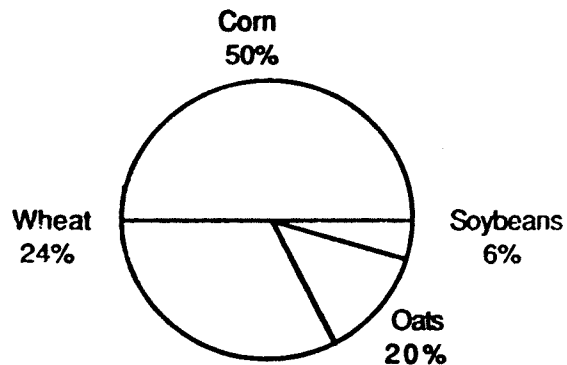
GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) use varied means of communicating mathematical ideas. 2) understand the role of mathematical definitions. 3) use mathematical notation. 4) use mathematics to model situations in other disciplines.	1) translate a mathematical idea from one form to another (e.g., oral, written, pictorial, concrete, graphical, and algebraic forms). 2-a) identify examples and non-examples of a mathematical concept, given a definition of the concept. 2-b) formulate a definition of a mathematical concept using essential components. 3) use symbols to express mathematical ideas. 4) communicate necessary mathematical techniques and problem solving steps that arise in other disciplines and real-life situations (oral, written, pictorial, graphic, etc.)	

1-5D

STANDARD 2 Communication Examples

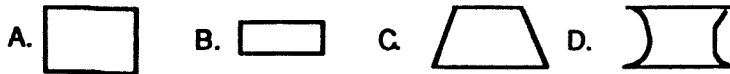
- 1) Use Kansas Abstracts and gather data on one of the crops harvested in Kansas. Develop a graph to show the production. Collect data on the weather for each of the years. Collect data on the average price that farmers earned. What effect did price have on production? Discuss this work with your group and submit a written report on your findings.

1)



The diagram represents a crop of 30,000 bushels.
How many bushels of soybeans were harvested?

- 2-a) Which of the following figures is not a quadrilateral?



- 2-b) Define angle.

- 3) Choose the correct symbols to represent this statement:

Three more than a number.

- A. $y/3$ B. $y - 3$ C. $y + 3$ D. $3y$

- 4) Play the role of a person who works for the weather bureau. Your task is to determine accurately the amount of precipitation that the current snowfall has produced. Do your research by finding an undisturbed area, carefully collect samples of snow with known volume and know surface area. Allow the snow to melt and determine the amount in tenths of inches of precipitation.

- 4) While studying a world region in social studies, develop charts and graphs to show population density.

- 4) Develop a plan listing the steps of how you would identify the problem, collect the necessary data, analyze the data, reach appropriate conclusions, and report the findings in this situation: You are ordering for an ice cream store. Determine the appropriate proportion of each flavor you should order.

STANDARD 3
Reasoning
Examples

- 1 - a) Following the pattern, predict the shape of the next figure in the sequence.



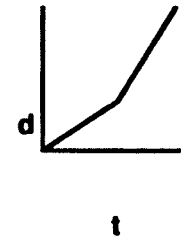
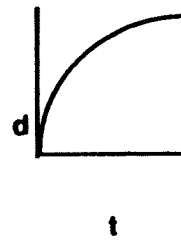
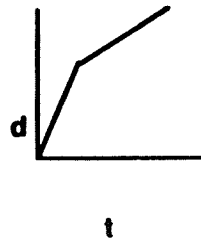
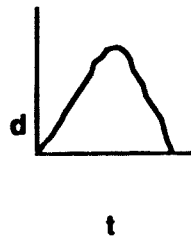
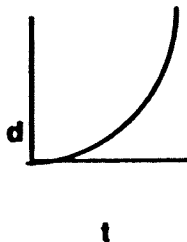
- 1 - a) Suppose another school challenged your school to try and read 1,000,000 pages in library books in free time and at home. How realistic would this goal be for your school? Approximately how long would it take? Suppose a local pizza company was willing to give your school a pizza party if you could accomplish the million pages in a year, is it reasonable to expect your school could have the party?
- 1 - b) Gather data for at least a six-week period on the number of students that eat a full school lunch. Study the data carefully. From your data, create a five-day menu plan that would have the highest proportion of students eating in the cafeteria. Make a plan to see if you can convince the cafeteria to serve your planned meals. Use any constraints they must employ. If the meals are actually served, analyze the data and determine how accurate you were and where you made mistakes. Hypothesize why your plan had flaws.
- 1 - b) Clue 1: Tom has 13 nickels and dimes.
Clue 2: The coins have a total value of 95c.
How many dimes does Tom have?
- 1 - b) Clue 1: One number is three more than a second number.
Clue 2: Both numbers are integers.
What could the numbers be?
- 2) Maria was born Nov. 17, 1976. She has to turn 13 by Sept. 1, 1990, to be eligible to participate in basketball. Will she be able to participate this year? Why or why not?

STANDARD 4 Mathematical Connections

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) see mathematics as an integrated whole. 2) use mathematics to model situations in other disciplines.	1) describe a situation in differing mathematical ways (graphic, numeric, algebraic, or verbal). 2) solve problems that arise from other disciplines and real-life situations (i.e., art, music, psychology, science, business, etc.).	

STANDARD 4
Mathematical Connections
Examples

- 1) Mary and her brother John leave home together to walk to school. Mary thinks they are going to be late, so she starts out running, then tires and walks the rest of the way. John starts out walking and starts to run as he nears the school building. They arrive at the same time. The graphs in the figures show the distance from their home on the vertical axis and time on the horizontal axis. Which graph best represents Mary's trip? John's trip? (See NCTM Standards, pp 100-101)



- 2) You are to be in charge of planning a field trip to four locations in Kansas. One of the locations must be of historical significance, one must be to a fun place, and one must be at least 100 miles from your own town. Develop procedures for selecting the four locations and prepare a plan including the time it will take to reach each of the locations, mileage, and how long one would spend at the location to appreciate it. Calculate the cost of the trip using the type of transportation that your school usually uses for field trips. Would it be cheaper to come home each night or to spend one night in a motel when you travel the distance? What are the admission charges that must be paid? Prepare a presentation to your class on your ideas.
- 3) An architect was hired to build a monument for a Civil War battlefield. The structure was to be a pyramid made out of cannonballs. The base of the pyramid was to be 81 cannonballs with 9 cannonballs on a side. How many cannonballs were needed to build the monument? (Hint: Make a table and look for a pattern.)
- 4) A toy store owner is planning his order of toys for the upcoming holiday season. Describe how the owner of the store can use mathematics to predict how many toys to buy without having too many left over.

STANDARD 5 Number and Number Relationships

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<p>1) represent and use numbers in a variety of forms.</p> <p>2) show number sense.</p>	<p>1- a) show the need for and uses of integers, fractions, decimals, rational numbers, percents, exponents, scientific notation, and ratio and proportion in the world and mathematical problem situations.</p> <p>1- b) investigate relationships among integers, fractions, decimals, and percents and various operations on these numbers.</p> <p>2- a) identify relative size and order of a set of numbers in different forms (e.g., fractions compared to decimals).</p> <p>2- b) use appropriate forms of a given number (e.g., When is a fraction appropriate? When is a decimal appropriate?).</p> <p>2- c) determine if the magnitude of a number is appropriate for the situation it is describing (e.g., Is the answer obtained on a calculator reasonable?).</p>	

1-516

STANDARD 5 Number and Number Relationships

- 1 - a) Jose had a balance of \$150 in his checking account. He wrote checks for \$75.39, \$16.59, \$53.00 and \$35.49. What is his bank balance?
- 1 - a) Pepsico's stock opened the week at $26 \frac{3}{4}$. During the week, it rose $\frac{1}{4}$ on Tuesday, fell $\frac{1}{2}$ on Wednesday, fell $\frac{1}{8}$ on Thursday, and rose 3 on Friday. What did it close at on Friday afternoon?
- 1 - a) A baseball player set a personal goal of hitting 28 home runs for the season. He hit 34 home runs. What percent of his personal goal did he reach?
- 1 - a) The moon has a mass of 7.35×10^9 metric tons. Write this number as a decimal.
- 1 - b) Collect attendance data for each class in the school. Calculate the proportion and the percent of attendees in each class and the total school.
- 1 - b) Bill got $\frac{13}{15}$ right on a quiz and Tammy got $\frac{14}{17}$ correct on another quiz. Which was the better score?
- 2 - a) Rank these batting averages from least to greatest:
George 0.286 Ron thirteen out of thirty-five
Tuong 0.33 Gabe one out of four
- 2 - b) Identify whether the appropriate form of measure would be in a decimal or fraction form.
money gasoline recipes weights
- 2 - b) Work in groups to generate a list of measures that are usually expressed as fractions and those that are usually expressed as decimals.
- 2 - b) Work in groups to generate a list of measures that are usually expressed as fractions and those that are usually expressed as decimals.
- 2 - c) Which of the following numbers most appropriately represents the population of the state of Kansas?
A. 200,000 B. 170,000,000 C. 1,500,000
- 2 - c) Of the following, which would be appropriate for the miles per gallon average for a Ford Taurus?
A. 3 mpb B. 30 mpg C. 300 mpg D. 3,000 mpg
- 2 - c) Kim was having a birthday party. She went to the store and bought $3 \frac{3}{4}$ pounds of hamburger at \$1.29 a pound. The clerk ran it over the scanner and the total was \$48.38. Should Kim pay this amount? Why or why not?
- 2 - c) Use estimation in a research project such as:
• the amount of soft drink a teen-ager consumes in a week.
• the amount of milk a typical 16 year old boy consumes in a week
• the amount of water it takes to fill a bath tub.

STANDARD 6 Number Systems and Number Theory

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<p>1) understand operations with various forms of numbers.</p> <p>2) apply number theory concepts.</p> <p>3) understand the unique roles of zero and one as numbers.</p>	<p>1-a) show how the basic arithmetic operations are interrelated.</p> <p>1-b) give examples in real-life situations where whole numbers are not sufficient to describe situations.</p> <p>2) apply primes, factors, and multiples in real-world and mathematical problem situations.</p> <p>3) apply zero and one in all forms of computation (addition, subtraction, multiplication, division, and exponentiation).</p>	

1-58

STANDARD 6
Number Systems and Number Theory
Examples

- 1 - a) Given a starting number and an ending number, create a number puzzle that chain numbers and operations together. You must use all four operations. Create as long a chain as possible.
- 1 - a) How is $26 + 14$ related to $260 + 140$?
- 1 - b) Brainstorm lists of situations where numbers are used. Classify these by their use as whole numbers, fractions, decimals, and integers. Find a situation in which a number used in not one of these.
- 1 - b) The price of a share of stock has risen from $5 \frac{1}{4}$ to $6 \frac{1}{8}$. How much has the value risen?
- 2) Todd worked in an egg packaging plant as a packer. He packed 12 eggs in each carton and 24 cartons in each crate. There were 48 crates in each truck. How many eggs were in each truck?
- 3) $27 \times 38 \times 1 \frac{1}{2} \times 100 \times 0 \times 62 = ?$
- $3^0 = ?$ $16 \times \underline{\quad} = 0$
- $17 + 0 = ?$ $129 \times 1 = ?$ $6 \frac{1}{3} \times \underline{\quad} = 6 \frac{1}{3}$
- 3) Given a target number, create a chain using each operation at least once and return to the number from which you started. (e.g., $12 + 5 \times 2 - 10 + 48 + 4 - 12 = 12$)

STANDARD 7 Computation and Estimation

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<p>1) compute in the rational number system.</p> <p>2) understand and apply techniques for computation.</p> <p>3) use estimation appropriately.</p>	<p>1) compute using appropriate techniques and technology (mental arithmetic, estimation, paper-and-pencil, calculator, and computer).</p> <p>2-a) explain basic computational algorithms, either concretely or as a result of number system properties.</p> <p>2 - b) apply appropriate computational techniques to solve a problem.</p> <p>3 - a) explain and demonstrate techniques for estimating.</p> <p>3-b) use estimation to check the reasonableness of results.</p>	

1-100

STANDARD 7
Computation and Estimation
Examples

1) If a pizza bill of \$17.93 is to be split among 3 diners, about how much should each person pay?

1) Write a plan and estimate the number of pages in the fiction section of your school library.

2-a,b) **Teaching Notes:** A knowledge of basic facts and procedures is critical in mental arithmetic and estimation. Knowing that $8 \times 7 = 56$ is a basis for finding 8×700 mentally, multiplying $(+8) \times (-7)$, estimating 824×689 and estimating 8.24×6.89 .

When problem solving, valuable class time should not be devoted to developing students' proficiency in calculations such as 824×689 or 8.24×68.9 with pencil and paper, since these exercises can be done more readily with a calculator. (See K-4 Standard 7.)

2 - b) Your class members each have \$25.00 to spend. You must develop at least 2 spending plans and spend between \$24.00 and \$25.00. In one plan, you must save at least 20%. In the other, you need to spend something on your friends. Remember that any purchase you make must include sales tax.

2 - b) Keep a daily progress chart of your grades. Determine if the calculation is reasonable considering the data. Set a target grade average and try to reach it.

3) How many aluminum cans do you need to collect at the rate of 30 cents a pound to earn \$20.00? Estimate how much space will they take up if they are not crushed and if they are crushed. Present some calculation to verify the accuracy of your prediction.

Note: Also see K-4 Standards Examples.

3) Sarah's calculator showed the answer 676.8 after she multiplied 9.4×7.2 . Her estimate suggested the answer should be about 9×7 or about 63. What did she do wrong?

STANDARD 8 Patterns and Functions

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) describe and create patterns. 2) analyze and use functional relationships.	1-a) describe a pattern using words, mathematical formulas, and/or illustrations (e.g., a sequence of numbers, a set of geometric figures, a series of transformations on a figure). 1-b) create and explain a pattern 2-a) describe and represent relationships with tables, graphs, and rules. 2-b) explain how a change in one quantity of a functional relationship results in a change in another quantity. 2-c) solve problems that involve a functional relationship.	

1-102

STANDARD 8
Patterns and Functions
 Examples

- 1 - a) Investigate what happens when different sized cubes are constructed from unit cubes, the surface is painted, and the large cube is then disassembled into its original unit cubes. How many of the $1 \times 1 \times 1$ cubes are painted on three faces? two faces? no faces? (Note: These are triangular and square numbers.)
- 1 - b) Create a list of numbers which follow a pattern and have someone determine the next number in the pattern. Also investigate triangular and square numbers.
- 1 - b) Using pattern blocks, create a pattern. Have a classmate describe your pattern and extend it.
- 2 - a) Play "Guess My Rule". Or complete a table when given 2 of its 3 components.

Input	Rule	Output
x	$2x + 3$	
1	$2(1) + 3$	4
?	$2(?) + 3$	9
5	?	?

- 2 - b) Start with a $1''$ cube and explain what happens when one, then two, then all three dimensions are doubled. (i.e., $1 \times 1 \times 1 = 1$ cu in, $2 \times 1 \times 1 = 2$ cu in, $2 \times 2 \times 1 = 4$ cu in, $2 \times 2 \times 2 = 8$ cu in)
- 2 - b) Given a collection of circular objects, a measuring tape and a calculator, measure and complete a table showing the characteristics of each object. List its diameter, radius, circumference, $d/2$, d/r , $c \times d$, and c/d . Describe any consistent relationships you find. Find the average of all the data your class collected in the c/d column. How close does this approximate π ?
- 2 - c) Good news travels fast. Iris saved enough money from her paper route to buy a new bicycle. She immediately told two friends, who, ten minutes later, each repeated the news to two other friends. Ten minutes later, these friends told two others. If the news continues to spread in this fashion, how many people will know about Iris' new bicycle after 80 minutes?

1-63

STANDARD 9 Algebra

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) understand and apply variables, expressions, equations, and inequalities.	1-a) identify variable quantities in a problem statement. 1-b) write symbolic expressions, equations, and inequalities representing relationships described in a verbal statement. 1-c) solve linear equations and inequalities in one variable. 1-d) solve real-world and mathematical problems using algebraic methods.	

11-1

STANDARD 9
Algebra
Examples

- 1 - a) Gerry spent x dollars at the grocery store, y dollars on gas, and z dollars at a restaurant with friends. What are the variable quantities?
- 1 - b) In 1990, the population of the United States was 227,547,082. Of this number, u people lived in urban areas and r lived in rural areas. Write an equation to represent the above information.
- 1 - c) Mark had 5 hits in last night's baseball game and Jeff had n hits. Together they had 12 hits. Write an equation and solve for the number of hits Jeff had.
- 1 - d) A cookbook recommends that you roast a turkey $\frac{3}{4}$ hour for each kg of turkey. How large a turkey could be cooked in $2\frac{3}{4}$ hours? Write an equation and solve.
- 1 - d) In 1626, Peter Minuit bought Manhattan Island from the Manhattan Indians for beads, clothing, and trinkets worth about \$24. If that money had been invested at 7% annual yield, what would be its value in 1990?

1-45

STANDARD 10 Statistics

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) understand and apply statistics.	1-a) collect, organize, and describe data. 1-b) construct, read, and interpret displays of data. 1-c) make inferences and convincing arguments based on data. 1-d) evaluate arguments that are based on data analysis. 1-e) identify valid and invalid uses of statistics.	

Note: Formulating key questions, interpreting graphs and charts, and solving problems are important goals in the study of statistics. Once data are collected and organized, questions which guide students in interpreting the data might include: What appears most often in the data? What trends appear in the data? What is the significance of outliers? What interpretations can we draw from these data, and can we use our interpretations to make predictions? What additional data can we collect to verify or disprove the ideas developed from these data?

In addition to traditional forms of graphs, students should also use histograms, scatter plots, line plots, box-and-whisker plots, and stem-and-leaf plots to display data for analysis.

1-66

STANDARD 10
Statistics
Examples

- 1 a-d) Collect data on a school sports team and analyze it. As a sample, consider this table from an NBA championship game between Los Angeles and Boston. Using the table, generate such new information as points/minute, rebounds/minute, points/field goals attempted. Who is the best percentage shooter?

Player	Minutes Played	Field Goals/Rebounds	Assists	Points
Worthy	37	8 / 19	5	20
Johnson	34	8 / 14	12	19
Bird	31	8 / 14	9	19
McHale	32	10 / 18	0	26

- 1 - d) Graph how many words you can read in one minute, 5 minutes, and 15 minutes. Using that information, predict how many words you could read in 30 minutes, 60 minutes, and 120 minutes. Actually conduct the experiment and check the validity of your prediction. What factors affect the outcomes? Are there any that can be controlled?
- 1 - e) Make a scrapbook of graphs. Choose three examples from the book one of which is an example of a well-prepared graph. A second should illustrate a graph that shows misleading information. Be able to explain why it is misleading and what would need to be done to correct it. A third should be a graph that is essentially correct but with minor changes could be even better. Explain what these changes might be.
- 1 - e) The prices of some houses in a neighborhood are \$25,000, \$36,000, \$42,000 and \$150,000. Would the mean, median, or mode be the best indicator of the value of houses in this neighborhood?
- 2) Make a list of things that are likely to happen to all students, might happen to all students, and things which would not happen to all students. After making the list, work with your group and try to rank order them from most likely to happen to least likely to happen.

1-67

STANDARD 11
PROBABILITY
Examples

1 - a,b) Survey your school on an election issue. Predict the outcome of the election based on your survey results.

1 - a,b) The table gives the record for Joan Dyer's last 100 times at bat during the softball season. She is now coming up to bat. Use the data to answer the following questions:

Home runs	0
Triples	2
Doubles	16
Singles	24
Walks	11
Outs	38
Total	100

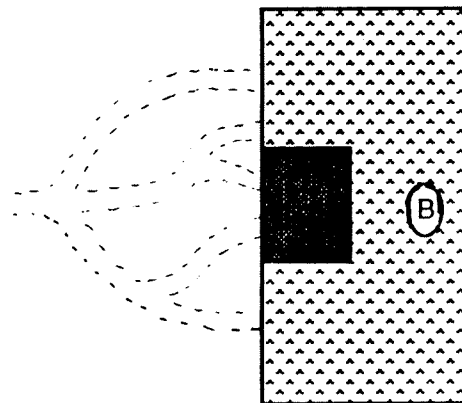
What is the probability that Joan will get a home run?

What is the probability that she will get a hit?

How many times can she be expected to get a walk in her next 14 times at bat?

2) In the maze drawn, Tom is to pick a path at random. Determine the probability that he will enter room A or room B.

2) Use the flipping of a coin three times to simulate the number of boys and girls in a three-child family. What is the probability that all three will be girls? Does this agree with your simulation? Why or why not?



STANDARD 12 Geometry

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) identify, describe, compare, and classify geometric figures.	1 - a) describe and classify geometric figures using appropriate geometric terminology. 1 - b) describe relationships among geometric figures (e.g., congruence, similarity, parallelism, transformations).	
2) visualize and represent geometric figures.	2 - a) construct figures described in words. 2 - b) draw a two-dimensional representation of a three-dimensional figure (e.g., sphere, cone, prism).	
3) apply transformations to geometric figures.	3) perform and analyze transformations on geometric figures (e.g., rotations, translations, reflection, point and line symmetry).	
4) understand and apply geometric properties and relationships.	4 - a) use geometric properties and relationships to solve real-world and mathematical problems. 4-b) use a computer to investigate geometric relationships. 4-c) identify the use of geometric figures and relationships in the real world (e.g., in art, architecture, construction).	

STANDARD 12
Geometry
Examples

- 1 - a, b) Given a collection of two or three dimensional shapes, classify them according to their properties. (e.g., the number of faces, shape of the faces, the number of vertices, congruences, similarity, parallelism, etc.)
- 2 - a) Given a written description of a room with actual sizes, build a scale model of the room from the description.
- 2 - a) Construct a figure with 6 faces and 12 congruent edges.
- 2 - b) Draw a representation of a cone.
- 2 - b) Using instructions given by your art teacher, make a drawing using perspective.
- 3) Investigate shapes such as isosceles triangles, circles, pentagons, hexagons, and other shapes which can be used to form tiling patterns and tessellations. Develop patterns using tiling. Alter a shape to form a new one. (Try to replicate some of the ideas of M. C. Escher.)
- 3) In the word MATH, which letters have point symmetry? Line symmetry?
- 3) Using a geoboard, develop a shape. Have your partner perform a transformation on the shape. Then you create a proportional shape.
- 4 - a) Use indirect measure and proportions to determine the height of a tall object by measuring its shadow.
- 4 - b) Using a computer program, determine whether the bisectors of the angles of a triangle meet at a point. (Many programs are on the market which allow students to construct figures using dimensions or simple commands. Several allow students to measure sides and angles, as well as construct altitudes, medians or angle bisectors.)
- 4 - c) Make a scrapbook that shows pictures of structures and architecture. With a marker, highlight the geometric figures used. Find and identify examples of the "golden rectangle".

STANDARD 13 Measurement

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) estimate and measure a quantity appropriately. 2) understand the structure and use of a measurement system. 3) apply measurement concepts.	1 - a) measure a quantity in the metric or customary systems, selecting the appropriate instrument, units, and degree of accuracy. 1 - b) estimate the measure of quantity without using a measuring instrument in the metric or the customary systems. 2) convert a given measurement to another unit in the <u>same system</u> (e.g., feet to miles, meters to centimeters). 3 - a) find measures of parts that are not indicated, given a figure or described situation with selected measures indicated. 3-b) solve problems involving measurement. 3-c) apply the concept of rate.	

1-72

STANDARD 13
Measurement
Examples

- 1 - a) Build a scale model of one room in your house. The model should show the position of major objects in the room. Model two objects in the room to scale.
- 1 - b) Estimate the weight of a book in grams. Check your estimate by using a scale.
- 1 - b) Plan and compete as a team member in an "Estimation Fair". Include measures of various objects throughout your school - length, area, volume, or capacity. Perform actual measurements for each object to determine the percent of error. Determine which is the best estimator for each category and award it.
- 1 - c) How many seconds are in a day? Discuss with your group whether you think you have lived a million seconds? a billion?
- 2) You attend school 180 days a year. If you spend $2 \frac{1}{2}$ hours each day writing notes, how many 6-hour school days have you spent writing notes? What percent of your time have you spent writing notes? What fractional part of your day do you spend writing notes?
- 3 - a) Using an actual architect plan for a home or building, determine any missing dimensions.
- 3 - a) Find a scale drawing of a home or a building. Use the drawing and chalk or masking tape to outline the major parts on a parking lot or a gym floor.
- 3 - b) How many 20 cm x 20 cm tiles are needed to cover the floor of a 2.5 m x 2.5 m room?
- 3 - b) Design a new and different piece of playground equipment that could be added to a school yard. Study the size of the students and decide on its appropriate dimensions. Create a drawing from at least two views. Label the dimensions and build a scale model.
- 3 - c) A motorcycle race has a course is to go to a city 70 miles away and back. Orite, on her new Harley-Davidson, averages 80 miles an hour going out but has clutch trouble and can manage only 60 miles an hour coming back. Eric, on a Honda, can go only 70 miles an hour, but he keeps it up for the entire race. Who wins the race?

Notes: 5-8 Standards

PL-1

GRADES 9-12

MATHEMATICS STANDARDS
Core Curriculum
Grades 9-12

Upon completion of high school mathematics, the students will demonstrate mathematics skills in the following areas according to these standards:

I.* *Mathematics as Problem Solving*

The students will apply integrated mathematical problem-solving strategies to problems both within and outside mathematics.

II. *Mathematics as Communication*

The students will use the language and symbols of mathematics to communicate mathematics ideas.

III. *Mathematics as Reasoning*

The students will use logical reasoning skills in mathematical contexts and real-world situations.

IV. *Mathematical Connections*

The students will recognize mathematics as an integrated whole and make connections among mathematical topics, between mathematics and other disciplines, and between mathematics and the real world.

* Standards are numbered to be consistent with the NCTM Standards.

V. Algebra

The students will use algebraic concepts, symbols, and skills to analyze, represent, and solve a variety of problems.

VI. Functions

The students will understand the important mathematical role which functions play and will use them to model and solve real-world problems.

VII & VIII. Geometry

The students will learn the fundamentals of geometry from several perspectives. The students will select the appropriate form or forms to model situations, solve problems, and argue logically.

IX. Trigonometry

The students will understand and apply common trigonometric ratios and functions. In addition, the college-intending student will understand the connections between trigonometry, geometry, and algebra.

X. Statistics

The students will use statistical methods to represent and analyze real-world data, and to design experiments for investigating problems.

XI. *Probability*

The students will use both theoretical and empirical probability to represent and solve problems involving uncertainty or chance.

XII. *Discrete Math*

The students will use elements of discrete mathematics to model and solve real-world problems.

XIII. *Conceptual Underpinnings of Calculus*

The students will explore informal concepts of calculus and apply these concepts both numerically and graphically.

XIV. *Mathematical Structure*

The students will understand that mathematical systems, whether numerical, geometric, or algebraic exist within frameworks that are compatible and complementary.

MATHEMATICS STANDARDS
Grades 9-12 Core Curriculum

STANDARD 1 PROBLEM SOLVING

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVE AND RESOURCES:
<p>1) apply integrated mathematical problem-solving strategies to solve problems from within and outside mathematics.</p> <p>2) recognize and formulate problems from situations within and outside mathematics.</p> <p>3) apply the process of mathematical modeling to real-world problem solving.</p>	<p>1 - a) apply problem-solving strategies to the high school mathematics curriculum.</p> <p>1 - b) apply problem-solving strategies to other disciplines and real-world situations.</p> <p>2 - a) identify the problem from a described situation, determine the necessary data, and apply the appropriate problem-solving strategy.</p> <p>3 - a) use mathematics to model real-world problems and their solutions.</p>	

1-79

STANDARD 1
Problem Solving
Examples

- 1 - a) A farmer has a field of wheat that must be partially plowed up to meet government requirements for a subsidy payment. He must plow up 40% of his field that measures 60 rods by 140 rods. How many rods must he plow off the edges all the way around the field to meet the requirement?
- 1 - a) Person A lives three miles from person B; person C lives 4 miles from person B. How far does person A live from person C? (Hint: Make a drawing to show that the answer lies in the range from 1 to 7 miles.)
- 1 - b) A contractor is building a hotel which measures 150 feet by 100 feet. He is setting up the foundation. How can he make sure the foundation is square by using only a tape measure and a calculator? What principle or theorem can be used to solve the problem?
- 1 - b) A student drew a map which showed the equator horizontally near the bottom of the map. The question was asked, "Which direction (N, S, E, or W) is up?" Discuss why there is not a unique solution to this problem.
- 2 - a) Mary has \$100 to spend on herself and finds a sale in a clothing store. She buys a skirt that has an original price of \$140. If the discount is 35% and sales tax is 7%, can she afford to buy the skirt and blouse?
- 2 - a) If four cuts are made through a birthday cake, what is the maximum number of pieces which can result?
- 2 - a) What is the average word length of the words in the Gettysburg Address?
- 3 - a) William is considering quitting his job which pays him \$1200 per month plus insurance benefits of \$250 per month. He wants to start a trucking business which initially will make him an average of \$2400 per month net. His starting costs will be \$30,000 most of which will go for paying toward his truck at \$600 per month. He will have to pay his own insurance and social security. Does this change in his life seem feasible if his business will increase at 10% per year?
- 3 - a) A very large plastic sheet was used to cover a football field. A member of the grounds crew recalled that the crew folded this sheet in half 30 times in the process of taking it off the field and putting it up. Investigate this and comment on what the crew member recalled.

STANDARD 2 Communication

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) use mathematical language and symbols to read and write mathematics, and to converse with others about it.	1 - a) express mathematical ideas orally and in writing. 1 - b) read written presentations of mathematics with understanding. 1 - c) translate mathematical ideas from one mode to another. 1 - d) ask clarifying and extending questions related to mathematics they have read or heard about. 1 - e) formulate mathematical definitions and express generalizations discovered through investigations. 1 - f) model situations using oral, written, concrete, pictorial, graphical and algebraic methods. 1 - g) participate in group discussions involving mathematics and summarize ideas presented.	

STANDARD 2 COMMUNICATION

Examples

- 1-a) Given a theorem or mathematical rule such as the Pythagorean Theorem, explain its meaning and find examples of its use.
- 1-a) Describe how you would solve this following problem: (You do NOT need to actually find the answer.) Bill bought two records and a book. He gave the clerk a \$2 bill. How should his change be figured?
- 1-b) Using a newspaper article having mathematical inferences, write mathematical sentences or equations concerning the material presented.
- 1-b) Read the paragraph and discuss it with others. "There is often a measurable relationship existing between beauty and mathematics. It is pleasing symmetry to see morning-glory buds form trim spirals, the hexagons of snowflakes, the lovely geometric spiral of the nautilus, and the perfect cubes found in mineral crystals. We ourselves see mathematics surrounding us."
- 1-c) Draw a diagram and solve the following problem: A recreation center builds a dirt mountain and covers it with artificial snow for skiing. The cone-shaped mountain has a circular base and contains 1000 tons of dirt. It is to be covered with 10 tons of artificial snow. The area around the base is surrounded by a fence 200 yards long. Business is so good that the owner decides to build another ski mountain of the same shape but twice as high. How much dirt is needed for the new mountain? How much artificial snow is needed? How long a fence is needed to surround the base?
- 1-d) Given a practical situation such as investment data, develop questions pertaining to the material presented. Ask "what if..." questions concerning missing information. What if the interest is paid daily? What if I double the principle?
- 1-e) Find the perimeters and areas of several rectangles. Determine what relationship exists between the length and width of the rectangle which would be necessary so that the perimeter and area of the given rectangle would be equal? What conditions must hold for a right triangle with legs a and b so that its perimeter is numerically equal to its area? Make generalizations concerning the area and perimeter of various geometric figures.
- 1-e) Class project: Draw a number of convex polygons with differing numbers of sides. Draw and count all the diagonals for each polygon. Summarize the data in a chart on the board. Discuss ways of summarizing the relationship between the number of sides and the number of diagonals. Look for rules expressed in words as well as formulas.
- 1-f) Given the following information, sketch a graph to show how the number of drinks in a machine might vary from 8 a.m. to 6 p.m. One axis of the graph should indicate "Time of day" (8 a.m., 9 a.m., etc.), and the other axis would indicate "Number of drinks in the machine". Information given: A factory cafeteria contains a vending machine which sells drinks. On a typical day:
- (1) The machine starts half full.
 - (2) No drinks are sold before 9 a.m. or after 5 p.m.
 - (3) Drinks are sold at a slow rate throughout the day, except during the morning and lunch breaks (10:30 - 11 a.m. and 1-2 p.m.) when there is greater demand.
 - (4) The machine is filled up just before the lunch break. It takes about 10 minutes to fill the machine.
- 1-g) In the class project 1-e, express your results as a graph, an equation and a sentence.

STANDARD 3 Reasoning

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) use logical reasoning skills in mathematical contexts and real-world situations.	1 - a) recognize and apply informal deductive and inductive reasoning in mathematical and non-mathematical contexts. 1 - b) make and evaluate conjectures and arguments. 1 - c) make generalizations. 1 - d) formulate counterexamples. 1 - e) judge the validity of an argument. <u>in addition the college-intending students can</u> 1 - f) construct formal proofs, including indirect proofs and proofs by mathematical induction, or mathematical assertions.	

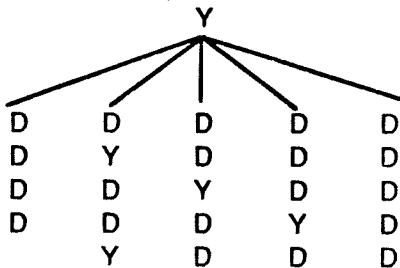
STANDARD 3 Reasoning Examples

- 1 - a) Look at triangular regions of polygons. Knowing that the sum of the angles of a triangle is 180 degrees, complete the table.

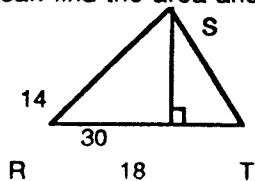


SIDES	3	4	5	6	7
DIAGONALS	0	1			
REGIONS	1	2			
SUM OF ANGLES 180	360				

- 1 - a) In 1955 the Dodgers lost the first two games of the World Series against the Yankees, but won the series in the end. In how many ways can the series go so that the losing team wins the first two games? Use a tree diagram to illustrate possible outcomes.



- 1 - b) Determine the area of the triangle shown with $RT = 18$, $RS = 14$, and $m\angle R = 30^\circ$. Explain what additional information must be found. Explain to a partner how you can find the area and logically defend your answer.

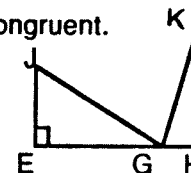


- 1 - c) From the observations in the polygons example 1-a, what conclusions can be formed?
Sides = n , Diagonals = $n-3$, Regions = $n-2$
Sum of angles = $180(n-2)$

- 1 - d) "If two angles are vertical angles, then their measures are equal" is a true theorem. The converse of this theorem is "If two angles have equal measures, then they are vertical angles." Is this converse statement true or false? Give a counterexample if the converse is false.

- 1 - e) In biology class, one student stated that if a family already had two sons, the chances are the third child would probably be a girl. Do you agree with this statement? Why or why not?

- 1 - f) Given: The two right triangles are congruent.
Prove: $m\angle 1 = 90^\circ$
Write a deductive proof, in narrative or two-column form.



- 1 - f) Using the triangle from example 1-b, use an indirect proof to prove it is not a right triangle. The indirect form would be, "Assume the triangle is a right triangle."

- 1 - f) Prove by mathematical induction that for all positive integers n ,

$$1 + 3 + 5 + \dots + (2n - 1) = n^2.$$

[Hint: $1 = 1^2$. Suppose it is true for k . Prove it is true when you add the next positive odd integer, $2(k + 1)$]

STANDARD 4 Connections

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) recognize mathematics as an integrated whole. 2) apply mathematical concepts in other disciplines. 3) recognize connections between school mathematics and real-world applications.	1 - a) recognize and use connections within the various math topics. 1 - b) recognize equivalent representations of the same mathematical concepts. 2 - a) use and value connections between mathematics and other disciplines such as art, music, psychology, science, and business. 3 - a) apply concepts learned in mathematics classes to job and life skills.	

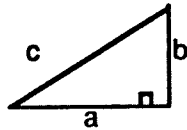
STANDARD 4 CONNECTIONS

Examples

- 1 - a) Name one theorem which will be used in solving all three of the following problems:

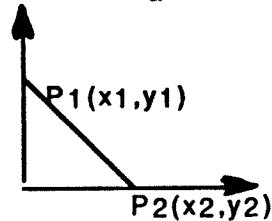
Geometry

Find the length of side b.



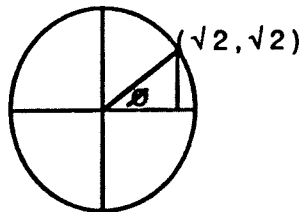
Algebra

Find the length of P_1P_2 .



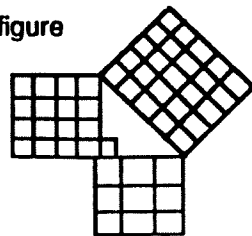
Trigonometry

Find $\sin \theta$.



- 1 - a) Illustrate at least three methods of solving two simultaneous linear equations. Use either elimination method, substitution, graphing, or matrices.

- 1 - b) Use the accompanying figure to explain the relationships of the lengths of the three sides of a right triangle.

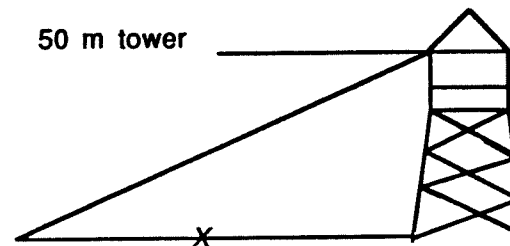


- 2-a) While studying the circulatory system in biology class, collect data on pulse rates before and after exercising. Analyze the data by finding the range, mean, median, mode, and standard deviation. Display the data on a graph. Can you find any conclusions from your data?

- 3 - a) Give the lengths needed for the rafters of a garage if the roof has a 30° pitch and the garage is 20' wide.

- 3 - a) Investigate the quality control program in a factory. Use probability plots to determine the percentage of time that industry meets specifications with their product.

- 3 - a) Use trigonometric functions to assist a forest ranger in determining the location of animals or fire from his/her observation tower.
Angle of depression of 28°



STANDARD 5 ALGEBRA

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<p>1) develop a means of operating with algebraic concepts</p> <p>2) apply algebraic processes to real-life situations.</p> <p>3) use matrices to organize and analyze data.</p>	<p>1 - a) operate on expressions.</p> <p>1 - b) solve linear and quadratic equations and inequalities.</p> <p>1 - c) associate linear and quadratic equations with their graphs.</p> <p>1 - d) use tables, graphs, calculators and computers as tools to investigate algebraic concepts.</p> <p><u>and in addition, college-intending students can</u></p> <p>1 - e) demonstrate technical facility with algebraic transformations.</p> <p>2 - a) represent situations through the use of expressions, equations and inequalities.</p> <p>2 - b) apply algebraic processes to solve equations and inequalities.</p> <p>2 - c) construct, use, and interpret tables and graphs that represent real-life situations.</p> <p>3 - a) use matrices to organize data and solve problems.</p> <p><u>and in addition, college-intending students can</u></p> <p>3 - b) use matrices to solve systems of equations.</p>	

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STANDARDS 5

Algebra Examples

- 1-a) Assume that the costs for a company to produce x items of a product are given by the formula

$$C(x) = \frac{x^2 - 1}{x - 2}$$
 The additional cost to produce one more item is given by the expression

$$C'(x) = C(x + 1) - C(x).$$
 (a) Compute and simplify $C'(x)$.
 (b) Evaluate $C'(x)$ for $x = 7$.

- 1-b) A rectangular solar collector is to have a height of 1.5 meters, but its length is still to be determined. What is the range of values for this length if the collector provides 400 watts per square meter, and if it must provide a total of between 2000 and 3500 watts, inclusive.

- 1-c) Predict the shapes of the graphs of these equations:
 $3x^2 - 4y^2 + 2y - 5 = 0$ $2x + 3y = -6$
 $2x^2 - 6 = 3y$ $2x^2 + 2y^2 - 3x - 5 = 0$

- 1-d) Consider the function $s(t) = -4.9t^2 + 8t + 10$. This describes the height of a ball thrown straight upward with an initial velocity of 8 m/sec from a tree 10 m tall.
 (a) Evaluate $s(t) = 0$, $t = 0.2$, $t = 0.4, \dots$ until you obtain a negative number. List these values in the form of a table.
 (b) Sketch the graph of $s(t)$ or use a graphing calculator.
 (c) Using (a) and (b), estimate the maximum height the ball obtains and when it will hit the ground.

- 1-e) When not assisted by appropriate computer software, be able to use algebraic fractions, factor polynomials, simplify radicals and find determinants of matrices.

- 2-a) An open box is to be made from a rectangular piece of cardboard which measures 10 cm by 20 cm by cutting a square from each corner of the cardboard. What should be the length of the side of the squares to be cut from the cardboard if the bottom of the box needs to be 96 square cm?

- 2-a) Amy scored 73, 82, 63 and 94 on four 100-point tests in mathematics. Suppose that a grade of B requires an average between 75 percent and 85 percent. What score on a 100-point final exam would qualify Amy for a B in the course? What score on a 200-point final exam would qualify Amy for a B?

- 2-b) In physics, the formula for centripetal force is $F = (mv^2)/r$ where r represents the radius, m represents mass and v represents velocity. Solve the formula for r . Then find the length of a string fastened to a 5 kg mass being spun at a speed of 3 meters per second and that has centripetal force of 22.5 newtons acting upon it.

- 2-c) Crickets are known to chirp faster when the temperature is higher. Using the information given, make a graph that will record the information and then predict chirps at 30° Celsius.

Temperature C°	6	8	10	15	20	
Chirps per min.	11	29	47	75	107	

- 3-a) Company A needs 6 workers to finish one piece of its product and Company B needs 8 workers. The costs of Company A per item are \$58 and the costs of Company B per item are \$72.
 (a) Arrange these data in the form of a matrix.
 workers Companies A and B need altogether, and what their total costs are, if Company A produces 65 items and Company B produces 59 items.

- 3-b) Solve using matrices.
- $$\begin{aligned} 4x - 2y + 3z &= -1 \\ x + 5y &= 1 \\ 3x + 6y - z &= 5 \end{aligned}$$

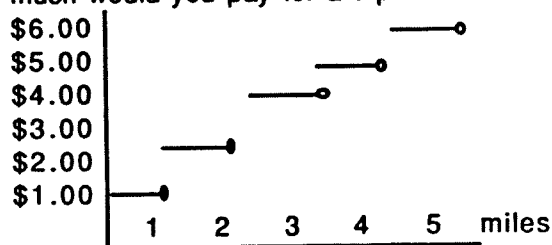
STANDARD 6 Functions

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<p>1) understand functions as an expression of relationships between different quantities.</p> <p>2) apply functions to visualize real-world problems.</p>	<p>1 - a) represent and analyze relationships using tables, verbal rules, equations, and graphs.</p> <p>1 - b) translate among tabular, symbolic, and graphical representations of functions.</p> <p>1 - c) analyze the effects of parameter changes on the graphs of functions.</p> <p><u>and in addition, the college-intending students can</u></p> <p>1 - d) understand operations on, and the general properties and behavior of classes of functions.</p> <p>2 - a) model real-world phenomena with a variety of functions.</p> <p>2 - b) recognize that a variety of problem situations can be modeled by the same type of functions.</p> <p><u>and in addition, the college-intending students can</u></p> <p>2 - c) apply functions in the context of trigonometry, statistics, and algebra.</p>	

STANDARD 6 Functions Examples

Note: Extensive use of graphing calculators and computer software is assumed in these examples.

- 1 - a) The amount you pay for a cab ride depends on the length of the trip, as shown in the accompanying chart. How much would you pay for a trip of 4.5 miles?



- 1 - b) Translate among tabular, symbolic, and graphical representations of functions. Joe has a lawn mowing business during the summer. He charged a basic fee of \$5.00 plus \$3.75 per hour. He made the following chart for quick reference in determining his total fees.

# hours	1	2	3	4	5
fee	\$8.75	12.50	16.25	20.00	23.75

Write an equation to represent his fee schedule.

- 1 - c) In the previous illustration 1-b, how would the chart change if the basic fee was \$7.00. How would this effect the equation? How would the graph of the equation change?

- 1 - d) Given two functions $f(x) = 2x + 3$ and $g(x) = 3x - 2$, find their:
Sum $(f + g)(x)$, Product $(fg)(x)$, Composition $f(g(x))$
Determine if the two are inverse functions using:
 $f(g(x)) = g(f(x))$

- 2-a,b) For each of the following, sketch a reasonable graph and identify the type of function it could be (linear or periodic).

A. The depth of the water at the beach depends on the time of day due to the motion of the tides.

B. A gymnast is jumping up and down on a trampoline. Her distance from the floor depends on time.

C. The distance you go depends on how long you have been going (at a constant speed.)

D. The amount of money you earn at a given hourly wage depends upon the number of hours you work.

- 2 - b) Suppose that the population of the world today is 5.2 billion and it is growing at the rate of 1.64% per year. What will the population be a year from now? Two years from now? When will the population double?

- 2 - b) Calculate the amount for one year at simple interest then the amount for one year compounded every 6 months, then every 3 months, etc.

2 - c) Explore the graphs of $y = \ln(x)$ and $y = e^x$.

STANDARDS 7 & 8 Geometry

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) identify common geometric figures and their properties.	1 - a) interpret and draw three-dimensional objects. 1 - b) represent problem situations with geometric models and apply properties of figures. 1 - c) classify figures in terms of congruence and similarity and apply these relationships. 1 - d) deduce properties of, and relationships between, figures from given assumptions.	
2) use geometry from both from both coordinate and transformational viewpoints.	2 - a) translate between synthetic and coordinate geometry. 2 - b) deduce properties of figures using transformations and coordinates. 2 - c) identify congruent and similar figures using transformations. 2 - d) analyze properties of Euclidean transformations and relate translations to vectors.	
3) apply vectors to the study of geometry.	3-a) deduce properties of figures using vectors. 3-b) apply transformations, coordinates, and vectors in problem solving.	
4) work with axiomatic systems.	<p style="text-align: center;"><u>in addition, the college-intending students can</u></p> 4 - a) develop an understanding of an axiomatic system through investigating and comparing various geometries.	

STANDARDS 7 & 8
Geometry
Examples

1 - a) Given a solid figure such as pyramid, draw it free hand showing the hidden lines with dotted lines and visible lines with solid lines. Do the same with other solids.

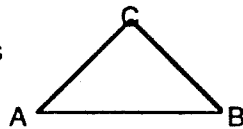
1 - a) Make a simple scale drawing of a rectangular classroom, showing length, width, and height.

1 - b) In decorating a school gym for a dance, streamers are to be strung diagonally across the basketball court. Find the length of the streamers. Show how this can be done using a geometric model.

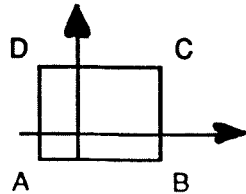
1 - c) A teacher used the enlarge feature of a photocopier to "blow up" a picture of a triangle. Discuss the relationship between the enlarged triangle and the original one.

1 - c) Each of three right triangles has an acute angle with a measure of 27° . What can be said about these right triangles?

1 - d) In the figure, the measures of angles A and B are equal. What can be said about segments AC and BC?



1 - d) A box has dimensions 2 x 3 x 4. A similar box has dimensions 4 x 6 x 8. Compare the surface areas and volumes of the two boxes.



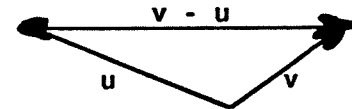
2 - a) In the figure, square ABCD has an area of 25. If the coordinates of B are (4,-3), what are the coordinates of point D?

2 - b) The coordinates of the endpoints of segment AB are A(1,-2) and B(-3,5). The coordinates of segment CD are C(-1,-1) and D(-4,6). Without using the distance formula, show that the segments are congruent.

2 - c) A triangle has vertices with the following coordinates: A(1,2), B(-3,0), C(0,4). Give the coordinates of the vertices E and F of $\triangle DEF$ if $\triangle ABC$ is congruent to $\triangle DEF$, given D(0,-1).

2 - d) Triangle ABC with vertices A(0,0), B(5,0), and C(0,5) is translated to triangle A'B'C' through the vector (2,-3). Give the coordinates of the vertices of triangle A'B'C'.

3 - a) In the given figure, show that $.5(v - u) = .5v - .5u$



3 - b) Use a vector drawing and measurement to determine the course of a plane when given its bearing and wind forces.

4 - a) Explore the basic assumptions in various non-Euclidean geometries (i.e., spherical, hyperbolic).

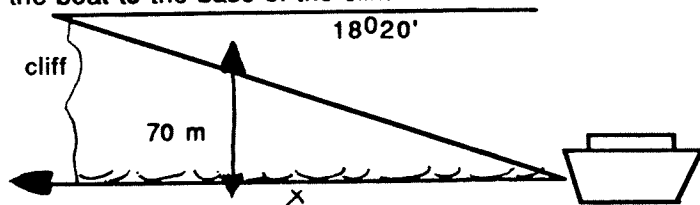
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STANDARD 9 Trigonometry

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) understand and apply trigonometric relations and functions. 2) understand the connections between trigonometry, geometry, and algebra.	1 - a) use trigonometric functions to solve problems involving right triangles. 1 - b) relate periodic real-world phenomena to sine and cosine functions. <u>in addition, the college-intending students can</u> 2 - a) understand the connection between trigonometric and circular functions. 2 - b) use circular functions to model periodic real-world phenomena. 2 - c) apply general graphing techniques to trigonometric functions. 2 - d) solve trigonometric equations and verify trigonometric identities. 2 - e) understand the connections between trigonometric functions and polar coordinates, complex numbers, and series.	

STANDARD 9 Trigonometry Examples

- 1 - a) Use the information below to find the distance x from the boat to the base of the cliff.



- 1 - b) As you ride the Ferris wheel, your distance from the ground varies sinusoidally with time. Sketch a graph of your position on the wheel in relation to the time the wheel is turning.

- 1 - b) Set up an oscilloscope to measure the output from two signal generators. Watch the sine or cosine pattern on the screen and observe the changes as you adjust amplitude, period and phase shift. Connect a speaker and listen to the differences made with these changes.

- 2 - a) Definition: Given a unit circle in a coordinate plane. Let $W(0) = (1,0)$ and let θ mapped to $W(\theta)$ be the winding function. For each real number θ , let $W(\theta) = (x_\theta, y_\theta)$. Then $\sin \theta = y_\theta$, $\cos \theta = x_\theta$. These correspondences are called the trigonometric functions. For example, $\theta = \pi/2$, $W(\theta) = (0,1)$ gives $\cos \pi/2 = 0$ and $\sin \pi/2 = 1$.

- 2 - a,b) For a sound wave given by $y = 2.7 \sin 1600 \pi x$, find the amplitude, period and frequency if x is time in seconds and y is in centimeters.

- 2 - b) Suppose a waterwheel rotates at 10 revolutions per minute. A point P is on the rim of the wheel. Assume that the lower 1 foot of the wheel is immersed in the water container. Model the distance d of point P from the surface of the water in terms of the number of seconds which have elapsed.

- 2 - c) Graph the function $y = 3 \sin(2x + \pi)$. (Either make a sketch or use a graphing calculator.) Determine maxima, minima and inflection points.

- 2 - d) Using the addition formula for the cosine, verify that $\cos(\theta + \pi) = -\cos \theta$. Illustrate the identity using graphing techniques.

- 2 - d) Find all real numbers x in the interval $(1,2)$ satisfying $\tan(8x) = 1$.

- 2 - e) Using a calculator or computer, verify the accuracy of the series for approximating values of the cosine function:

$$\cos x = 1 - x^2 + x^4 - x^6 + x^8 + \dots + (-1)^n x^{2n} + \dots$$

- 2 - e) Explore the fascinating relationship involving complex numbers and trig functions in the calculation of powers of the number e :

$$\cos x + i \sin x = e^{ix}.$$

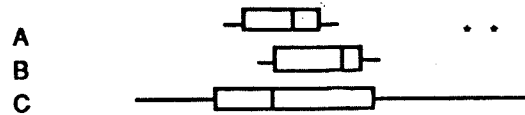
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STANDARD 10 Statistics

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<p>1) use various models to describe real-world data.</p> <p>2) design experiments to represent and investigate certain problems.</p> <p>3) apply more advanced methods of statistics.</p>	<p>1 - a) construct and draw inferences from charts, tables, and graphs including box plots, histograms, stem-and-leaf, and scatter plots.</p> <p>1 - b) use curve fitting to predict from data.</p> <p>1 - c) understand and apply measures of central tendency, variability, and correlation.</p> <p>2 - a) understand sampling and recognize its role in statistical claims.</p> <p>2 - b) design a statistical experiment to investigate a problem, conduct the experiment, and interpret and communicate the outcomes.</p> <p><u>in addition the college-intending students can</u></p> <p>3 - a) test hypotheses using appropriate statistics.</p> <p>3 - b) transform data to aid in its interpretation and prediction.</p> <p>3-c) use non-parametric techniques such as Chi-Square.</p>	

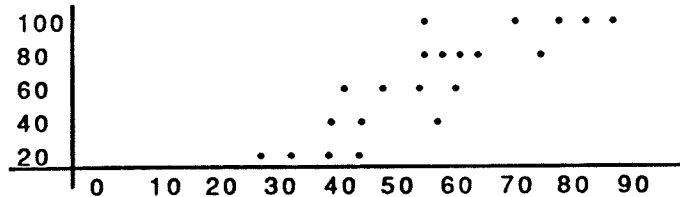
STANDARD 10
Statistics
Examples

- 1 - a) Here are box plots of the miles-per-gallon achieved by all the different car models made by three manufacturers, A, B, and C. 20 25 30 35 40 45



Which manufacturer does the best if we compare cars according to highest miles-per-gallon? Median miles-per-gallon? Which miles-per-gallon varies least?

- 1 - b) A field biologist has recorded, at various temperatures, the number of times a cricket chirps per minute. From the given scatterplot of data, draw the best line of fit and predict how many times a cricket will chirp when it is 110° F.



- 1 - c) A potential manufacturer of jigsaw puzzles has sufficient capital to buy just one stamping machine to cut the pieces of a puzzle. For the size of puzzle bought, the mode is 750 pieces, the median is 1000 pieces, and the mean is 1250 pieces. Which number should the manufacturer use for the initial production, and why should he use that number?
- 2 - a) Find an example in the newspaper which makes a claim such as "a poll of 850 people showed that 43% of all Americans...." Discuss the validity of these types of claims.

- 2 - b) Your math class had been asked to investigate student preferences for what food the cafeteria should serve. Design a survey instrument and decide how you will sample the student body. Conduct your experiment and then display your results in an appropriate form (chart, table, graph.) Write a recommendation from your findings.

- 3 - a) The mean cost for a private hospital room in Kansas in 1985 was \$492. A private consumer group wants to determine whether prices are higher in 1990. A sample of 40 hospitals results in a mean cost of \$523 with a standard deviation of \$45. At the .05 level, have prices increased?

- 3 - b) A statistician is analyzing some data in which all figures are in the millions. To make calculations simpler and take less space in the spreadsheet she is using, she plans to enter 27,000,000 simply as 27. If she does this to all scores, what effect will it have on mean and standard deviation?

- 3 - c) The U.S. was surveyed in 1983 regarding the distribution of homes of various sizes. In 1988, 150 potential California home buyers listed their preferences.

	<u>US 1983</u>	<u>California 1988</u>
# bedrooms	Percent	Frequency
2 or less	24%	47
3	59%	93
4 or more	17%	10

Use a Chi-squared test to determine, at the 5% level, whether or not preferences have really changed.

1-16

STANDARD 11 Probability

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<p>1) represent and solve problems involving uncertainty and chance.</p> <p>2) describe the normal curve and its properties.</p> <p>3) generate and interpret probability distributions using the concept of random variable.</p>	<p>1 - a) use experimental or theoretical probability, as appropriate, to represent and solve problems involving uncertainty or chance.</p> <p>1 - b) use simulations to estimate probabilities.</p> <p>1 - c) create and interpret discrete probability distributions.</p> <p>2) describe, in general terms, the normal curve and use its properties to draw conclusions about sets of data that are assumed to be normally distributed.</p> <p><u>in addition, the college-intending students can</u></p> <p>3) apply the concept of a random variable to generate and interpret probability distributions including distributions binomial, uniform, normal, and Chi square.</p>	

STANDARD 11
Probability
Examples

- 1 - a) George Brett has a batting average of .300. How many hits would you predict that he would have in his next 60 times at bat?
- 1 - b) If a child is equally likely to be born a boy or a girl, what are the chances that a family of three children will contain exactly one girl?
Using a coin: Head represents Girl, tail represents Boy. Toss the coin 3 times or toss 3 coins at once.
Using a number cube: 1, 2, or 3 represents Girl, 4, 5, or 6 represents Boy
Toss 3 cubes.
- 1-a,b,c) Let a roll of a cube represent an at-bat for a baseball player. Let a 5 or a 6 represent a hit, so that the batter gets a hit $\frac{1}{3}$ of the time. Let four rolls of the cube constitute a game. Working in groups of two, roll the cube a number of times, and record the number of "hits" and "outs" for each "game." Summarize the data in a chart on the board.
[Note: Beginning students can graph the results and discuss the distribution of probabilities. Advanced students can use the binomial probability theorem to predict the distribution of no-hit games, 1-hit games, and so on. They can then compare the theoretical results with the actual results of the simulation.]
- 1 - c) List the totals that are possible when you roll two number cubes. In a second column write the probability of each outcome. What is the probability that you would roll a total 7 or greater?
- 2 - a) After a math test, your teacher tells the class that the scores were distributed like the normal "bell" curve. How did the number of scores above the average compare with the number of scores below the average? Support your answer.
- 2 - a) Look at a graph of SAT scores. What percent of students score within 10% of the mean score? What is the difference in scores between students who score in the 95th percentile and the 99th percentile? What other information do you see?

Look at a state-by-state distribution of SAT scores. You will see that the Kansas score is very high. Why is this so?
- 3 - a) After a statistics test, your teacher tells the class that the mean was 78 and the standard deviation was 10. Your class has 30 students. Assuming that the scores were normally distributed, how many scores will fall between 68 and 88?

STANDARD 12 Discrete Math

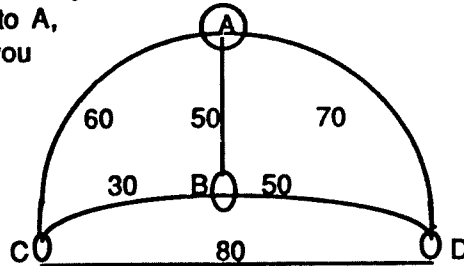
GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
1) use finite graphs to model real-world situations. 2) apply enumeration (counting) techniques. 3) use recurrence relations.	1 - a) apply a knowledge of paths, circuits, and trees to solve problems. 2 - a) use sequential counting methods. 2 - b) understand and apply permutations and combinations. 3 - a) use recursion to describe sequences. 3 - b) solve real world problems such as compound interest. <u>in addition, the college-intending students can</u> 3 - c) verify a statement using mathematical induction.	

66-1

STANDARD 12
DiscreteMathematics
 Examples

- 1 - a) In the graph shown, the vertices represent cities and the numbers on the edges give the cost of traveling

between those cities. If you start at A, visit all the cities, and return to A, what path should you take to spend the least amount of money?



- 2 - a) The menu at a restaurant offers 3 appetizers, one of 4 main courses, and one of 10 desserts. How many different complete meals of appetizer, main course and dessert are available?
- 2 - b) A consumer group will test the following computers: Compaq, IBM-PC, Epson, Tandy, and Apple IIe. The group will list their first, second, and third choice based on performance. How many different rating lists are possible?
- 2 - b) A Chinese restaurant, the China Inn, offers a dinner special which consists of your choice of any four different main dishes. How many different dinner specials are possible if the China Inn has 10 main dishes?

- 3 - a) In the given sequences, a) describe in words how each term depends upon the previous term, and b) write a mathematical sentence to describe the relationship.

$$1, 4, 7, 10, \dots \quad 1, 2, 4, 8, 16, \dots$$

- 3 - b) Your grandparents deposited \$1000 in a savings account for you when you were born. The account has paid 6% interest, compounded quarterly, ever since. How much was in the account when you were 5 years old? How much will be there when you are 18?

- 3 - c) By the method of mathematical induction, prove that the following statement is true for all positive integral values of n.

$$1 + 3 + 5 + \dots + (2n - 1) = n^2$$

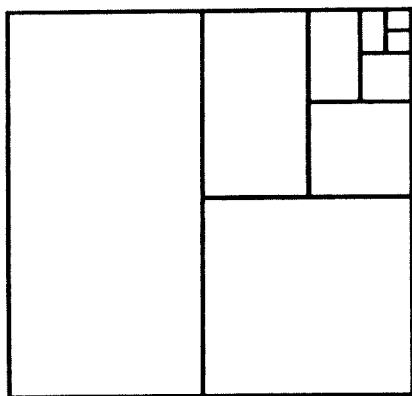
STANDARD 13 Conceptual Underpinnings of Calculus

GOAL: Students can	OUTCOMES: Students will demonstrate the ability to	DISTRICT OBJECTIVES AND RESOURCES:
<p>1) explore and apply informally concepts of calculus.</p> <p>2) apply mathematical concepts that are necessary for the formal study of calculus.</p>	<p>1 - a) generate a sequence and calculate a partial sum.</p> <p>1 - b) apply the concept of limit when investigating infinite sequences and series.</p> <p>1 - c) investigate maximum and minimum points and interpret the results in problem situations.</p> <p>1 - d) approximate areas under curves.</p> <p><u>In addition, the college-intending students can</u></p> <p>2 - a) understand and apply the conceptual foundation of limit, slope of a tangent line, and rate of change.</p> <p>2 - b) analyze the graphs of polynomial, rational, radical, and exponential functions.</p>	

101-1

STANDARD 13
Conceptual Underpinnings of Calculus
 Examples

- 1-a) On your first birthday, your parents gave you one cent. On your second birthday they gave you two cents, four cents on your third, and continued doubling the gift each year. How much would you receive on your tenth birthday? Eighteenth birthday? How much would you have received in total birthday gifts?
- 1-b) Approximate the value of .9 by using the sums of its partial fractions, $9/10 + 9/100 + 9/1000 + \dots$
- 1-b) You wish to walk one mile, but you only want to walk half the distance each hour. (i.e., 1/2 mile the first hour, 1/4 mile the second hour, etc.) How long will it take you to walk the whole mile?
- 1-b) Make a geometric drawing to illustrate the limit of the sum of the fractions $1/2 + 1/4 + 1/8 + \dots$



- 1-c) An open box having a square base is to be constructed from 108 square inches of material. What dimensions will produce a box with maximum volume?

- 1-c) Investigate the geometric shape which has the maximum area with the minimum perimeter. Investigate the geometric solid which has the maximum volume with the minimum surface area. Why don't manufacturers use this shape?
- 1-d) Use the area of rectangles to approximate the area bounded by the x-axis and the function $f(x) = 3x^2 - 1$ in the interval from $x = -1$ to $x = 2$.
- 2-a) Use the limit of the difference quotient to find the slope of the tangent line to $f(x) = x^2 + 3$ at the point $(-2,7)$.
 Ans: $\lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x} = 2x$
- 2-b) Use a graphing calculator or computer software to examine the graph of the following function. [If these are not available, use a table of values generated by calculator and a sketch.]

$$f(x) = \frac{x^2 + 6x - 55}{x + 11}$$

Approximate any relative maxima or minima and zeros of the function. Look for any apparent inflection points. Notice the values of the function as x approaches -11 from both sides.

From the left		From the right	
x	f(x)	x	f(x)
-11.5	-16.5	-10.5	-15.5
-11.4	-16.4	-10.6	-15.6
-11.3	-16.3	-10.7	-15.7
-11.2	-16.2	-10.8	-15.9
-11.1	-16.1	-10.9	-15.9

What is the result of the direct substitution of -11 into the function? What is the graphing result?

-101-1

STANDARD 14
Mathematical Structure
Examples

1-a) Be able to give an example of each kind of number and an example of its use.

- Integer The number of people in the room.
- Negative Your bank balance overdrawn.
- Rational The probability it will rain today.
[In fraction, per cent, decimal form]
- Irrational The number π , or the number you get on a calculator when you hit $\sqrt{3}$.
- Real The numbers used to name any point on a number line.
- Imaginary The numbers used to describe the square roots of negative numbers.
- Complex Every number in our number system.

1-b) Define the complex number set:

$C = \{x \mid x = a + bi \text{ where } a \in J, b \in J \text{ and } i = \sqrt{-1}\}$
 Given two complex numbers, be able to find their sum, difference, product, quotient, find the complex conjugate of each, and sketch their graph on the complex plane.

2-a) In solving these following equations, describe the step needed for their solution:

- $x - 5 = 15$ Addition Property of Equality
- $n/3 = 10$ Multiplication Property of Equality

2-a) Use the appropriate mathematical terms applied below:
 A number is equal to itself.

- Reflexive Property of Equality
- If $3x = 12$, then $12 = 3x$.
Symmetric Property of Equality
- If $m \angle A = 30^\circ$ and $30^\circ = m \angle B$, then $m \angle A = m \angle B$.
Transitive Property of Equality

2-b) Be aware of the meaning of these terms which are the properties of a mathematical field. Give a numeric example

of the use of each property for the real numbers.

Addition

- Closure Property $3 + 4$ is a real number.
- Associative Property $(1/2 + 1) + .3 = 1/2 + (1 + .3)$
- Identity Property $10 + 0 = 10$
- Inverse Property $18 + (-18) = 0$
- Commutative Property $\pi + 2 = 2 + \pi$

Multiplication

- Closure Property $(.6)(.1227)$ is a real number.
- Associative Property $(16 \times 2/3) \times 9 = 16 \times (2/3 \times 9)$
- Identity Property $777 \times 1 = 777$
- Inverse Property $5 \times 1/5 = 1$
- Commutative Property $42 \times 11 = 11 \times 42$

Distributive Property 49×125
 of Multiplication $= 49(100) + 49(25)$
 over Addition

2-c) After studying a set of postulates and theorems, demonstrate the validity of a geometric statement using either a paragraph or two-column proof.

2-c) Prove: $\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$

Proof: $\frac{a}{b} + \frac{c}{d} = \frac{ad + cb}{bd \quad db}$ Identity Property for multiplication
 $= \frac{ad + bc}{bd \quad bd}$ Commutative Prop. for multiplication
 $= \frac{ad + bc}{bd \quad bd}$ Commutative Prop. for multiplication
 $= \frac{ad + bc}{bd}$ Definition of addition of fractions

2-c) Prove: If two sides of a triangle are congruent, then the angles opposite these sides are congruent.

1-104

Notes: 9-12 Standards

Kansas State Board of Education

120 S.E. 10th Avenue, Topeka, Kansas 66612-1182

January 23, 1995

TO: Senate Education Committee
FROM: State Board of Education
SUBJECT: State Curriculum Standards for Social Studies

The state social studies curriculum standards which the Committee received from State Board of Education staff on January 11 were the most recent complete draft. As the Committee may recall, we also indicated in our discussion with you that the social studies standards are under revision in order to incorporate more specific curriculum content.

Attached for the information of the Committee is a sample revision of the social studies standards as received by the State Board in November. Further revisions to the standards, adding additional content, are to be delivered to the State Board in March 1995.

While the initial versions of the curriculum standards did not ignore subject area content, a major focus was developing the skills needed to acquire and make use of content to answer questions, make decisions, understand issues and dilemmas, and develop civic responsibility and competency. At the direction of the State Board, however, specific curricular content is being added in order to offer more direction and assistance to school districts as they develop curriculum and instruction.

This mode of development is the same used in other subject areas. As an example of the developmental process, we have provided copies of the first mathematics curriculum standards, issued in 1990, and a copy of the current edition of the mathematics standards, which you also received January 11.

State Board staff and Dr. Poggio of the University of Kansas Center for Educational Testing and Evaluation will also discuss with the Committee the pilot state social studies assessment scheduled for this spring. The assessment has two components, one requiring students to identify correct responses to questions, in a typical multiple choice format, and one requiring students to investigate a topic and develop a paper on it as part of an instructional activity.

Lee Droegemueller
Commissioner
(913) 296-3201

Senate Education
1-23-95
Attachment 2

PROGRAM OUTCOME II

The student will understand recurring issues and dilemmas which influence ideas, values, beliefs, attitudes, and choices within and across societies.

STANDARD IIA

The student will understand the spatial relationships among people, places, and environments in the local community, Kansas, the U. S., and selected nations in the world.

BENCHMARKS, GRADE LEVELS 12-K

Key Concepts/Ideas Related to People, Places, and Environment	By the end of the 12th grade level, the student will be able to:
Seeing the World in Spatial Terms	<p>use maps, globes, and other graphic tools to analyze and develop explanations and solutions to geographic problems</p> <p>identify the ways in which people's mental maps of the Earth and their perception of places influences decisions of location, settlement, and public policy</p> <p>apply concepts related to spatial interaction, such as complementarity, intervening opportunities, and connections, to explain flow patterns in space</p>
Places and Regions	<p>evaluate how humans interact with the physical environment to form places</p> <p>use the concept of region to organize the study of the Earth's surface</p> <p>evaluate the causes and effects of ways that different groups in society view places and regions</p>

	<p>use concepts of physical geography, such as system, boundary, force, threshold, and equilibrium, to explain the effects of physical processes on different on different regions</p> <p>evaluate and analyze the distribution and characteristics of ecosystems</p> <p>apply concepts of ecosystems to environmental issues</p>
<p>Human Systems</p>	<p>explain and analyze the physical and cultural consequences of human migration</p> <p>describe the effect of technology on standards of living</p> <p>explain how culture influences conflict and cooperation</p> <p>analyze and evaluate issues related to economic systems at various spatial scales</p> <p>describe the differing characteristics of settlements in economically developing and developed countries</p> <p>explain how population and economic activity interact to change the spatial structure of settlements</p> <p>analyze the conflict and cooperation involved in shaping the various social, political, and economic spaces on Earth at different scales</p>
<p>Environment and Society</p>	<p>describe and analyze the changing nature of people's perceptions of the environment</p> <p>describe the causes and implications of different types of pollution, resource depletion, land degradation, and economic activity on the environment</p> <p>explain the role of resource development and use in the exploration, colonization, and settlement of different areas of the world</p> <p>identify ways that resources can be reused or recycled</p>

<p>The Power of Geography</p>	<p>compare and analyze the role of physical and human geographical factors in shaping the evolution of major historical outcomes</p> <p>evaluate contemporary issues by incorporating spatial and environmental perspectives</p>
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BENCHMARKS, GRADE LEVELS 8-K

<p>Key Concepts/Ideas Related to People, Places, and Environment</p>	<p>By the end of the 8th grade level, the student will be able to:</p>
<p>Seeing the World in Spatial Terms</p>	<p>use maps, globes, models, graphs, charts, and data bases to analyze spatial distributions and patterns</p> <p>use mental maps to answer geographic questions</p> <p>use concepts, such as distance, accessibility, association, and connections, to explain patterns of land use in urban, suburban, and rural areas</p> <p>use concepts, such as interdependence, accessibility, and distance, to explain the different ways that places are connected</p> <p>use the concept of diffusion to explain current spatial patterns and distributions</p>
<p>Places and Regions</p>	<p>identify and analyze how the use of technology alters the human and physical characteristics of places</p> <p>analyze the various criteria used to define a region</p> <p>explain how regions are connected</p> <p>identify the ways in which culture influences the perception of places and regions</p>

<p>Physical Systems</p>	<p>explain how physical processes influence the formation and distribution of resources</p> <p>infer and predict the consequences of specific physical processes operating on the physical environment</p> <p>explain the distribution of different ecosystems and their impact on human populations</p> <p>trace and explain changes in ecosystems</p>
<p>Human Systems</p>	<p>explain how population characteristics, patterns, and migration influence the way people behave spatially and economically</p> <p>analyze examples of culture change to identify the geographic and historical factors that influenced the change</p> <p>describe how cultures and societies change</p> <p>explain why and how countries trade goods and services</p> <p>explain how changes in technology, transportation, and communication affect economic activities</p> <p>explain how population growth, resource use, and environmental quality are related to economic development</p> <p>analyze and evaluate issues related to economic development</p> <p>locate and compare settlement patterns in different regions of the world</p> <p>describe and analyze how different goods and services are offered in settlements of different size</p> <p>explain why people cooperate and why they engage in conflict to divide the Earth's surface into different spaces</p> <p>explain how the Earth is divided into political, social, or economic units at a variety of scales</p>

<p>Environment and Society</p>	<p>describe how the various parts of a system relate to one another</p> <p>trace how systems change over space and time</p> <p>analyze ways humans depend on, adapt to, and alter the physical environment</p> <p>analyze and explain the positive and negative consequences of human interaction with physical systems at different levels of technology</p> <p>analyze and explain ways that contemporary land uses affect physical systems</p> <p>investigate local and larger scale environmental problems</p> <p>explain why people have different viewpoints regarding resource use</p> <p>explain how technology affects access to and use of resources</p> <p>identify and evaluate plans for the management and use of renewable, flow, and non-renewable resources</p>
<p>The Power of Geography</p>	<p>analyze and evaluate the impact of physical and human geographic factors on major historical events</p> <p>explain how exploration and mapping of territory in the U. S. related to changes in settlement patterns</p> <p>analyze the location, size, and importance of urban areas over time</p> <p>explain how competition for resources causes conflict</p> <p>use spatial and environmental perspectives to analyze contemporary issues</p>

BENCHMARKS, GRADE LEVELS 5-K

Key Concepts/Ideas Related to People, Places, and Environment	By the end of the 5th grade level, the student will be able to:
Seeing the World in Spatial Terms	<p>identify and describe the essential characteristics and purposes of maps, globes, and other geographic tools and technologies</p> <p>show spatial information on maps, models, and other data displays</p> <p>use his/her mental map of Earth to identify the relative location of places from a local to global scale</p> <p>identify major physical and human features of places at a variety of scales</p> <p>analyze and evaluate the location of places for human activities</p> <p>describe the different ways that places are connected through movement of goods, ideas, and people</p> <p>use spatial concepts such as direction, distance, accessibility, patterns, and association to describe relationships between locations</p>
Places and Regions	<p>describe and compare the human and physical characteristics of places</p> <p>describe and interpret physical and human processes that shape places</p> <p>analyze and evaluate the consequences of change in places</p> <p>describe the human and physical criteria that define a region</p>

	<p>describe ways in which regions are connected to one another</p> <p>describe places and regions in different ways</p>
<p>Physical Systems</p>	<p>describe the types of physical systems on Earth's surface and their characteristics</p> <p>explain and analyze relationships among physical patterns and processes</p> <p>describe how Earth's position relative to the Sun affects events and condition on Earth</p> <p>describe and illustrate ecosystems at a variety of scales</p> <p>explain ways humans interact with ecosystems</p>
<p>Human Systems</p>	<p>describe the patterns and distribution of population at a range of scales</p> <p>identify the factors which contribute to human migration</p> <p>identify the characteristics and components of culture in different regions</p> <p>identify the locations and boundaries of various economic activities in communities</p> <p>identify the different modes of transportation that are used to move people and products from one place to another</p> <p>explain patterns of settlement at different periods of time</p> <p>locate and describe the characteristics of major cities</p> <p>describe the processes people use to divide Earth's surface into political and economic units</p>

<p>Environment and Society</p>	<p>describe and analyze the ways that humans interact with the physical environment to satisfy their wants and needs</p> <p>compare the ability of physical systems to absorb the impacts of human activity</p> <p>assess the consequences of human activity on physical systems</p> <p>identify the characteristics and types of natural hazards</p> <p>locate and distinguish between renewable, flow, and non-renewable resources</p>
<p>The Power of Geography</p>	<p>identify major historical pathways for human movement in the U. S. and Western Hemisphere</p> <p>describe how the human and physical characteristics of places change over time</p> <p>identify the origins and impact of various kinds of boundaries</p> <p>analyze the role of resources in settlement</p>

STANDARD IIB

The student will understand how people create and change structures of power, authority, and governance in the local community, Kansas, the U. S., and selected nations in the world.

BENCHMARKS, GRADE LEVELS 12-K

Key Concepts/Ideas Related to Power, Authority, and Governance	By the end of the 12th grade level, the student will be able to:
Civic Life, Politics, and Government	<p>explain the meaning of civic life, politics, and government</p> <p>explain the major arguments advanced for the necessity of politics and government</p> <p>evaluate, take, and defend positions on competing ideas regarding the purposes of politics and government and their implications for the individual and society</p> <p>explain the essential characteristics of limited and unlimited governments</p> <p>evaluate, take, and defend positions on the importance of the rule of law and on the sources, purposes, and functions of law</p> <p>explain and evaluate the argument that civil society is a prerequisite of limited government</p> <p>explain and evaluate competing ideas regarding the relationship between political and economic freedoms</p> <p>explain different uses of the term "constitution"</p> <p>distinguish between governments with a constitution and a constitutional (limited) government</p> <p>explain the various purposes served by constitutions</p> <p>evaluate, take, and defend positions on what conditions contribute to the establishment and maintenance of constitutional government</p>

describe the major characteristics of systems of shared powers and of parliamentary systems

explain the advantages and disadvantages of federal, confederal, and unitary systems of government

evaluate, take, and defend positions on how well alternative forms of representation serve the purposes of constitutional government

Foundations of the American Political System

explain the central ideas of American constitutional government and their history

explain the extent to which Americans have internalized the values and principles of the Constitution and attempted to make its ideals realities

explain how characteristics, such as absence of a nobility or an inherited caste system, religious freedom and the Judeo-Christian ethic, social, economic, and geographic mobility, diversity of the population, and market economy, tend to distinguish American society from most other societies

evaluate, take, and defend positions on the importance of voluntarism in American society

evaluate, take, and defend positions on the contemporary role of organized groups in American social and political life

evaluate, take, and defend positions on issues regarding diversity in American life

explain the importance of shared political and civic beliefs and values to the maintenance of constitutional democracy in an increasingly diverse American society

describe political conflict in the U. S., both historically and at present

explain the factors that tend to prevent or lower the intensity of political conflict in the U. S.

explain how and why the ideas of liberal democracy and classical republicanism are reflected in the values and principles of American constitutional democracy

evaluate, take, and defend positions on what the fundamental values and principles of American political life are and their importance to the maintenance of constitutional democracy

evaluate, take, and defend positions on issues which involve conflicts among fundamental values and principles

evaluate, take, and defend positions about issues concerning the disparities between reality and the ideals of American constitutional democracy

System of Government
Established by the Constitution

explain how the U. S. Constitution divides and distributes power to national and state governments and how it seeks to prevent the abuse of power

evaluate, take, and defend positions on issues regarding the distribution of powers and responsibilities within the federal system

evaluate, take, and defend positions on issues regarding whether branches and agencies of the federal system are adhering to the values and principles of American constitutional democracy

evaluate, take, and defend positions about issues concerning the purposes, organization, and functions of institutions of the national government

evaluate, take, and defend positions on the major responsibilities of the national government for domestic and foreign policy

evaluate, take, and defend positions about how government should raise money to pay for its operations and services

evaluate, take, and defend positions on the proper relationships between the national government and the state and local governments

evaluate, take, and defend positions about issues regarding the organization of state and local governments

identify the major responsibilities of his/her state and local governments

evaluate how well his/her state and local governments are fulfilling their responsibilities

evaluate, take, and defend positions on the role and importance of law in the American political system

evaluate, take, and defend positions on current issues regarding the judicial protection of individual rights

evaluate, take, and defend positions about how the public agenda is set

evaluate, take, and defend positions about the role of public opinion in American politics

evaluate, take, and defend positions on the influence of the media on American political life

evaluate, take, and defend positions about the roles of political parties, campaigns, and elections in American politics

evaluate, take, and defend positions about the contemporary roles of associations and groups in American politics

evaluate, take, and defend positions about the formation and implementation of public policy

Relationship of American Politics and Government to World Affairs

explain how the world is organized politically

explain how nation-states interact with each other

evaluate, take, and defend positions on the purposes and functions of international organizations in the world today

explain and evaluate the significance of the principal policies and events in America's relations with the world

evaluate, take, and defend positions about how U. S. foreign policy is made and the means by which it is carried out

evaluate, take, and defend foreign policy in light of American national interests, values, and principles

evaluate, take, and defend positions about the impact of American political ideas on the world

evaluate, take, and defend positions about the effects of significant international political developments on the U. S. and other nations

evaluate, take, and defend positions about the effects of of significant economic, technological, and cultural developments in the U. S. and other nations

evaluate, take, and defend positions about what the response of American governments at all levels should be to world demographic and environmental developments

evaluate, take, and defend positions about what the relationship of the U. S. should be to international organizations

Roles of the Citizen in American Democracy

explain the meaning of citizenship in the U. S.

explain how a person can become a citizen of the U. S.

evaluate, take, and defend positions about issues involving personal rights

evaluate, take, and defend positions about contemporary issues that involve rights pertaining to political freedom

evaluate, take, and defend positions about contemporary issues pertaining to economic rights

evaluate, take, and defend positions about the relationships among personal, political, and economic rights

evaluate, take, and defend positions on issues regarding the proper scope and limits of the rights of citizens

evaluate, take, and defend positions about whether citizens in a constitutional democracy have certain personal and civic responsibilities

evaluate, take, and defend positions about the types of civic dispositions or traits of character that lead individuals to become independent members of society

evaluate, take, and defend positions about the types of civic dispositions or traits of character that foster respect for individual worth and human dignity

evaluate, take, and defend positions about the traits of character that incline citizens to public affairs

evaluate, take, and defend positions about the types of civic dispositions or traits of character that facilitate thoughtful and effective participation in public affairs

explain, using historical and contemporary examples, why certain types of civic dispositions or traits of character are important to the preservation and improvement of American constitutional democracy

evaluate, take, and defend positions on the relationship between politics and the attainment of individual and public goals

explain the difference between political and social participation

evaluate, take, and defend positions about the means that citizens should use to monitor and influence the formation and implementation of public policy

evaluate, take, and defend positions about the functions of leadership in American constitutional democracy

explain the importance of knowledge to competent and responsible participation in American constitutional democracy

BENCHMARKS, GRADE LEVELS 8-K

<p>Key Concepts/Ideas Related to Power, Authority, and Governance</p>	<p>By the end of the 8th grade level, the student will be able to:</p>
<p>Civic Life, Politics, and Government</p>	<p>explain the meaning of civic life, politics, and government</p> <p>evaluate, take, and defend positions on why government is necessary and what purposes government should serve</p> <p>describe the essential characteristics of limited and unlimited governments</p> <p>explain the importance of the rule of law for the protection of individual rights and for the common good</p> <p>explain various uses of the term "constitution"</p> <p>distinguish between governments with a constitution and a constitutional (limited) government</p> <p>explain the various purposes constitutions serve</p> <p>explain those conditions which are essential for the flourishing of constitutional government</p> <p>explain the advantages and disadvantages of federal, confederal, and unitary systems of government</p> <p>describe the major characteristics of systems of shared powers and of parliamentary system</p>
<p>Foundations of the American Political System</p>	<p>explain the central ideas of American constitutional government</p> <p>identify and explain the importance of historical experiences and geographic, social, and economic factors which have helped to shape American society</p> <p>evaluate, take, and defend positions on the importance</p>

of voluntarism in American society
evaluate, take, and defend positions on the value and
challenges of diversity in American life

explain the importance of shared political values and
principles to American society

describe political conflict in the U. S., both historically
and at present

explain the factors that tend to prevent political
conflict from leading to violence or that lower the
intensity of political conflict in the U. S.

explain the meaning and importance of the fundamental
values and principles of American constitutional
democracy

evaluate, take, and defend positions on issues in which
fundamental values and principles are in conflict

evaluate, take, and defend positions on issues
concerning ways and means to reduce disparities
between American ideals and the realities of political
and social life

System of Government
Established by the Constitution

explain how the powers of the national government are
distributed, shared, and limited

explain how and why powers are distributed and shared
between national and state governments in the federal
system

explain the major responsibilities of the national
government for domestic and foreign policy

explain the necessity of taxes and the purposes for
which taxes are used

explain why states have their own constitutions and
what relationships exist between state constitutions
and the federal constitution

describe the organization and major responsibilities of
state and local governments

identify his/her representatives in the legislative branches and the heads of the executive branches of his/her local, state, and national governments

explain the importance of law in the American constitutional system

explain and apply criteria useful in evaluating rules and laws

evaluate, take, and defend positions on current issues regarding judicial protection of individual rights

explain what is meant by the public agenda and how it is set

evaluate, take, and defend positions about the role of public opinion in American politics

evaluate, take, and defend positions on the influence of the media on American political life

explain how political parties, campaigns, and elections provide opportunities for citizens to participate in the political process

explain how interest groups, unions, and professional organizations provide opportunities for citizens to participate in the political process

explain how public policy is formed and carried out at local, state, and national levels and what roles individuals can play in the process

Relationship of American
Politics and Government to
World Affairs

explain how the world is organized politically

explain how nation-states interact with each other

explain how U. S. foreign policy is made and the means by which it is carried out

explain and evaluate the role of major international organizations in the world today

describe the influence of American political ideas on other nations

	<p>evaluate proposals for dealing with significant political, demographic, and environmental developments in the world</p>
<p>Roles of the Citizen in American Democracy</p>	<p>explain the meaning of American citizenship</p> <p>explain how a person becomes a citizen of the U. S.</p> <p>evaluate, take, and defend positions on issues involving personal rights</p> <p>evaluate, take, and defend positions on issues involving political rights</p> <p>evaluate, take, and defend positions on issues involving economic rights</p> <p>evaluate, take, and defend positions on issues regarding the proper scope and limits of rights of citizens</p> <p>evaluate, take, and defend positions on the importance of personal and civic responsibilities to the individual and to society</p> <p>evaluate, take, and defend positions on the importance of certain types of civic dispositions or traits of character to him/her and to American constitutional democracy</p> <p>explain the relationship between participating in civic and political life and the attainment of individual and public goals</p> <p>explain the difference between political and social participation</p> <p>describe the means by which Americans can monitor and influence the formation and implementation of public policy</p> <p>explain the importance of political leadership and public service in a constitutional democracy</p> <p>explain the importance of knowledge to competent and responsible participation in American democracy</p>